

Proceedings of the International Conference on Education Research

**Hosted by Independent Institute of
Education, South Africa**

21 - 22 November 2024



**Margi Boosey and
Reza Hosseini**

A conference managed by ACI, UK



**Proceedings of the
International Conference on
Education Research
ICER 2024**

**A Conference Hosted By
The Independent Institute of Education
South Africa**

21 - 22 November 2024

**Edited by Margi Boosey and
Reza Hosseini**

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About the International Conference on Education Research, 2024

The Proceedings of the International Conference on Education Research, 2024 includes academic research papers, PhD research papers, Master's Research papers and work-in-progress papers, which have been presented and discussed at the ICER 2024 conference. The proceedings are of an academic level appropriate to a professional research audience including graduates, post graduates, doctoral and post-doctoral researchers. All papers have been double-blind peer reviewed by members of the Review Committee.

Aims and Scope

The International Conference on Education Research (ICER) is an opportunity for academics, practitioners and consultants from around the world who are involved in the study, management and development of education research related issues to come together and exchange ideas. There are several strong strands of research and interest that are developing in the area including the use of technology in teaching and learning, active learning and student engagement, assessment and feedback, curriculum design and delivery, inclusive teaching and learning and teaching for social justice to mention only a few.

The aims of the conference now not only include sharing academic research but also fostering dialogue among practitioners, policymakers, and scholars to address pressing issues facing organizations and institutions today. The 2025 call for papers for the ICER is interested in contributions that consider the following topics. In addition, the committee welcomed papers on a number of specialist mini-tracks which can be seen at the end of this list.

1. The Use of Technology in Teaching and Learning

- Blended Learning Environments
- Educational Technology Tools
- Impact of Virtual Reality in Education
- E-learning Platforms and Accessibility

2. Active Learning and Student Engagement

- Cooperative Learning Strategies
- Gamification in Education
- Role of Discussion in Active Learning
- Engaging Diverse Learners

3. Assessment and Feedback

- Formative vs. Summative Assessment Techniques

- Peer Assessment Approaches
- Importance of Timely Feedback
- Digital Tools for Assessing Student Work

4. Curriculum Design and Delivery

- Integrating Interdisciplinary Approaches
- Developing Culturally Relevant Curriculum
- Online Curriculum Development Strategies
- Monitoring and Evaluating Curriculum Effectiveness

5. Inclusive Teaching and Learning

- Universal Design for Learning (UDL)
- Strategies for Supporting Diverse Learners
- Addressing Implicit Bias in Education
- Creating Inclusive Learning Environments

6. Teaching for Social Justice

- Critical Pedagogy Approaches
- Curriculum for Social Change
- Empowering Marginalized Voices
- Community Engagement in Education

7. Assessment Practices and Strategies

- Authentic Assessment Methods
- Designing Rubrics for Effective Assessment
- Using Analytics to Inform Assessment Practices
- Continuous Improvement in Assessment Strategies

8. Constructive Feedback on Completed Assessments

- Best Practices for Providing Feedback
- Balancing Critique and Encouragement
- Feedback Loops in Learning Cycles
- Using Technology to Enhance Feedback

9. Module Development in the New Digital Era

- Best Practices for Online Module Design
- Incorporating Multimedia in Course Content
- Student-Centered Approaches to Module Development
- Evaluating Online Learning Modules

10. Curriculum Development, Implementation, and Monitoring

- Strategies for Effective Curriculum Implementation
- Feedback Mechanisms for Curriculum Improvement
- Engaging Stakeholders in Curriculum Development
- Evaluating Learning Outcomes

11. Module Throughput and Success

- Factors Influencing Student Success
- Strategies to Improve Module Completion Rates
- Analyzing Dropout Rates in Modules
- Support Systems for Struggling Students

12. Teaching and Learning Pedagogies

- Innovative Teaching Strategies

ICER Preface

These proceedings represent the work of contributors to the International Conference on Education Research (ICER 2024), hosted by ACI and The Independent Institute of Education, South Africa, on 21 - 22 November 2024. The Conference Chair is Professor Margi Boosey, and the Programme Chair Professor Reza Hussein all from The Independent Institute of Education, South Africa.

ICER is in its inaugural year as an event on the academic research calendar and the key aim is the opportunity for participants to share ideas and meet the people who hold them. The scope of papers will ensure an interesting two days. The subjects covered illustrate the wide range of topics that fall into this important and ever-growing area of research.

The opening keynote presentation is given by Professor Andre Abrahams from The Independent Institute of Education, South Africa, who will talk about *Not All Movement is Forward, Not All Change is Good: Tradition in the age of rapid innovation and technology*. The second day of the conference will begin with an address from Extraordinary Professor Dan Remenyi from University of the Western Cape, South Africa who will discuss *AI and Research*.

With an initial submission of 155 abstracts, after the double blind, peer review process there are 53 Academic research papers, 2 PhD research papers, and 4 work-in-progress papers published in these Conference Proceedings. These papers represent research from Australia, Botswana, Canada, France, Ireland, Netherlands, Nigeria, South Africa, Sweden, Turkey, UK, and the USA.

We hope you enjoy the conference.

Margi Boosey and Reza Hussein

Cape town, South Africa

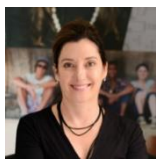
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Conference and Programme Chairs



Margi Boosey is a seasoned education professional with a remarkable career that has spanned diverse roles and responsibilities, culminating in her current position as Academic Manager for Varsity College and IIE MSA brands.

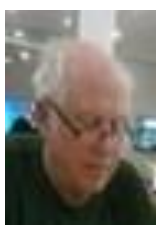


Reza Hosseini is the Acting Dean of Research and Postgraduate Studies at The Independent Institute of Education.

Keynote Speakers



André Abrahams, is currently the Deputy Dean: Academic Development and Support at the Central Academic Team of The Independent Institute of Education (IIE). He completed his undergraduate and Master's degrees in Political Science, and a PhD in Development Studies with a focus on Education for Sustainable Development and transformative teaching practice and has over 10 years' experience in the field of higher education. Dr Abrahams's research interests include Education for Sustainable Development (ESD), Transformative Learning and Problem-Based Learning. An advocate for student-centered learning which aims to place students as the focal point of each lecture, giving students the ability to gain critical thinking skills that will transcend the lecture halls into real-life situations; André has also worked with Amnesty International, various municipalities, and NGO's to promote Education for Sustainable Development and the 21st century skills desperately needed in the Southern African context.



Dan Remenyi has had a lifelong interest in universities and academe and has taught in more than 20 countries around the world. Originally his subject was information and communications technology Management, but for the past few decades he has specialised in research methodology and the sociology of research. He has recently edited two volumes on the subject of the university of the future. He has authored and co-authored some 30 books as well as a number of peer-reviewed academic papers. He holds a BSocSc, MBA and PhD.

Mini Track Chairs



Brenda van Wyk (PhD; M.Ed; M.Inf) is currently a research associate and senior academic in the EBIT Faculty at the University of Pretoria. She serves on the steering committee of ACEIE. She is the Managing Editor of a DHET accredited journal: the Independent Journal of Teaching and Learning (IJTL). She has published several manuscripts and articles in academic journals, chapters in books and conference proceedings



Ayanda Deliwe is the Head of Department and Senior Lecturer at Nelson Mandela University Business Management Department. She holds a PhD in Commerce Leadership and is an international award winner where she has won the Women in Leadership award in the London Digital School of Business awards 2023. She has also won the Nelson Mandela University Faculty Emerging Researcher

Award in the year 2021. Dr Deliwe has published articles in high-rated journals on education and e-learning and has presented and been a keynote speaker at international conferences. Dr Deliwe is currently working on an e-learning 3-year project where the main focus is on how higher education institutions can prepare for the future of technology.



Ockert R. Pretorius is a lecturer at the Department of Urban and Regional Planning, University of Johannesburg, South Africa. His research interests include regional policy and economic resilience, and he has an industry background in development economics.



Rika Swanzen is the Deputy Dean of Research at the Independent Institute of Education. From 2015-2018 Rika held the position of Adjunct Associate Professor with the Caulfield campus of Monash University and from mid-2016 to mid-2022 she served as ministerial appointee on the South African Council for Social Service Professions. She co-edited the Relational Child and Youth Care Practice journal from 2015 to 2022 and was a member of the scientific committee for the 2021 ASASWEI conference. Dr. Swanzen authored 24 peer reviewed publications and delivered 28 conference presentations from 2007 to 2023. While managing various academic departments since 2010, she developed curriculum, lectured, supervised and externally examined postgraduate students.

An Investigation Into the Perceived Effectiveness of GitHub Repositories to Teach Programming

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Abstract: The utilization of Git for version control and collaboration has long been the staple of the software development industry. To ensure that Computer Science students are industry-ready, academics adopt the use of platforms like GitHub in their teaching in different ways to expose students to these tools. In earlier studies, GitHub has been integrated for the purposes of student management, collection of assessments and facilitation of collaborative programming exercises. This paper explores the use of lecturer-provided GitHub repositories as a tool to support the teaching of core aspects of a programming curriculum. The pedagogical approach constructivism required students to learn core concepts by following repositories to build simpler applications. Thereafter, students are assigned more complex applications to develop. Students were required to work in pairs and submit their repositories for evaluation. This study adopted a case study approach supported by a combination of a student survey and a focus group discussion among lecturers and the teaching assistant involved in the course. Key findings included that integrating GitHub repositories presents several opportunities for collaboration, knowledge enhancement, self-directed learning, and reduced stress. However, this approach also resulted in team and technical challenges becoming prevalent, with students finding their own ways to overcome these challenges. Additionally, lecturers observed varied levels of engagement, reliance on lecturer-provided code, and occasional contextual challenges related to Internet connectivity. Lecturer-provided repositories can be enhanced in terms of structure, the inclusion of more comments explaining code, and through the inclusion of images and video. Recommendations are provided for academics who are looking to integrate GitHub into their teaching practice as well as suggestions for future work.

Keywords: Educational technology, Higher education, Computer science education, GitHub, Collaboration, Industry-readiness

1. Background

The field of software development is evolving rapidly, and it is becoming increasingly essential to equip Computer Science (CS) students with skills and attributes required in industry. These skills include the ability to work collaboratively in geographically distributed teams and utilize modern version control platforms like git to work on shared codebases with increasing complexity (Glassey, 2019, Patani et al., 2024). Upon completion of a CS qualification, graduates are expected to integrate into existing teams with existing and legacy codebases often hosted on git platforms, like GitHub (Patani et al., 2024). Knowledge of git also enables students to harness DevOps capabilities like automated testing, continuous integration, and continuous deployment (Patani et al., 2024). GitHub, a widely used cloud-based repository and version control platform with over 100 million users in 2023 (Dohmke, 2023), has been introduced several years ago into CS for managing assignments, assessments and providing feedback (Glassey, 2019).

This study aimed to investigate the perceived effectiveness of using GitHub repositories to teach final year programming from the perspective of students and lecturers. This paper provides a review of previous literature followed by into the course used as a context for this study. Then, an outline of the methodology is provided. Thereafter, an analysis of results is conducted in the context of existing literature. The paper concludes with recommendations and suggestions for future work.

2. Review of Previous Literature

This literature review commences by discussing the history of GitHub in higher education followed by discussing pedagogical considerations. Thereafter, strengths and challenges of using GitHub as a tool are discussed. Within each sub-section, various themes are extracted from literature.

2.1 History of GitHub in Higher Education

Perhaps the earliest use of GitHub in higher education an American university in 2010 (Glassey, 2019). However, GitHub was not designed as an e-learning platform but was repurposed to facilitate learning (Glassey, 2019, Feliciano et al., 2016). In 2015, GitHub launched GitHub Classroom to allow for the management of individual and group submissions in repositories, automated grading of work, and collaboration with students (Gennarelli, 2018).

2.2 Pedagogical Considerations Relating to GitHub

GitHub offers benefits for teaching and learning, explained by Feliciano et al. (2016) as Contributing Student Pedagogy. In such a pedagogy, students are encouraged to participate in collaborative spaces to drive their own learning through equitable participation, creation of content, solution sharing, and participation in peer reviews (Feliciano et al., 2016). This approach aligns with the constructivist pedagogical approach adopted in teaching the course used in this study, whilst allowing connectivism to be harnessed (Siemens, 2007).

There are multiple ways in which GitHub can be integrated into a course. For managing assessments, students can submit assessments using GitHub, host their own projects, and GitHub Classroom spaces as a replacement to traditional LMS platforms to manage assessment submissions (Glassey, 2019, Feliciano et al., 2016, Haaranen and Lehtinen, 2015, Angulo and Aktunc, 2019). For feedback, lecturers can use the built-in issue tracker, pull requests to enable review, and unit testing to automatically grade work (Glassey, 2019, Hsing and Gennarelli, 2019). For disseminating course content, lecturers can share content, code or starter code with students (Haaranen and Lehtinen, 2015, Feliciano et al., 2016, Angulo and Aktunc, 2019, Patani et al., 2024). However, Patani et al. (2024) argues that these are passive approaches where students consume rather than create.

For fostering participation and collaboration, GitHub has been adopted for courses where students can participate by picking issues to fix, cloning, committing new changes, engaging in code reviews, and merging their changes (Zakiah and Fauzan, 2016). GitHub has also been used to facilitate practical lab activities (Angulo and Aktunc, 2019), for collaborative assessments where continuous integration (CI) was used to monitor code quality using DevOps tools (Lu et al., 2020, Raibulet and Arcelli Fontana, 2018).

2.3 Advantages Presented by GitHub

GitHub presents several possible advantages. Students are provided with skills to engage with industry tools, opportunities for increased collaboration, and a chance to contribute to their own learning (Glassey, 2019, Tushev et al., 2020). Academics are provided automated grading capabilities and insight into individual student participation in group projects (Buffardi, 2020, Feliciano et al., 2016, Angulo and Aktunc, 2019). Furthermore, academics may choose to reuse teaching material across years or courses (Feliciano et al., 2016). Institutions face reduced technical burden to setup and maintain dedicated infrastructure on campus for submissions of assignments (Glassey, 2019).

2.4 Challenges Confronting the use of GitHub

Despite the capabilities and advantages of GitHub, it is not a silver bullet (Tushev et al., 2020). There is a significant learning curve to understand the principles of git, learning git commands, dealing with merge conflicts, learning markdown, managing commits, and managing team dynamics around code collaboration (Glassey, 2019, Angulo and Aktunc, 2019, Tushev et al., 2020). Additionally, GitHub itself is also not the ideal space for different types of documentation documents and presentations (Tushev et al., 2020, Feliciano et al., 2016). Furthermore, academic integrity concerns become prevalent when students push their code to public repositories (Feliciano et al., 2016).

As can be gleaned from the literature, GitHub provides opportunities to enhance teaching and learning in CS, but it is not without challenges. Furthermore, whilst there have been several studies exploring GitHub for assessments and team collaboration, there has been limited study into how GitHub repositories have been used in developing context as a tool to support the teaching of core programming concepts through lecturer-provided repositories.

3. The Programming Course for This Study

The context for this study is a final year CS course at a private South African Higher Education Institution (HEI). The course covers design patterns and enterprise architecture. In the 2024 iteration, the course was co-taught by the author and two lecturers to two groups of students, respectively. The course was also supported by a postgraduate student who served as a teaching assistant.

The pedagogical approach undertaken in the course was grounded in constructivism and connectivism as explained by Siemens (2007). Previously, students were assigned smaller activities to facilitate learning of content. In this iteration, students were assigned a single complex application that students would develop over the semester. Students were required to work in pairs to build a web-based bookstore to a recommended architecture specification outlined in Figure 1.

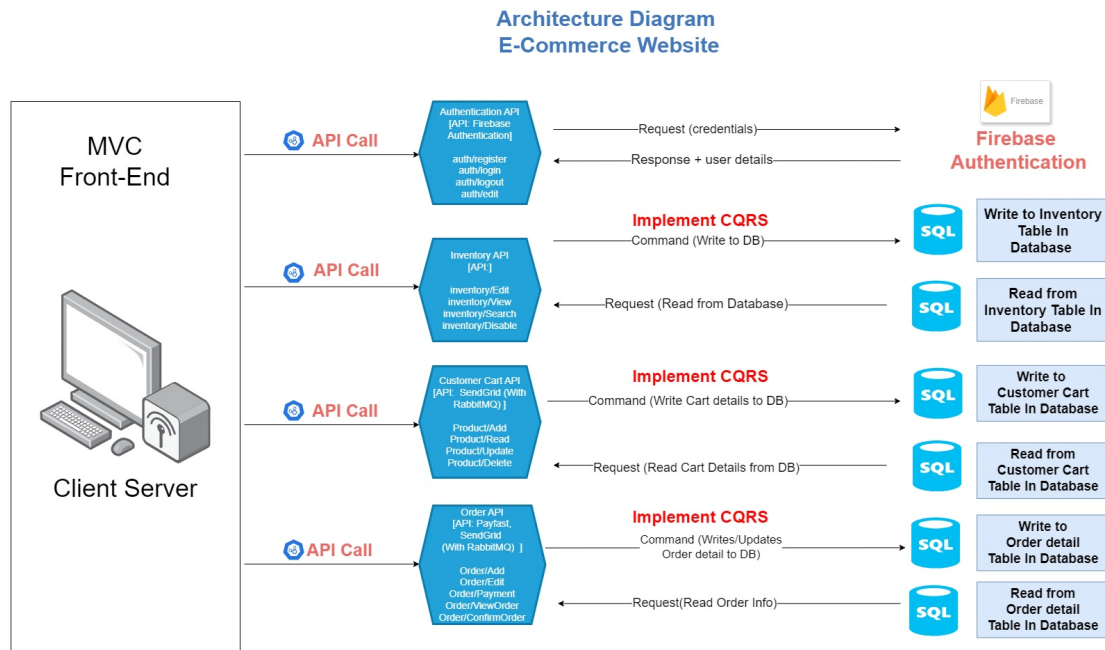


Figure 1: Online bookstore architecture

To teach the concepts, the author used a simple math application that incorporated an architecture of similar complexity developed over the semester using several GitHub repositories. Each repository contained a readme file written in markdown with steps and explanations of course content in a tutorial format – see Figure 2. Working code for the simple math application was also pushed to the repositories as concepts were added. In this manner, students could follow the tutorial for their own learning and troubleshoot using the code.

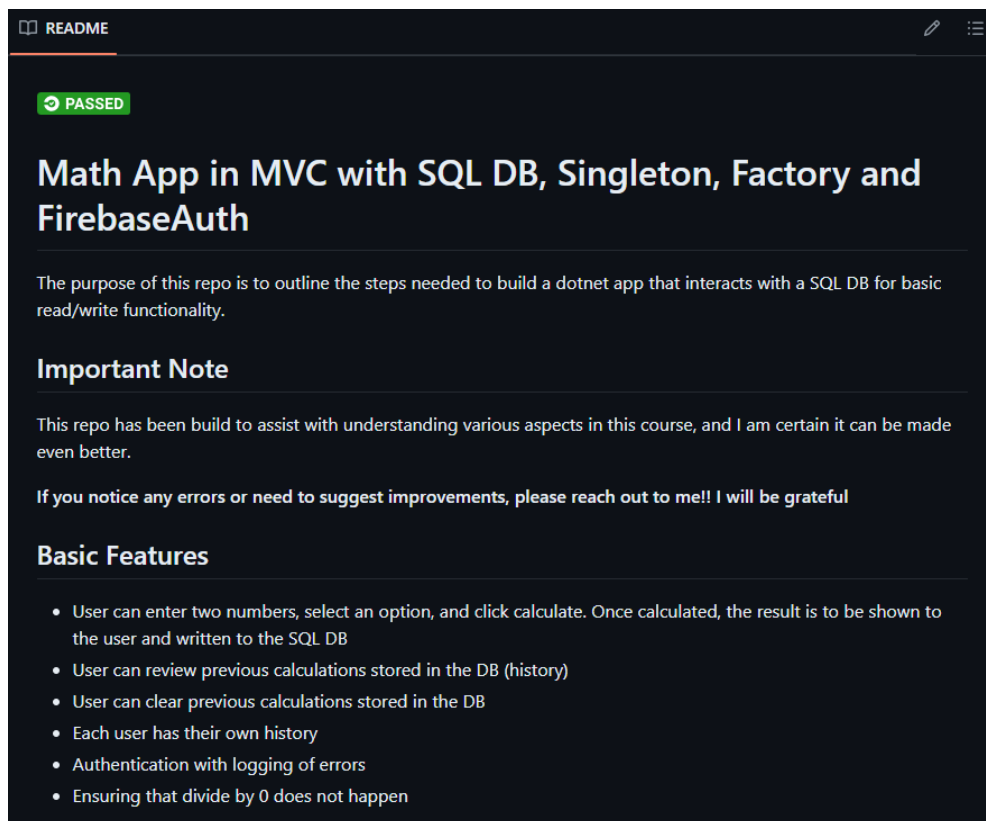


Figure 2: An example of a tutorial from the repository showing instructions and badges

The various repositories and the concepts covered in each repository are outlined in Table 1. Repositories were hosted in the GitHub organization for the course: <https://github.com/PROG7311-VCDN-2024/>. As students were assigned an activity to integrate new concepts into their own bookstore, the lecturers used the repositories to teach the content.

Table 1: Repositories and concepts covered

Repository Name	Concepts Covered
MathApp	Revision of MVC in C#, FirebaseAuth in .NET, EntityFrameworkCore, integration of various design patterns, environment variables
MathAPI	Receiving and serving API requests, documenting with SwaggerUI
MathAPIClient	Making API requests, working with JSON objects, error handling
EmailService	Minimal APIs, SendGrid integration, GitHub Actions
MathApp (Docker branch)	Containerization using Docker and deployment to DockerHub
MathApp (CircleCI branch)	Continuous integration using CircleCI
MathApp (master branch)	Continuous deployment using CircleCI and Azure

4. Methodology

Since this study aimed to deeply understand a real-world phenomenon in a specific context without the intent of generalizing findings, an interpretivist paradigm was followed supported by a case study approach (Leedy and Ormrod, 2023). This study adopted a mixed methods approach to data collection to harness the benefits offered by both quantitative and qualitative instruments whilst allowing for triangulation to enhance the credibility of the findings (Harwell, 2011, Creswell, 2017). A case study approach has previously been adopted to understand how students experienced and perceived GitHub in several studies by Haaranen and Lehtinen (2015), Feliciano et al. (2016), Tushev et al. (2020), and Lu et al. (2020).

To collect data, this study employed an online survey distributed to students enrolled in the course as well as a focus group discussion with the two lecturers and teaching assistant. Data collection only commenced once institutional ethics was obtained (Reference: R.0002044), informed consent was obtained from all participants, and all participants' identities are protected and that participants are anonymised.

The link to complete the online survey was distributed to all 110 students enrolled in the PROG7311 course. These students comprised two thirds male and one third female, with an average age of 21 years old. Students were purposively sampled based on whether they actively engaged with the repositories provided. A total of 29 students provided complete responses resulting in a response rate of 26%. When considering the sampling approach, the fact that the survey was run outside of term when students were not on campus, and the fact that the survey was administered online, the response rate is deemed acceptable (Wu et al., 2022).

The practice of using a survey for a study exploring students use of GitHub has precedent in prior studies by Patani et al. (2024), Raibulet and Arcelli Fontana (2018), and Bennedsen et al. (2022). For this study, surveys that were used by Tushev et al. (2020) and (Haaranen and Lehtinen, 2015) to understand how students experienced GitHub to learn programming were adapted. Several open-ended questions were adapted from their surveys. The closed-ended Likert scale questions also adapted into this survey asked participants to provide their perceived GitHub competency before the course, their perceived GitHub competency after the course, and the extent to which lecturer-provided repositories enhanced learning. Responses were analysed using the Python pandas library to understand the descriptive statistics. Themes that emerged from the remaining open-ended survey questions were analysed using NVivo.

The focus group was hosted online to ensure that travel constraints did not hinder participation as the focus group was held outside of term (Sekaran and Bougie, 2016). The focus group was recorded and transcribed in Microsoft Teams. Thereafter, thematic analysis was also conducted using NVivo. The use of qualitative instruments to understand GitHub use for learning has precedent in a study Feliciano et al. (2016) who adopted a range of interviews to understand student experiences of using GitHub at various levels of study. In this study, the use of a focus group enabled participants and researcher to build upon responses provided by others in the focus group (Ravitch, 2020, Leedy and Ormrod, 2023). Analysis of results

This section commences with an analysis of the responses provided by students in the survey. Thereafter, an analysis of focus group discussion is provided. The themes that emerged from data included perceived

benefits, perceived challenges, and suggestions for improvement. Within each of these themes, several sub-themes are explored relating to aspects like academic performance, problem solving, independent learning, student engagement, use of multimedia, and team collaboration. These formed the lens through which analysis is presented.

4.1 Students' Perceptions and Experiences of GitHub

As discussed in the literature, despite the necessity of learning GitHub, the technical learning curve was cited as an inhibiting factor to the adoption of GitHub (Tushev et al., 2020). One of the intentions behind adopting repositories as a central feature of this course was to encourage use of an industry tool among students (Bennedsen et al., 2022). Participants experienced an increased level of perceived competence with GitHub. Prior to engaging with the course, participants provided an overall positive rating (μ : 3.38, M : 3.0, s : 0.94). There was a noticeable increase reported after the course (μ : 4.1, M : 4.0, s : 1.01). Considering the std deviations before and after the course, it emerges that participants may have perceived varied levels of change in their perceived competence. In literature, students reporting improvements in GitHub competence was also found by Tushev et al. (2020), Patani et al. (2024) and Bennedsen et al. (2022). A distinguishing factor in this paper is the use of lecturer-provided repositories and participants indicated that the lecturer-provided repositories enhanced learning by providing an overall strongly positive rating (μ : 4.38, M : 5.0, s : 0.78). This suggests that their perceived competence was also shaped in a meaningful manner by the repositories.

4.1.1 Perceived benefits of using GitHub to learn programming

Several students reported that the course enhanced their knowledge by making them grow in their use of GitHub, *"Sprint tasks has allowed me to get completely comfortable with GitHub"* – SR3. Another student reported learning how to efficiently manage their repositories, *"It has made me do more research on GitHub practices and learn more about how to put manage my repo more efficiently"* – SR7. Similar findings were observed by Patani et al. (2024) whilst also showing that students experienced an increased sense of industry readiness through such tasks.

A further benefit was that students were able to hone their collaboration skills, *"Using GitHub provided more hands-on experience with collaborating with multiple users in the same repo"* - SR10. In alignment with this, another participant shared specific GitHub features that using repositories allowed them to develop, *"The sprints had helped me learn how to create branches, push and create pull requests"* – SR14. A similar sentiment was shared by another participant who indicated that these features enhanced collaboration, *"Using GitHub repositories to submit sprint work has greatly improved my understanding of version control, collaborative workflows, and project management. I've learned how to manage branches, create pull requests, and collaborate effectively with teammates through code reviews and issue tracking."* – SR20. The role of integrating GitHub to foster greater collaboration was also found by Patani et al. (2024). In developing collaboration skills, Feliciano et al. (2016) argue that students become more industry ready.

However, not all participants found that integrating repositories into the course benefitted them, primarily due to prior knowledge of GitHub, *"GitHub came as first nature I mean we are 3rd Computer Science students so being able to do something as simple as uploading proved no challenge"* – SR1. This was echoed by another participant as well, *"Not much because it's similar to other submissions"* – SR4. These participants bear resemblance to some surveyed by Bennedsen et al. (2022) who only saw the short term benefits of using GitHub.

4.1.2 Perceived challenges of using GitHub to learn programming

When considering challenges experienced by students, the most prevalent challenge was the learning curve. *"My teammates are not being as knowledgeable with using git."* – SR3. These findings relating to the learning curve and overcoming technical challenges were also observed by Feliciano et al. (2016), Patani et al. (2024) and Bennedsen et al. (2022). Students overcame these challenges by reaching out to lecturers, and this was cited by several participants. One example of such feedback was, *"I get advice and help from lecturers."* – SR13. Aside from lecturers there were also students turning to peers, *"I asked a friend who was more knowledgeable to help me."* – SR22. It also emerged that students undertook their own research when facing challenges. This included using online resources, *"I managed to resolve the issue using Stackoverflow."* – SR9. Other platforms were also consulted as outlined by a participant, *"I got assistance by Googling, research, YouTube videos and consulting lecturers."* – SR24. As was observed in this study, when students overcome the learning curve in their own ways, it creates a sense of accomplishment and confidence (Haaranen and Lehtinen, 2015).

Using GitHub also presented challenges relating to collaboration and merging, *"Occasional miscommunications with team members regarding pushing and pulling code from the repo"* – SR10. This was explained by another participant, *"The common issue is managing conflicts when multiple team members are working on the same files or branches simultaneously."* – SR20. To overcome this challenge, students adjusted their internal team processes to ensure that code collaboration was easier, *"My teammate and I had to let each other know when we made commits so we knew to pull before we started working."* – SR22. This was echoed by another participant, *"Resolving these conflicts requires communication and coordination among team members to ensure changes are integrated correctly."* – SR17. This proved useful for some, *"Better communication with fellow team members resolved challenges faced, and more hands-on practice made repo management easier"* – SR10. These challenges were also found by Feliciano et al. (2016).

4.1.3 Student suggestions for improvement

Participants were also asked to share how lecturer-provided repositories could be improved to enhance their learning. They indicated that documentation be provided in the forms of comments, *"More comments that even a non-technical guy can understand in the code"* – SR1. Another form of documentation that emerged was the need to support students with more steps coupled with guidance on possible errors and debugging, *"I think more walkthroughs and possible issues and errors that could occur would be more"* – SR7.

From a multimedia perspective, images were suggested to enhance engagement, *"Make them fun having images"* – SR1. Additionally, the inclusion of videos was cited as potentially beneficial, *"Perhaps a YouTube tutorial if necessary."* – SR15 and *"a video showing how the code works"* – SR16. Some participants highlighted topics which they felt would benefit from having videos, *"Include custom videos of how you did your activities, such as dockerizing."* – SR8 and *"videos may help to re-learn the git commands"* – SR13.

After experiencing GitHub repositories to learn at final year level, participants suggested that using GitHub within programming classes should be introduced in earlier years, *"I think if there was a short course in year one on how to push to git, big files, small files, etc. it would have opened us more to its usefulness."* SR11. This was echoed by another participant, *"The repos were good, you should start using them from year one. The sprint work too so that students aren't overwhelmed by the workload"* – SR16. Whilst there will always be room for improvement in how git is rolled out (Haaranen and Lehtinen, 2015), earlier integration was also argued for by Feliciano et al. (2016).

4.2 Lecturers' Perceptions and Experiences of Using GitHub to Teach

4.2.1 Perceived benefits of using GitHub to teach programming

When lecturers were asked about the perceived benefits of using GitHub to teach, they primarily identified benefits for students. The first benefit is an increase in academic performance and coding skills among students who engaged with repositories, *"When marking, I noticed that students who used the repositories tended to perform better and put in more effort. There was a visible improvement in their practical coding skills"* – L3. Alongside this, lecturers observed an increase in students using other features of git, *"They've been come accustomed to it and to the use of markdown and use the other tools that are available from Git itself."* – L2. Tushev et al. (2020) also observed that students who engage begin to utilize other tools provided by GitHub.

Another benefit was that lecturer-provided repositories allow for self-paced learning, *"The repos were particularly useful for students who preferred to work at their own pace, providing a reliable resource for self-study."* – L1. This was echoed by another lecturer, *"There was benefit for students having a working codebase to refer to and this helped them learn through exploration and experimentation."* – L2.

Additionally, lecturers reported that students benefit from having what they perceived as a reliable resource, *"Having a reliable resource reduced students' stress, especially during assessments, as they had a clear reference to guide them."* – L1. Another lecturer shared a similar sentiment, *"Repositories provided a consistent and trustworthy resource, helping students feel more confident in their work."* – L3.

4.2.2 Perceived challenges of using GitHub to teach programming

Alongside the benefits, lecturers identified challenges relating to the use of GitHub, again from the view of their students. Lecturers found that not all students used the repositories effectively, *"While some students fully utilized the repositories, others did not engage as much, leading to inconsistencies in achieving learning outcomes."* – L1. Possible reasons cited were lack of motivated or struggling during the initial setup of GitHub,

"The repositories were not as effective for students who were not self-motivated or who struggled with the initial setup." – L2. This aligns with a finding by Bennedsen et al. (2022) who found that initial setup proved challenging for some students.

One possible reason for a lack of motivation to engage was cited as students expecting that they would get the repositories which made them reliant on lecturer-provided code, *"Some students might rely too much on the provided code without fully understanding it, leading to superficial learning."* – L2. This practice resulted in students adopting an approach that negatively affected their engagement, *"Some students copied and pasted code without attempting to understand or modify it, which was more evident in less engaged students."* – L3.

In terms of technical issues, the learning curve proved significant for some students, *"Some students faced difficulties with the initial setup and needed additional support to get started with the repositories."* – L3. On occasion, lecturers found that students faced issues with the environment, *"Technical issues such as problems with virtual machines and internet connectivity that sometimes hindered the effective use of repositories."* – L2.

In this study, challenges from literature around repository privacy and the fact the GitHub was not designed as primarily a teaching tool did not emerge (Glassey, 2019, Angulo and Aktunc, 2019, Feliciano et al., 2016). The author posits that this is since repositories and student submissions in the course were hosted inside a GitHub organization linked to GitHub Classroom, which manages repository privacy and allows access to private repositories for lecturers.

4.2.3 Lecturer suggestions for improvement

Like was the case with students, lecturers were also asked to provide suggestions for improvement of the GitHub repositories to teach programming. Notable, there is alignment between students and lectures on what can be improved.

The first suggestion was that the codebase itself must not be provided to students before class, *"Perhaps a hybrid approach is needed, where initial exercises are done in class before providing complete solutions in the repositories, to ensure students first attempt the problems on their own."* – L2. This was supported by another participant to alleviate the reliance, *"I support this idea as it would help balance guided learning with independent practice."* – L1. Thus, whilst providing the repositories may be a benefit, there is a need for a more balanced approach.

Like with students, lecturers also suggested more instructions in the form of comments, *"I recommend providing more detailed instructions and comments within the repositories to help students understand the code better."* – L3. Additionally, lecturers also suggested more multimedia be included in repositories, *"Including visual aids and more interactive elements could further enhance the learning experience."* – L1.

Lecturers also suggested that repositories be phased in, *"Perhaps gradually introducing the use of repositories, especially for less experienced students, to ensure they first build a strong foundational understanding."* – L2. Considering this alongside students' feedback discuss earlier reinforces the need for integrating repositories into programming earlier on in the qualification would be beneficial.

5. Recommendations

Based on the findings of this study, the following recommendations, which are supported by literature, are made:

Integration is essential: It is recommended that lecturers teaching programming integrate the use of GitHub repositories into their teaching practice as findings show that expecting students to work GitHub for in-class activities encourages students to learn and master the technology. This prepares them well for a career in industry working in collaborative teams where git is widely used. Multimedia should be integrated into the repositories to increase engagement.

Overcome the learning curve: Students should be provided with training and resources on how to use GitHub to collaborate and submit their work. Lecturers should be upskilled on the advanced features of GitHub and on how to use repositories effectively and in a balanced manner within their teaching.

Integrate early on: It is also recommended that GitHub is integrated into teaching practice early on as findings suggest that students will have more time to traverse the learning curve presented by git as a technology. If this is done earlier, then students can adjust to using GitHub more frequently and can be exposed to more

complex aspects like CI/CD later in the qualification. Since the code-collaboration tools provided by GitHub are where students reported challenges, group or pair activities are recommended even from early stages.

Integrate in moderation to encourage engagement: It is also recommended that lecturers do not provide the entire codebase up-front but may provide the tutorial-style structure to begin an activity. Once sufficient progress has been made by students, then the codebase may be shared with students to refer to. This will ensure that constructivism is applied, a balance is maintained, students engage with work and form their own knowledge, and are not reliant on lecturer-provided code. GitHub can be used to gather submissions and assess level of contribution.

6. Future Work

This study may be extended to different contexts, other courses and larger classes, to apply and evaluate the recommendations. Furthermore, the inclusion of more programming activities and DevOps tools into the learning process needs to be explored. Additionally, feedback and automated grading features of GitHub Classroom can benefit from further study. Lastly, the influence of integrating of GitHub earlier in a curriculum may be explored longitudinally.

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Reader's Theatre: A Critical Lens for Engaging Psychology Students with Socio-Political Reality

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Abstract: Thanks to the intersection of colonialism, late capitalism and neoliberalism, Western medico-scientific approaches dominate psychological training and practice in the global South. Such approaches position patients as passive, encouraging clinicians to impose universalised assumptions in the psychotherapeutic space. Western approaches also undermine any acknowledgement of the socio-cultural, political, and economic causes of distress - such as racism, sexism, and engineered inequality - so prevalent in multicultural and resource-constricted contexts. Taking a transformational and decolonial stance, there is an urgency to develop alternative approaches to address this neglect. In response, this study employs an action research design - with pre- and post-strategy questionnaires and self-study assignments - and explores the usefulness of reader's theatre for developing awareness of the impact of taken-for-granted socio-political attitudes, norms, and values on subjectivity. Findings reflect that through this strategy students can acknowledge how experiences that do not correspond to socio-politically endorsed discourses lead to feelings of anger and resentment for some, as well as shame and humiliation for others. Employing reader's theatre may, therefore, be an important step toward the development of clinicians empowered to work in a respectful and socially just manner with the complexities of distress in the global South.

Keywords: Colonialism, Critical pedagogy, Late capitalism, Neoliberalism, Social unconscious, Transformation and decolonisation of higher education

1. Introduction

The intersection of colonialism, late capitalism, and neoliberalism has significantly influenced many aspects of higher education, including psychological training and practice (Hook, 2001). As many higher education institutions in the global South were founded during periods of colonial domination, they frequently prioritised the agendas of colonial powers over the needs of indigenous communities (Long, 2016). This has resulted in the privileging of Western epistemologies and methodologies at the expense of local knowledge and meaning making systems (Maldonado-Torres, 2017). Today, the intersection of late capitalism and neoliberalism has further exacerbated marginalisation in the global South (Hlatshwayo, 2022). For example, in the pursuit of profit and efficiency, there has been a tendency to prioritise medico-scientific models of psychology over more holistic and community-based approaches (Holdstock, 2013). As a result, educators, students, and clinicians - as academic citizens - often engage with the complexities of distress solely in terms of internal defensive operations, negative automatic thoughts, and genetic predispositions (Auld, 2023). This has led to the neglect of socio-cultural, political, and economic factors, all of which can be crucial for understanding and addressing suffering in diverse contexts (Layton, 2007). This neglect is disturbing, especially considering that as long ago as 1989, numerous South African scholars - such as Butchart and Seedat (1990), Foster (1999), Gibson (1989), Mohutsioa-Makhudu (1989), and Swartz and Levett (1989) - highlighted the profound and lasting effects of political oppression, economic inequality, and apartheid on subjectivity.

Ultimately, the prioritisation of Western medico-scientific approaches represents a missed opportunity to see people as active, purposeful agents, who create meaning and make choices in their lives, while their subjectivity is both restrained and contained by their social embeddedness. Transforming and decolonising psychological education, therefore, entails incorporating critical approaches which facilitate the exploration of entrenched, taken-for-granted, socio-cultural, political, and economic discourses (Boyle, 2022, Layton, 2007). In this study, reader's theatre is put forward as one such approach. It is hoped that this strategy will enrich psychological education, fostering a more comprehensive grasp of human experiences across diverse cultural landscapes.

The paper begins with an overview of the need to transform and decolonise psychological education. Next, the group psychoanalytic concept of the 'social unconscious' is discussed. This is followed by an exploration of the utility of reader's theatre as a means of enabling students to become aware of the impact of accepted socio-political attitudes, norms, and values on subjectivity. Finally, a study is put forward to illustrate how, by portraying a character in a play, students have the potential to gain an embodied understanding of embedded socio-cultural, political, and economic discourses operating at an unconscious level.

2. The Imperative to Transform and Decolonise Psychological Education

Scholars of critical theory - such as Butler (1990), Frosh (1999), Grosfoguel (2009), and Haraway (1988) - emphasise how social structures can dominate and oppress. For example, Butler (1990) extends critical theory by exploring intersectionality. In doing so she examines how systems of inequality related to gender, race, ethnicity, sexual orientation, disability, class, and other forms of discrimination, intersect to produce unique effects. Similarly, Haraway (1988) argues against the idea of disembodied subjectivity, where objectivity and neutrality are considered ideal, and instead promotes the concept of embodied subjectivity. Here, Haraway challenges us – as academic citizens - to consider how our own positions within social discourses shape our observations. Grosfoguel (2009) also asserts that our subjectivity is confined by existing socio-political power relations and hierarchies, while Frosh (1999) suggests that our positions within these hierarchies determines the experiences available to us. From these scholars' work, therefore, we come to understand the necessity for academic citizens to critically examine these dynamics in order to challenge and transform oppressive systems.

Scholars in the global South - such as Lobban (2013) and Swartz (1989) - emphasise the need to address structural inequalities and systemic injustices in the wake of colonialism. For example, Lobban (2013) calls on educators to facilitate the exploration of how colonial legacies, and other forms of oppression, continue to shape identities in the here and now. In order to address these legacies, as well as transform and decolonise psychological education, pedagogical strategies need to explore how systems of privilege and power operate at both personal and structural levels, and how individuals navigate and resist these systems (Swartz, 2013). For, as Hopper (1996) explains, in terms of psychological practice, a clinician who is unaware of the constraints of social facts and forces will be insensitive to their unconscious recreation within the psychotherapeutic space.

In the global South, Western medico-scientific approaches to psychological treatment have continued to dominate, often marginalising indigenous forms of healing that may be more accessible and culturally appropriate for the majority (Slaughter and Rhoades, 2004, Chiodo et al., 2014, Long, 2016). Traditional healing practices, spirituality, and community support systems are frequently overlooked or stigmatised in favour of Western interventions (Boyle, 2022, Bracken et al., 2016). Additionally, the influence of global pharmaceutical corporations promotes a focus on symptom management through medication, ignoring any underlying socio-cultural, political, and economic impacts on mental health and well-being. It is crucial, therefore, to explore how intertwined socio-political power relations perpetuate colonial legacies and influence subjective reality.

In my previous research on decolonising and transforming psychological education (Auld, 2022b, Auld, 2022c, Auld, 2022a, Auld, 2023), I emphasise the group psychoanalytic concept of the 'social unconscious' to help students understand how their deeply ingrained attitudes and values are rooted in their cultural and societal contexts. We will now further explore this concept in terms of its usefulness within the transformation and decolonisation of psychological education.

3. The Social Unconscious

Scholars working with the concept of the social unconscious - such as Foulkes (2018), Hopper (1996), Volkan (2001), Dalal (1998), and Weinberg (2007) - have drawn from Fromm (2001), who integrates Freud's theory of the unconscious within the framework of Marxist philosophy to emphasise the fundamentally social nature of humanity. In other words, Fromm points out that while individuals believe their thoughts shape their social existence, the reality is that their social existence shapes their thoughts. In arriving at this conclusion, Fromm builds on Freud's idea of an unconscious shaped by repression and proposes that individuals repress not only parts of themselves, but also elements that society unconsciously represses.

Contemporary scholars such as Dalal (1998), Stacey (2003), and Hopper and Weinberg (2011), are influenced by the work of social psychologists like Mead (2015) and Elias (2001) as well as advancements in relational models of psychoanalysis (see for example, Mitchell (1988), Ogden (2018), and Stern (2004)). Highlighting salient factors in these scholars' work, Mead (2015) suggests that individuals shape their lives through a continuous process of gesture and response. Put another way, both our conscious and unconscious lives are continually shaped and influenced by our interactions with others. Consequently, even our most private thoughts are socially formed. Similarly, Elias (2001) supports the idea that individuals are deeply embedded in their cultural contexts. Particularly relevant is Elias's argument that individuals are continually constrained by the demands of their social environment and the need to conform and belong. He argues that identity is not based on instinctual elements like greed or envy, but rather on socially constructed feelings such as shame and embarrassment. These constraints are linked to power structures and develop into what Elias terms the social 'habitus' of specific

groups and cultures, forming the foundation for individual identities. It is not feasible, therefore, to talk about an independent 'I' or 'we' – they are merely different facets of one entity.

Group analytical theorists also emphasise a link between external and internal experiences. Dalal (1998), for example, suggests that we are born into environments with pre-existing socially formed ideas about what is 'good' or 'bad', 'right' or 'wrong'. Consequently, our anxiety stems from socially formed internal fantasies based on perceived values. These value judgements arise from the social environment, permeate our thoughts, experiences, and language, forming the basis of our deepest psyche. As a result, from a group analytic perspective, we defend ourselves against anxiety arising from abandonment, ostracism, and helplessness in the face of hegemonic socio-political attitudes, values, and norms. Defense mechanisms such as denial, projection, and splitting are, therefore, seen to be constructed not only to protect us internally, but also to keep us intact as a social entity and as individuals within our social group (Jaques et al., 1955, Menzies-Lyth, 1992). Feelings such as shame, disgust, and disdain are, therefore, developed to maintain group safety. Put another way, to avoid exclusion, individuals often accept socially valued traits, and defensively project or repress unwanted aspects of themselves. In this way, society acts as a repressive force, with the social unconscious shaping our perceptions of gender roles, racial stereotypes, and societal expectations of success.

Going further, Weinberg (2007) highlights the traumagenic nature of the social unconscious by drawing on Volkan's (2001) concept of 'chosen trauma' - unresolved psychological representations of a group's shared trauma related to loss. These overwhelming traumas are repressed and denied, lying dormant within the group until reactivated by new threats. This reactivation causes old patterns of conflict response to resurface in the face of the new threat, leading to a compounded sense of distress. For example, the reactivation of chosen trauma can be seen in the enduring impact of apartheid. During apartheid, black South Africans were subjected to widespread oppression, violence, and systemic disenfranchisement, including forced removals, limited access to quality education, economic exploitation, and severe restrictions on personal freedoms (Swart, 2013). Such trauma may be reactivated in contemporary struggles for equality and justice, serving as a powerful reminder of past injustices. The reactivation of such a chosen trauma can have both constructive and destructive consequences on individuals, adding to the complexity of distress experienced in the global South. For example, on one hand, the reactivation of the chosen trauma can fuel solidarity and collective action aimed at overcoming the residual effects of apartheid. However, on the other, it can also lead to renewed tensions and conflicts at both the individual and at the group level, especially when current socio-political conditions exacerbate feelings of injustice and marginalisation.

Drawing these points together, the concept of the social unconscious has the potential to be a powerful tool in highlighting how we internalise, replicate, and reinforce taken-for-granted socio-political attitudes, norms, and values impacting our subjectivity and the meaning we ascribe to our experiences (Dalal, 1998). This insight may prove crucial for psychological education, as awareness of the social unconscious, and the legacy of chosen trauma, could help us understand how our social milieu shapes our feelings, behaviour, and interactions in profound and nuanced ways. To create culturally informed psychological education, therefore, we need transformational and decolonial approaches to counter the domination of Western medico-scientific approaches. In this regard, pedagogical strategies that develop awareness of the social unconscious may be useful in helping students explore the impact of taken-for-granted socio-cultural, political, and economic discourses, and the transgenerational legacy of massive trauma.

4. Drama-Based Pedagogy

Drama-based pedagogy encompasses various drama activities such as role-play, writing-in-role, improvisation, reader's theatre, creative drama, process drama, and tableau (Auld, 2023). Unlike traditional neoliberal pedagogical approaches focused on performance outcomes, drama-based pedagogy emphasises the use of drama activities to facilitate creative learning experiences (Ranzau, 2016). As opposed to conventional methods – such as desk based lectures, lecturer prescribed reading, rote memorisation, and written formative and summative assessments (Freire and Ramos, 1970) - drama-based pedagogy attempts to foster a more dynamic learning environment, with the hope of inspiring deeper student awareness, engagement, and understanding (Baldwin and Fleming, 2003, Burke, 2013, Ranzau, 2016, Wagner, 1976, Heathcote, 2004).

As drama-based pedagogy is grounded in a constructivist framework, it draws from the theories of Dewey (1938) and Piaget (1980). Building on these constructivist foundations, Bolton (1995) emphasises that the effectiveness of drama-based pedagogy lies beyond mere re-enactment tasks. Drama-based pedagogy's transformative potential lies in activities which allow students to step outside their own ethnocentric worldview and immerse themselves in the taken-for-granted socio-political attitudes, norms, and values of the characters they depict

(see Auld, 2023). This immersion enables students to distance themselves from their own perspective and embody situations differently. By doing so, students can step into new points of view in a non-threatening way, reducing defensiveness while examining contentious socio-political issues such as racism, poverty, gender discrimination, unfair labour practices, lack of access to health care, water, food, and social security (Alkin and Christie, 2002, Auld, 2023, Sonn et al., 2013).

Elaborating, Bolton (1995) suggests that through drama-based pedagogy, students can be challenged to reflect on ingrained ways of understanding, knowing, and being within a specific community at a specific moment in time. Similarly, Stern (2004) sees identity as not solely defined by actions, but also by the meaning attributed to those actions within the context in which they occur. Here, Bolton and Stern's thoughts give us the opportunity to open a door to students becoming aware of the social unconscious. To elaborate, the drama-based pedagogical strategy used in this study utilises the drama activity of reader's theatre. This strategy sees students take on the persona of a character in a play, embodying socio-political discourses which may be similar or dissimilar to their own taken-for-granted world view. Post-production students have an opportunity to engage in self-study, reflecting on the significance of their character's actions both within the context of the play, and when compared with their own personal outlooks. Further, following self-study, educator and students collaboratively create a 'third space' (Gutierrez, 2008) where they combine their insights, bringing greater awareness and understanding of self and other. In this collaborative environment, the diverse cultural backgrounds, discourses, and knowledge of both educator and students can serve as further resources for developing awareness of the impact of taken-for-granted socio-political attitudes, norms, and values on identity.

5. Procedure

To integrate drama-activities into psychological education, the following steps can serve as a guide:

1. Pre-strategy questionnaire

During orientation to their postgraduate psychology programme, students are invited to voluntarily take part in an anonymous pre-strategy questionnaire to determine their receptiveness to engaging with reader's theatre. The questionnaire contains both open and closed questions, exploring the students' thoughts on the utility of reader's theatre to their development as clinicians within the context of the global South.

2. Resources

Students submit journal articles and texts relating to the development and socio-political background of drama activities within their community to the educator. The educator takes the role of facilitator of the strategy. The facilitator then distributes the readings to the class. These readings form the strategy's core textual resources.

3. Initial class discussion

After reading the textual resources, students and facilitator begin by discussing their thoughts on the relationship between drama activities and their socio-political milieu.

4. Reader's theatre

The facilitator gives the class scripts of a short play. Students decide their roles among themselves. Students sit in a circle and read through the play together.

5. Play discussion

Students then discuss with the facilitator their ideas about the socio-political context of each role with the aim of subsequently performing the play in a communal space on campus.

6. Further class discussion

Following the performance, students and facilitator return to the classroom and engage in discussions about how the play and the roles they portrayed impacted them.

7. Post-strategy questionnaire

After the series of discussions, students engage with a post-strategy questionnaire, revisiting their thoughts on the utility of drama activities to their development as clinicians within the context of the global South.

8. Self-study activity

Students are then tasked with writing a reflective essay exploring any impact the strategy may have had on their understanding of self and other.

9. Final class discussion

Returning to the classroom, students share and discuss their reflective essays, comparing insights gained and challenges experienced.

6. Results

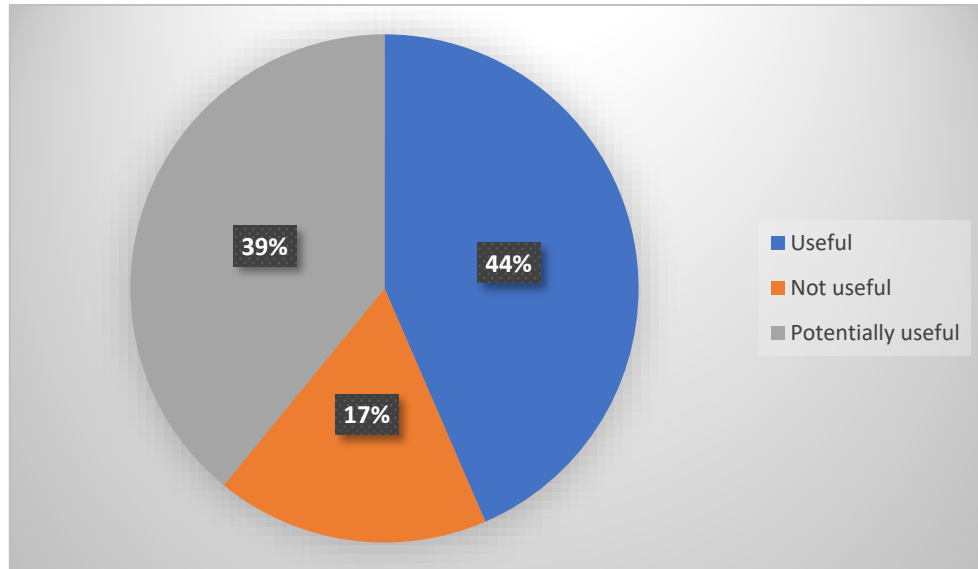


Chart 1: Pre-strategy - students' perceptions of the utility of reader's theatre

Twenty-three students engaged with the pre-strategy questionnaire. Results indicated that initially the minority of students (44%) felt that reader's theatre would be useful to their development as clinicians within the context of the global South.

Examples of verbatim feedback from students who felt reader's theatre would be of assistance included:

(i): "Might help with understanding characters and human emotions."

(ii). "I feel it might get us to start thinking about what it is like to be another person."

Examples of verbatim feedback from students who felt that the strategy would not be of assistance included:

(i): "I personally don't see the usefulness of a play as it's not what I am studying."

(ii): "To me, it does not involve helping each other or understanding another person and their situation."

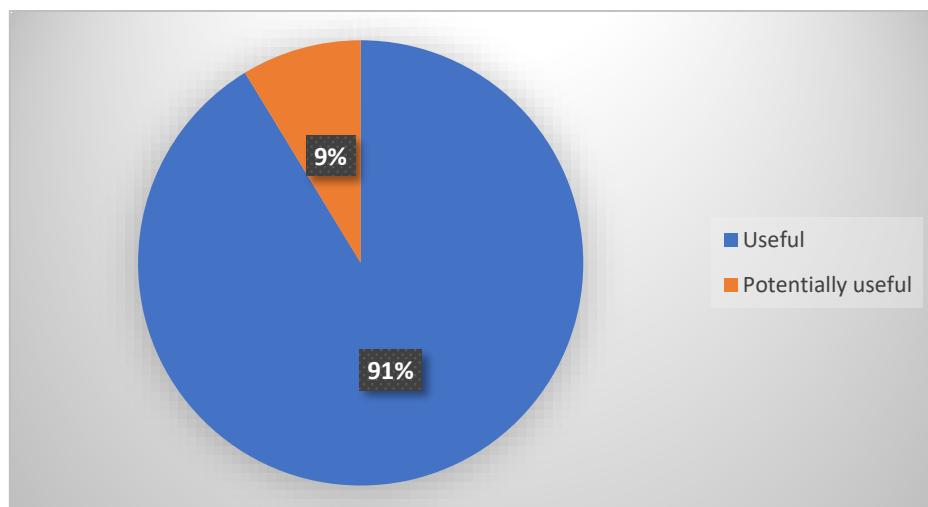


Chart 2: Post-strategy - students' perceptions of the utility of reader's theatre

All twenty-three students engaged with the post-strategy questionnaire. Results indicated that after engaging with the strategy the majority students (91%) now felt that there was utility in engaging with reader's theatre to their development as clinicians. This was a significant difference from the pre-strategy results.

Examples of verbatim feedback as to why students now felt reader's theatre could be of use included:

(i): "It allows the person to put him or her in the clients' shoes as well as see it from their perspectives to be able to understand their emotions and feelings."

(ii): "It forced to me take on the persona and characteristics of my character, allowing me to see different perspectives."

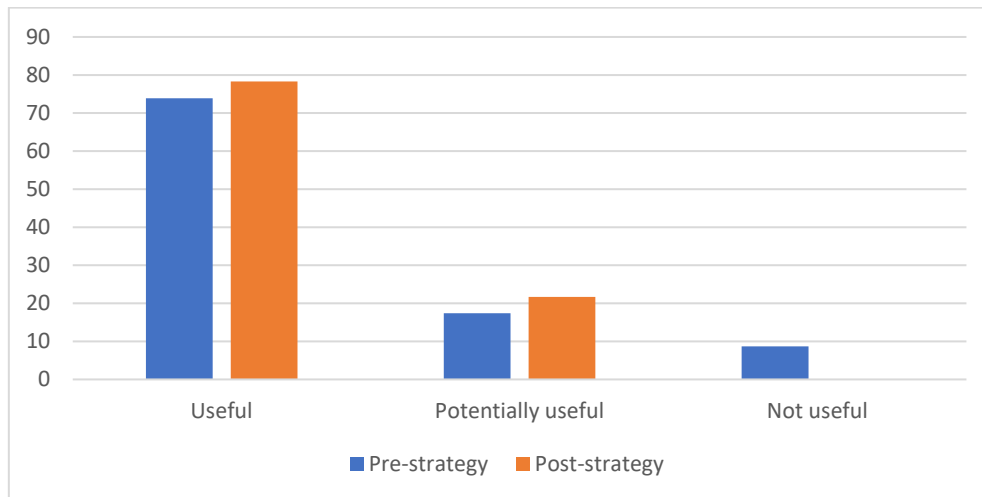


Chart 3: Pre- vs post-strategy - students' perceptions of benefit of understanding the socio-political context of the play

While many students felt that the socio-political context of the play they were engaging with was important to their study of psychology, it is significant to note that while 9% felt it was irrelevant pre-strategy, no students felt it was irrelevant post-strategy.

Some examples of verbatim feedback as to why students felt the socio-political context of the play could be useful to their study of psychology included:

(i): "The context of the play highlights different societal issues and allows a psychology student a first-hand experience into these issues and how they are represented in real life. Context always matters."

(ii): "Having to understand the context of the play is important as we have to look at things in different perspectives and understand different situations and unravel the scenarios just as you would if a person was in a session with you."

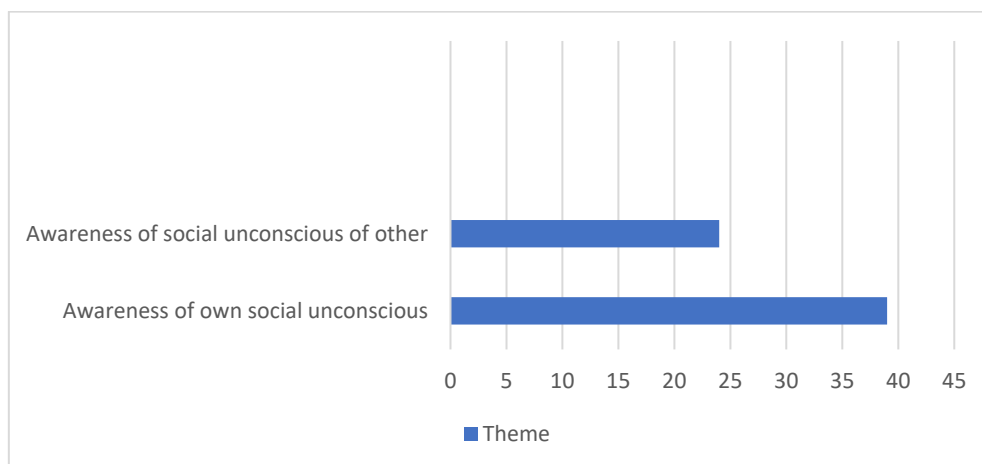


Chart 4: Post-strategy - themes occurring in the students' self-studies

Some verbatim examples of the theme “Awareness of social unconscious of other” occurring in the students’ self-studies were:

- (i). *“The contrast between my beliefs and those of, what I would say is the majority of people around me, underscored the tension between societal expectations and personal convictions.”*
- (ii). *“This insight highlighted the intricate relationship between individual identity and social context, shedding light on the complexities of human behaviour.”*

Some verbatim examples of the theme “Awareness of the social unconscious of self” occurring in the students’ self-studies were:

- (i). *“This play taught me to acknowledge my own personal biases and has enlightened me on my journey of self-reflection.”*
- (ii). *“It allowed me to be placed in someone else’s shoes and to see things from their perspective and not just my own.”*

7. Discussion

Anecdotally, as a lecturer in a department of psychology in the global South, I have become increasingly aware of the dominance of medico-scientific approaches to psychology over holistic approaches (Holdstock, 2013). Many universities no longer offer community psychology as a module, preferring to promote courses such as human development or psychopathology. Consequently, educators, students, and clinicians often address the complexities of distress primarily through internal defense mechanisms, negative automatic thoughts, and genetic predispositions (Auld, 2023). From a transformational and decolonial perspective a medico-scientific focus neglects consideration of the socio-cultural, political, and economic factors so crucial for understanding the complexity of suffering in multicultural and resource-constricted contexts. This point was driven home when student voices demanded to be heard in the #RhodesMustFall and #FeesMustFall protests of 2015 and 2016 (Costandius et al., 2018, Booyesen, 2016). Here, South African students highlighted that colonial legacies are still present in higher education post-apartheid. Being cognisant of student voices and scholarly debate, therefore, we need to examine how systems of inequality intersect (Butler, 1990). Added to this, we also need to be mindful of how our social positions’ influence our observations (Haraway, 1988), and how socio-political power relations and hierarchies confine our subjectivity and experiences (Grosfoguel, 2009, Frosh, 2018). Consequently, as scholars such as Butler (1990), Frosh (1999), Grosfoguel (2009), Haraway (1988), Hlatshwayo (2022), Lobban (2013) and Swartz (1989) have suggested, we need to address colonial legacies and systemic injustices by exploring privilege and power dynamics in education, and, as educators, help our students navigate and resist oppressive structures. In other words, decolonising psychological education requires incorporating critical approaches to counter colonial legacies. Therefore, we need to advocate for pedagogical strategies that explore privilege and power systems and their impact on identity. Responding to this call, reader’s theatre was put forward in this study in an attempt to enrich psychological education by fostering awareness of taken-for-granted socio-political influences on subjectivity - what group psychoanalytic scholars such as Fromm (2001), Foulkes (2018), Hopper (1996), Volkan (2001), Dalal (1998), and Weinberg (2007) have termed the ‘social unconscious’.



Figure 1: Students engaging in reader's theatre during orientation (Auld, 2024)

Based on the work of these scholars, and my anecdotal observations, I employed reader's theatre as a critical pedagogical strategy during orientation to my students' postgraduate psychology programme. Initially students were unsure of the utility of the strategy to their psychological education or future practice. In fact, most felt that reader's theatre was irrelevant to the work of clinicians in the global South. This finding was perhaps reflective of the impact of the intersection of colonialism, late-capitalism, and neoliberalism in higher education. For example, the following verbatim remark perhaps conveys the dominance of a medico-scientific understanding of identity most clearly: *"I personally don't see the usefulness of a play as it's not what I am studying."* However, after engaging in class discussions, actively finding and sharing resources, as well as undertaking reader's theatre, students were able to gain insight into the impact of taken-for-granted attitudes, norms, and values on the shaping of identity. An example of this insight into the social unconscious is highlighted the following verbatim remark: *"It allowed me to be placed in someone else's shoes and to see things from their perspective and not just my own."* This awareness enabled students to begin to acknowledge the complexity of identity and subjectivity.

As a critical pedagogical strategy, therefore, reader's theatre enabled students to reflect on the impact of the historical, traumatogenic, defensive, and political aspects of the social unconscious. In the safety of the classroom and with the support of the educator and peers, they were able to obtain an embodied sense of how we internalise and replicate socio-political norms, influencing our subjectivity and experiences (Dalal, 1998). This understanding is crucial not only for psychological education but for higher education in general, emphasising the need for transformational and decolonial approaches to counter the dominance of Western scientific models. Pedagogical strategies that develop awareness of the social unconscious can, therefore, help students explore the impact of socio-cultural, political, and economic discourses, as well as the transgenerational legacy of trauma. This approach can create culturally informed psychological education, enhancing understanding of how social milieus shape feelings, behaviour, and interactions (Stern, 2004).

8. Conclusion

Findings indicate that reader's theatre can help students recognise how experiences deviating from socio-politically endorsed discourses can evoke emotions such as anger, hatred, and resentment for some, and shame, embarrassment, and humiliation for others (Alkin and Christie, 2002, Auld, 2023, Sonn et al., 2013). Using reader's theatre can, thus, be a crucial step in cultivating clinicians who are equipped to work respectfully and justly with the complexities of distress in the global South.

Recommendations for future research include, *firstly*, exploring the impact of this critical pedagogical strategy on the remainder of the postgraduate psychology programme. In other words, given reader's theatre was employed during orientation, how do students subsequently engage with more traditionally medico-scientific modules - such as developmental psychology, research methodology, psychological assessments, and psychopathology – which tend to separate the mind from the body, the individual from the social group, and remove values, ethics, and power interests from theory and practice (Boyle, 2022)? *Secondly*, do more traditional medico-scientific modules change from the impact of students who are aware of the influence of taken-for-granted socio-political attitudes, norms, and values on the resources used, and the knowledge produced in these modules? *Thirdly*, would repeating reader's theatre with the same cohort of students at the end of their postgraduate psychology programme aid in their awareness and understanding of the impact of taken-for-granted attitudes, norms, and values on subjectivity? *Fourthly*, would incorporating reader's theatre into the curricula of postgraduate psychological education - as well as other professional postgraduate qualifications - further the transformational and decolonial agenda by highlighting the importance of collaboration and context in professional practice? Incorporating theatre into the curricula could include activities such as exploring the background and function of local theatre, taking students to the performance of a socio-politically rich play, reflecting and discussing insights gained from this experience, undertaking role-plays of socio-politically contentious aspects of the play (see Auld, 2023 for a more detailed discussion of these activities). It is hoped that examining these further applications will be an important step toward the development of professionals empowered to work in a respectful and socially just manner with the complexities of life in the global South.

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Navigating Teacher Well-Being in Globalized Education: Challenges and Recommendations

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Abstract: In the context of globalized education, teacher well-being has emerged as a critical area of study, where educators face unique challenges. This research investigated the multifaceted factors influencing teacher well-being, aiming to identify common struggles and contextual influences that shape their experiences. Given the increasing responsibilities placed on teachers, it is crucial to prioritize their well-being, as it has a direct impact on the quality of education they provide. The preliminary data were gathered via electronic open-ended questionnaires and eight semi-structured individual interviews, which served as case studies. The study primarily targeted South African teachers, but through a thorough literature review, the framework has been modified to accommodate a global audience. The findings unveiled the components that teachers described as driving them away from the profession and the factors that pulled them towards it. The in-depth literature reviews' findings focused on the globalization of education, which, while offering benefits like shared best practices, presents challenges to teacher well-being. These challenges include increased workloads due to curriculum changes, diverse learner needs, pressure from standardized testing, and inadequate support systems. Based on these insights, the researcher proposes several recommendations aimed at improving teacher well-being. These include systemic changes in curriculum development, equitable resource allocation, and enhanced support systems. At the school level, fostering a positive culture and effective workload management are essential, while individual strategies such as reflective practice and self-care can further mitigate stress. The study calls for further research to explore the long-term effects of globalization on teacher well-being and to evaluate the efficacy of targeted interventions. By addressing these issues, stakeholders can create a more supportive educational environment that benefits both teachers and students globally.

Keywords: Education globalization, Teacher coping strategies, Teacher challenges, Teaching profession, Teacher well-being, well-being framework

1. Introduction

In recent years, the globalization of education has accelerated, creating a more interconnected and interdependent world (Goodwin, 2020:6). This process has facilitated the exchange of educational practices, policies, and innovations across borders, aiming to improve educational outcomes globally. However, with this increased globalization comes a set of challenges, particularly concerning the well-being of teachers. As the cornerstone of educational systems, teachers play a crucial role in shaping future generations. Therefore, ensuring their well-being is of paramount importance, as it directly impacts the quality of education they provide (Timm & Barth, 2021:51).

The globalization of education is characterized by the increasing interconnectedness and interdependence of educational systems worldwide (Tight, 2021:53). This phenomenon is marked by a growing trend of students pursuing education in foreign countries, resulting in a more diverse and multicultural student body. Moreover, there is a shift towards standardizing educational benchmarks, exemplified by the Program for International Student Assessment (PISA) implemented by the Organization for Economic Co-operation and Development (Lewis, 2020). Educational institutions are also forming international partnerships to collaborate on research, curriculum development, and teacher training (De Wit & Altbach, 2021:304). Additionally, online learning platforms have emerged, providing global access to education and fostering a globalized educational community (McKenzie & Aikens, 2021:313).

These trends have led to a more dynamic and competitive educational landscape, where the sharing of best practices and policies can enhance educational quality. However, this increased globalization also places additional pressures on teachers, which ultimately influences their well-being.

2. Literature Review

Teacher well-being is a critical factor in the effectiveness and sustainability of educational systems worldwide. Despite its importance, there remains a significant lack of comprehensive global approaches to supporting teacher well-being (Long, Grave, Sayed & Lampen, 2017:7). This deficiency is particularly concerning given the increasing globalization of education, which brings diverse challenges and stressors to teachers across different contexts. This article explores the current state of teacher well-being, the consequences of their poor well-being, and the urgent need for action to address this critical issue.

According to CEOWORLD magazine (2024), the ranking of countries with the best education systems is based on an annual perception-based global survey that considers the opinions of university students, academic professionals, teachers, professors, business executives, and education policy experts. The survey was conducted from January to March 2024 and received over 196,300 responses. In the 2024 rankings, the United Kingdom has the most well-developed education system in the world, followed by the United States in second place, and Australia, the Netherlands, and Sweden in third through fifth. France ranks sixth, Denmark seventh, Canada eighth, Germany ninth, and Switzerland tenth. Japan, Israel, Finland, Taiwan, and Singapore occupy the 11th to 15th positions, respectively. South Africa is ranked 71st, while Botswana is last at the 93rd position.

2.1 Teacher Well-Being From a Global Perspective

Building on the statistics presented in the previous section, this section will delve into the well-being of teachers in four diverse countries: the United Kingdom (ranked 1st), Croatia (35th), South Africa (71st), and Botswana (93rd). By examining the well-being of teachers in these countries, we can gain a comprehensive understanding of the global teacher well-being landscape. These four countries provide a representative sample, offering insights into the varying levels of teacher well-being worldwide and enabling a broader understanding of the factors influencing their overall well-being.

There is no universally accepted definition of teacher well-being, leading to varied approaches in different contexts. Some systems emphasize mental health, others focus on job satisfaction (Capone & Petrillo, 2020), while some consider broader aspects such as work-life balance and professional development (Eslami, Hashemian, Khorakian & Adibzadeh, 2024). Moreover, policies related to teacher well-being are often inconsistent. While some countries have robust support systems, others have minimal provisions, leading to disparities in the well-being of teachers globally. Furthermore, many educational systems, especially in developing countries, lack the resources to implement comprehensive well-being programs (Botha, De Jager & Evans, 2023:7).

The well-being of teachers significantly impacts educational outcomes, and it varies across different countries. In the United Kingdom, research indicates that teachers generally experience higher levels of job satisfaction due to access to professional development and mental health resources. According to Ingersoll (2017), UK teachers report feeling supported in their roles, although high workloads and stress remain prevalent issues. The government has introduced initiatives aimed at reducing teacher burnout, recognizing its importance in maintaining a robust educational system (Sibieta & Stokes, 2018).

In Croatia, the situation is more complex. While teachers enjoy stable employment, they often face challenges such as underfunding and a lack of resources. A study by Šehić and Šehić (2020) highlights that Croatian teachers feel undervalued and experience significant stress due to large class sizes and insufficient support from the educational system. These factors contribute to a decline in teacher morale, affecting their overall well-being and effectiveness in the classroom.

South Africa presents a contrasting scenario, where socio-economic factors heavily influence teacher well-being. Teachers often work in poorly resourced environments, leading to high levels of job dissatisfaction. According to Wills and Reddy (2019), South African educators face considerable challenges, including large class sizes and inadequate support systems, which contribute to feelings of burnout and disillusionment. Despite efforts to improve salaries and training, many teachers feel unsupported, exacerbating the challenges they face in the classroom.

In Botswana, teachers encounter similar difficulties with job satisfaction and well-being. Research by Moswela (2015) indicates that while the government has made improvements in educational infrastructure, teachers often experience overwhelming workloads and a lack of recognition. This environment contributes to high turnover rates and challenges in retaining qualified educators. Addressing the well-being of teachers in Botswana is crucial for enhancing the stability and quality of the educational system.

Hence, the literature review reveals that teachers worldwide are facing unprecedented levels of stress, burnout, and mental health concerns, which are further intensified by factors such as excessive workloads, inadequate support, and the lingering effects of the COVID-19 pandemic. (Naidoo, 2017; Charland, Martineau, Arvisais, Turgeon, Vinuesa & Cyr, 2021). Various factors contribute to this issue, including inadequate funding (Carelse, 2018), insufficient teacher qualifications, overcrowding, disruptive learner behaviour, diverse learner needs, lack of management and parental support, poor working conditions, excessive workload, and time demands (Rechtshaffen, 2014, Dreer, 2023). The constant stress and trauma can lead to loss of purpose and commitment among teachers (Steiner, Doan, Woo, Gittens, Lawrence, Berdie, Wolfe, Greer & Schwartz, 2022).

When teachers successfully navigate these challenges, they tend to perceive their professional journey as positive, inspiring, and fulfilling. Therefore, equipping teachers with effective coping mechanisms is proposed as a potential strategy to mitigate teacher stress, reduce resignation rates, and ultimately enhance well-being (Botha et al, 2023: 22).

3. Theoretical Framework

The preliminary research study was informed by two theoretical frameworks: Samuel van Wyk's (2008) Force Field Model (FFM) of professional development, which examines the dynamics of change and growth, and Seligman's (2011, 2009) PERMA Model of Well-being, which encompasses five essential elements of well-being: Positive Emotions, Engagement, Relationships, Meaning, and Achievement.

3.1 The Force Field Model of Professional Development

This article utilizes the Force Field Model to examine the various forces that shape teachers' experiences and influence their decision to remain in the teaching profession. The interplay of these forces can either foster or hinder teachers' job retention, and their impact is filtered through individual teachers' unique experiences and perceptions. These forces can be categorized into four domains: contextual forces (e.g., school culture and environment), institutional forces (e.g., administrative support and policies), programmatic forces (e.g., professional development opportunities), and biographical forces (e.g., personal values and career aspirations).

3.2 The PERMA Model of Well-Being

The PERMA model of well-being, developed by Martin Seligman (2011), serves as the second theoretical framework for this research. This model identifies five essential elements that contribute to well-being: positive emotion, engagement, relationships, meaning, and accomplishment. Positive emotion focuses on cultivating a positive outlook, even in the face of adversity, to foster happiness. Engagement refers to a sense of purpose and connection to one's work or activities. Relationships involve a sense of belonging and social connections, which are linked to favorable outcomes like reduced depression and improved overall health. Meaning is about feeling connected to something larger than oneself, giving life purpose and direction. Accomplishment refers to achieving goals and receiving recognition, bringing a sense of personal success. While the PERMA model highlights internal forces influencing well-being, the Force Field Model emphasizes external variables impacting teacher wellness.

3.3 The Merging of the Two Models

Upon further examination, the Force Field Model (FFM) was found to primarily focus on external forces beyond the teacher's control, including the biographical force which encompasses fixed variables such as culture, religion, and race. This limitation created a need for a complementary model that could account for the personal, subjective elements that teachers can influence. The PERMA model was therefore incorporated to address this gap, focusing on internal forces that contribute to well-being, such as positive emotions, engagement, and a sense of purpose. By combining the two models, the researcher created a comprehensive framework for understanding and assessing teacher well-being, acknowledging both the external factors that shape their experiences and the personal elements that they can manage and cultivate.

4. Research Methodology

This article is grounded in an interpretivist paradigm, which is suitable for this inquiry as it emphasizes understanding human experiences, values, and perceptions within specific contexts (Creswell & Creswell, 2018). This approach allowed the researchers to gain an in-depth understanding of the factors influencing teacher well-being.

A qualitative approach, utilizing a case study design, was adopted to explore this issue. The case study design was chosen because the researcher had no control over the events affecting the topic under investigation (Yin & Campbell, 2018). This multiple case study included eight teachers from diverse teaching contexts, ensuring representation across various school settings, ethnic groups, teaching experiences, and genders.

Participants were selected in two stages: voluntary sampling followed by purposeful sampling. Initially, the purpose of the study was posted on three different Facebook pages dedicated to teachers and educational matters, chosen for their multicultural nature and use of English as the medium of communication. Interested participants clicked on a link to a Qualtrics form, providing informed consent and completing a biographical

section and eight open-ended questions. Eighty-eight participants completed this stage. From these initial participants, eight were selected for further study based on their diverse teaching contexts, ensuring representation of gender, population group, school type, and geographic area. These participants were interviewed using semi-structured interviews, a method chosen for its ability to delve deeply into the phenomena under investigation (Ruslin et al., 2022). Semi-structured interviews allowed the researchers to follow up on responses from the initial open-ended questions, providing a richer understanding of the teachers' experiences.

The data analysis process involved transcribing all interviews and evaluating each data set independently. Following Miles et al. (2014), similarities and differences were identified and categorized. The researchers, with a thorough understanding of the Force Field Model (FFM) and the PERMA Model of Well-being, related the categories to the FFM's different forces and the PERMA model's elements. Data content was analyzed descriptively, incorporating verbatim quotes to maintain authenticity. The flexibility of qualitative research analysis facilitated the transformation of raw data into meaningful conclusions.

Ethical principles, including informed consent, privacy and confidentiality, honesty and openness, access to findings, and avoiding harm, as described by Maree (2017), were strictly adhered to. Pseudonyms were used, and no schools were identified to ensure participant anonymity. Qualtrics enabled anonymous participation, with email addresses used solely for follow-up contact. Participants were informed of their right to withdraw at any time.

By employing an interpretivist paradigm and a qualitative case study design, this research provides a nuanced understanding of the factors influencing the well-being of South African teachers. The combination of the FFM and PERMA models offers a comprehensive framework for analysing both external and internal influences on teacher well-being, highlighting the complex interplay of forces that shape their professional and personal lives.

5. Research Findings and Discussion

The analysis identified codes and categories relevant to the current classroom environment in South Africa and its effects on teacher well-being. While this study specifically examined the experiences of South African teachers, the literature suggests that teachers globally face similar challenges. Although the severity and scope of these challenges may vary across contexts, the issues themselves are universally relevant, affecting teachers across the world.

As previously noted, the data was systematically categorized into four themes derived from the Force Field Model (FFM) and PERMA model.

5.1 Theme 1: Contextual Forces

This theme highlights the unique holistic context of teachers' experiences, encompassing all aspects of their careers, regardless of their teaching environment. The contextual forces shaping teacher well-being include professional benefits, which comprise various advantages associated with teaching, as identified by participants. These benefits included job security, salary, and fringe benefits.

The assurance of having a stable job, despite socioeconomic conditions, providing a sense of safety and belonging in the profession (Hussain & Saif, 2019). Furthermore, a consistent monthly income, although sometimes inadequate, providing financial certainty (74% of participants reported working over 7 hours daily, exceeding their contracted hours). Vacations annually, appealing particularly to mothers, allowing them to spend more time with their families (Skosana, 2018). However, these vacations are often utilized for administrative tasks, lesson preparation, and professional development (Simic-Muller, 2018).

These professional benefits can serve as pull forces, attracting teachers to the profession, while remuneration issues may serve as a push force, driving them away.

5.2 Theme 2: Institutional Forces

Institutional forces, unique to each school, play a significant role in shaping teacher well-being. These forces include learners, stakeholders, and the school environment, which encompasses infrastructure, resources, geographical location, and school type.

The influence of learners on teacher well-being is multifaceted. On the one hand, learner growth, positive behavior, and encouragement serve as motivators for teachers, driving them to continue in the profession.

Teachers find joy in seeing their learners achieve and flourish, and appreciation from learners can boost teachers' morale. On the other hand, learner misbehavior and absenteeism can create a negative work environment, leading to frustration and burnout.

Stakeholders, including the school management team, Department of Basic Education (in South Africa), and parents, also impact teacher well-being. While participants rarely mentioned school management, they acknowledged the importance of an open-door policy and recognition from the SMT. Appreciation and acknowledgment from stakeholders motivate teachers to work harder and contribute to their overall well-being.

On the other hand, parents were identified as the main contributing factor negatively impacting teacher well-being. The data revealed a lack of parental involvement, limited support, and unsatisfactory communication between teachers and parents. Specifically, unemployment and lack of education among parents were highlighted as significant challenges. Unemployment leads to poverty, making it difficult for parents to provide academic support, while illiterate parents struggle to assist their children with their studies.

The lack of parental support has a significant impact on teacher well-being, as teachers rely on parents to motivate their children, address behavioral issues, and support learning. Without this support, teachers are more likely to feel overwhelmed and demotivated, leading to a higher likelihood of leaving the school or profession altogether. Therefore, it is essential to recognize the importance of parental support and address the challenges posed by uninvolved and uneducated parents to create a more supportive and collaborative educational environment.

South Africa's diverse cultural, racial, and linguistic landscape, coupled with significant socioeconomic disparities, gives rise to varied school environments with distinct traditions, values, and challenges. The codes identified within this theme overlap but are presented here as school environment and socioeconomic factors. The term "school environment" encompasses various characteristics, including safety, atmosphere, and classroom conditions. Notably, safety concerns emerged as a significant influence on teacher workplace well-being in Data Set 1, aligning with the findings of the Teaching and Learning International Survey (National Centre for Education Statistics, 2018), which highlighted South Africa's high frequency and variety of school safety incidents. On the other hand, a positive school atmosphere was reported to enhance teacher well-being, motivating them to excel and remain in the profession. However, overcrowded classrooms posed a significant challenge for effective teaching.

The socioeconomic environment significantly impacts the lived experience of a school, with many African learners attending schools with inadequate infrastructure, resulting in poor academic performance. Historically disadvantaged neighborhoods often lack resources, presenting unique challenges for teachers. Analysis revealed that teaching in rural and township schools poses distinct challenges compared to private and urban schools, although the latter are not exempt from these challenges. While socioeconomic issues were primarily seen as a push force, some participants (four out of eight case studies) worked in well-resourced schools, enabling creative teaching methods. Both codes can influence teacher well-being and their decision to stay or leave the profession.

5.3 Theme 3: Programmatic Forces

Programmatic forces, encompassing formal, non-formal, and hidden curricula, significantly impact the teaching-learning experience (Samuel & van Wyk, 2008). Data analysis showed that participants focused on the workload associated with the curriculum and learner diversity, rather than the curriculum itself. This theme is categorized into two subthemes: the impact of learner diversity on teacher well-being and the influence of curriculum on teacher well-being.

When examining the impact of learners on teacher well-being within programmatic forces, learner diversity emerges as a significant factor. This diversity encompasses not only language and cultural differences but also the varying socioeconomic contexts in which schools operate. Teachers must continually adapt their teaching methods and classroom management strategies to accommodate learners with diverse cognitive levels, linguistic backgrounds, and socioeconomic statuses. This diversity can be taxing on teachers' well-being, potentially leading to burnout and departure from the profession.

The curriculum and teacher workload are closely intertwined. The current "one-size-fits-all" curriculum perpetuates inequality in the schooling system, failing to consider contextual differences among schools (Amin & Mahabeer, 2021). To address this, the curriculum should be revised to focus on relevant content, reduce

overload, and accommodate diverse learner needs. However, frequent curriculum changes since 1994 have resulted in increased workload, training requirements, and administrative tasks, overwhelming teachers and generating stress that negatively impacts their well-being. The assessment plans and content coverage requirements set by the DBE add to teachers' frustration, leading to a sense of overwhelm and push factors that detrimentally affect their well-being.

5.4 Theme 4: Biographical Forces

Samuel and van Wyk (2008: 140-141) defined biographical forces as the unique cultural, racial, ethnic, and religious identities that shape individuals' thoughts, actions, and behaviors in their interactions with learners, school authorities, and school subjects. These forces, rooted in teachers' personal histories, can significantly influence their well-being. While acknowledging the impact of these inherent forces, they are considered fixed attributes beyond the teacher's control. In this article, the biographical forces from the PERMA model are combined with those of the FFM and reframed as internal forces that teachers can actively manage and regulate. The five elements of the PERMA model - positive emotion, engagement, relationship, meaning, and accomplishment - are presented as categories and explored in detail below.

Positive Emotion

The first category of the PERMA model highlights the significance of positive emotions in contributing to teachers' well-being. Positive emotions encompass all emotions that enhance one's well-being, such as love, passion, and joy. Participants in both data sets expressed their deep love for teaching and their desire to continue in the profession, citing the emotional rewards of helping children reach their full potential. This passion for teaching acts as a pull force, keeping them engaged and motivated.

Engagement

The second element, engagement, refers to being emotionally resourceful and focused on one's work. When teachers are engaged, they are fully present and connected to their work, using their skills and strengths to achieve challenging tasks. Participants reported that the diversity in the school setting required constant adaptation, but they found solace in discussing problems with colleagues and valued an open-door policy with school management.

Relationships

The relationship element underscores the importance of various relationships in the workplace, highlighting their impact on well-being. Supportive relationships with colleagues, learners, management, and parents are crucial for teacher retention and well-being. Participants emphasized the importance of healthy relationships, which help share burdens and improve their overall well-being.

Meaning

The fourth element, meaning, refers to teachers' need to feel valued and worthy, serving something greater than themselves. Participants reported feeling appreciated and valued, knowing they were making a difference in learners' lives. Recognition and acknowledgement kept them motivated and committed to the profession.

Accomplishment

The final element, accomplishment, refers to achieving success and mastery in one's work. When teachers feel they have accomplished their goals, it enhances their well-being and serves as a pull force. Participants reported various goals, including seeing learners succeed and achieving career advancement. Despite challenges, most participants wanted to continue teaching, with some aspiring to higher positions in education.

The PERMA model's elements - positive emotion, engagement, relationships, meaning, and accomplishment - serve as positive or pull factors that enhance teachers' well-being. When these elements are present in teachers' lives, they experience a greater sense of well-being and are more likely to remain in the profession. On the other hand, the absence or opposite of these elements can drive teachers away from the profession and deteriorate their well-being. While most participants exhibited a positive attitude towards teaching and had most PERMA elements present, some did not share this sentiment. Notably, many participants reported a lack of support from parents, which acted as a push force, and some struggled to find meaning in their profession, teaching solely for financial reasons or due to limited career options.

6. The MGB Well-Being Framework

The data analysis led to the development of the MGB Well-being framework, which prioritizes equipping teachers with coping skills through the integration of the PERMA Model. The ultimate goal is to foster resilience in teachers, enabling them to thrive and excel in their profession. By encouraging teachers to engage in reflective practices, they can better understand the unique challenges that impact their well-being and, in turn, their teaching effectiveness. This reflective approach empowers teachers to prioritize their own well-being, leading to improved teaching quality. The following illustration provides a concise overview of the MGB Well-being framework:

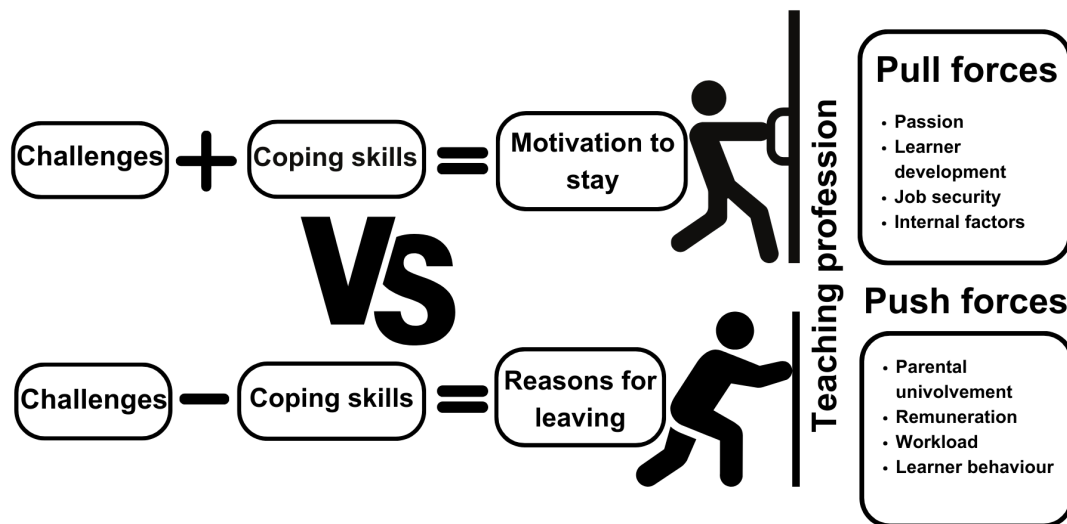


Figure 1: The MGB Well-Being Framework for Teacher Well-being

This framework offers a comprehensive approach to promoting teacher well-being, ensuring that educators are equipped to navigate the demands of the profession with resilience and dedication.

According to the proposed framework, teachers who employ effective coping strategies to address challenges are more likely to remain in the profession. Effectively managed challenges can even serve as motivators, encouraging future teachers to pursue a teaching career. This, in turn, enhances teacher well-being.

Conversely, if challenges are left unaddressed and effective coping strategies are not employed, teachers may be more likely to leave the profession. This scenario can have adverse effects on teacher well-being, ultimately driving them to discontinue their career. Therefore, it is essential to equip teachers with effective coping strategies to manage challenges, promoting teacher well-being and retention in the profession.

7. Recommendations for Policy and Practice

Based on the findings, several recommendations are proposed to enhance teacher well-being. First, policy and systemic changes should be implemented, including the adoption of a more contextually relevant and flexible curriculum that accommodates learner diversity and reduces teacher workload. Additionally, there should be a prioritized equitable distribution of resources to address disparities among schools in varying socioeconomic contexts. Comprehensive teacher support systems must be established, incorporating mentoring programs, access to mental health services, and professional development opportunities focused on stress management and coping strategies. Furthermore, strategies to improve parental engagement and community support for education should be developed.

At the school level, fostering a positive and supportive school culture is essential, as it values teacher well-being, encourages collaboration, and recognizes teachers' efforts. Effective workload management strategies should be implemented, ensuring realistic expectations for lesson planning, marking, and administrative tasks. Ongoing professional development opportunities are crucial to equip teachers with the necessary skills to address diverse learner needs, manage challenging behavior, and promote student well-being.

On an individual level, teachers should be encouraged to engage in reflective practices to identify stressors and develop coping mechanisms. Promoting self-care strategies and prioritizing personal well-being is vital to mitigate stress and burnout. Additionally, building supportive relationships among teachers can foster a sense of community and shared responsibility.

Finally, further research is needed to conduct longitudinal studies investigating the long-term impact of globalization on teacher well-being in various contexts. It is also important to explore the effectiveness of specific interventions and policies aimed at improving teacher well-being and retention, as well as to investigate the relationship between teacher well-being, student outcomes, and overall school effectiveness.

8. Conclusion

The globalization of education presents both opportunities and challenges for educational systems worldwide. While it fosters the exchange of knowledge and best practices, it also places significant pressures on teachers, impacting their well-being and, ultimately, the quality of education. This research, has highlighted the multifaceted nature of teacher well-being and the urgent need for comprehensive support systems.

The findings underscore the importance of addressing both external and internal factors influencing teacher well-being. Policymakers and school leaders must prioritize the creation of supportive working environments that value teacher well-being, provide adequate resources, and foster collaboration among stakeholders. Simultaneously, empowering teachers with coping mechanisms and promoting self-care strategies are crucial for navigating the complexities of the profession.

The MGB Well-being framework, offers a valuable tool for understanding and addressing the multifaceted nature of teacher well-being. By integrating the PERMA model's focus on internal resources with an understanding of the external forces shaping teacher experiences, this framework provides a roadmap for promoting teacher resilience and, consequently, enhancing educational quality.

However, it is crucial to acknowledge that this research represents a starting point. Further investigation is needed to explore the long-term impacts of globalization on teacher well-being across diverse cultural contexts. Longitudinal studies can provide valuable insights into the evolving challenges faced by teachers and the effectiveness of various interventions. Additionally, exploring the interplay between teacher well-being, student outcomes, and overall school effectiveness is crucial for developing evidence-based policies and practices.

Investing in teacher well-being is not merely an act of care for educators; it is an investment in the future of education itself. By prioritizing the well-being of those entrusted with shaping young minds, we pave the way for a more equitable, effective, and sustainable educational landscape for all.

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The Ripple Effect: How Chaos Theory can Transform Education

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ABSTRACT: Background: The education atmosphere in a class could influence students' attitude and their understanding and willingness to collaborate in a class. Chaos has a different meaning for different students and lecturers. Sometimes this same chaos could be the best possible paradigm or teaching strategy to influence students to have a deeper understanding of the work. The use of chaos theory in higher education could allow for a different way in which students view information and how they engage and collaborate in the class. **Focus:** In this research the use of chaos theory in Higher Education Institutions classrooms was researched to be able to answer the following research question: How do students and lecturers perceive the impact of chaos theory on fostering deeper learning and critical thinking in academic settings? **Methodology:** A qualitative research design was followed to determine how students experienced this approach of teaching, and the experience from the lecturers who apply this theory and method of teaching in the class. A case study design was followed to discover how the method is implemented in class and students used an open-ended questionnaire to explain their experience. The lecturers involved also filled in an open-ended questionnaire to explain the difference between the normal teaching strategy they used in their classes in relation to the chaos theory. Purposive sampling was used to determine who will be part of the study. Only lecturers who were willing to test the results regarding the chaos theory were asked to take part in the study. **Results and implications:** A paradigm change could contribute to deeper learning. The way lecturers approach this theory in the classroom contributed to a new approach of lecturing to use in the classroom to ensure students gain deeper learning in a different way than before. Students experience the situation differently and from the case study it was clear that lectures and students explain that this method of discovering and exploring need to be develop more in classrooms and students need to get the opportunity to be exposed to this method of lecturing. In the light of this, a recommendation to lecturers will be to explore this method of instruction and allow students to discover information in a different method.

Keywords: Chaos theory, Deeper understanding, Teaching strategies, Students attitude and education atmosphere

1. Introduction

Discussions regarding education often start with words like structured and focused. However new paradigms and new ways of thinking and approaches in education, especially with the focus on Higher Education, become more popular. Different paradigms and different theories need to be implemented to ensure students would be intrigued to come to class and have teaching experience which would support them to have a better understanding of the work. According to Akmansoy and Kartal (2014:510): "chaos theory provides refreshing insights into an educational system that consist of a mechanical world in which many individuals attempt to learn information under whatever philosophy of education is popular at that time". Chaos theory is a framework that studies how small changes in initial conditions can lead to unpredictable and complex outcomes in dynamic systems, emphasizing nonlinearity and sensitivity to initial conditions (Gleick, 1987). In this research a case study to investigate how the method is implemented in class was looked at, and students filled in an open-ended questionnaire to explain their experience. Lecturers were provided with an activity that related to barriers of reflection and the activity was designed to instil chaos in the classroom. The lecturers involved also filled in an open-ended questionnaire to explain the difference between their normal teaching strategy they used in their classes in relation to the chaos theory.

2. Literature Review

Chaotic and confusing scenarios could contribute to a different approach and deeper thinking of students in Higher Education Institutions. With the application of chaos theory random scenarios contribute to a complex analysis and students are offered the opportunity to re-think and change their way of thinking to discover a deeper understanding and meaning of the work (Kayuni, 2010). This theory will contribute to some changes regarding instruction. Traditionally control, order, objective, safe, certain, predictable and one best way would be applied and used in classes and students were bound to these prescriptions. With the application of the chaos theory in class, control is replaced with chaos, order with disorder, objective with subjective, safe with unsafe, certain with uncertain, predictable with unpredictable and one best way with any way. Students learn to form their own point of view and look at situations to be able to answer questions with a deeper understanding and not necessary according to a specific memorandum or prescriptive way of thinking (Kayuni, 2010). Richard Paule added that for lecturers to see students engaging with their studies in this manner, they also need lecturers who

will value critical thinking, and who will model the critical thinking skills that they are trying to develop in the students (Paul, 1993).

Even though chaos theory promotes a different point of view and a different approach than traditional education, it complements the education system which is a social unpredictable system (Khanal, Bento & Tagliabue, 2021). It is very important to emphasise the fact that chaos theory do not represent disorder or chaos in the sense of unplanned and unorganised, however it represents unpredictability and involved complex interactions (Lartey, 2020). Unpredictable human behaviour, especially in education, contribute to the fact that chaos theory could be applied in education because of this theory's discoveries in the field of nonlinear dynamics (Kiel and Elliot, 1996). Learning and thinking are nonlinear processes and lecturers in Higher Education Institutions need to use this theory in the class to obtain contribution and collaboration from students especially from the less successful students in the class (Khanal, Bento & Tagliabue, 2021).

Nonlinearity, feedback, bifurcation, strange attractors, fractals and self-organisation is the six key constructs of the chaos theory according to Lartey (2020). Nonlinearity can be explained by the relationship between variables that are not linear. In education this nonlinearity will be the unpredictability and different viewpoint. This is when students receive a case study with a different effect than the predictable situation. This nonlinearity flow over in the second construct namely feedback. When situations and case studies are unpredictable and nonlinear, students would need to provide feedback on a situation. This also contributes to deeper learning and understanding. The third construct, bifurcations is a sudden change of direction or characteristic or outcome. As such this is when students identify strange patterns or start to approach a problem differently. The fourth constrain is strange attractions which define the boundaries of dynamic systems as these systems progress towards chaos due to their continuous grow. The fifth constrain is fractals which make predictability of long-term outcomes impossible. Students need to work with what they have and will not be able to predict the outcome, which connect to the last construct, namely self-organisation. At this point, students need to communicate the change within a system and allow all parts to react to change and generate a new inner state of form (Lartey, 2020). These constructs speak to what Joseph Ford (cited in David, Smith and Leflore, 2008:8), a physicist at Georgia Institute of Technology, outlined: "chaos, educationally speaking is thinking freed from the shackles of order and predictability, children liberated to explore their every dynamical possibility, resulting in exciting variety richness of ideas and thought, a cornucopia of opportunity."

In conclusion, the application of chaos theory in higher education promotes a paradigm shift from traditional, linear instructional methods towards a more dynamic, non-linear approach that encourages deeper critical thinking and understanding. Chaos theory provides a framework for fostering unpredictable yet productive learning environments. This approach allows students to explore different perspectives, re-think conventional methos and engage in deeper learning by navigating complexity and unpredictability. In this research a change in instruction will be research to see if this could contribute to deeper learning and understanding.

3. Theoretical Framework

Chaos theory as method of instruction were used in this research, and for this reason, chaos theory will also be used to analyse the data of students and lecturers experience of the use of chaos as a method of instruction. Roberston (2020: 01) said as follows: "Chaos theory teaches educators that despite the appearance of chaos on the surface a deeper order can exist. Understanding that order can inform our conversations with each other about teaching as well as our own development as teachers."

From the explanation as mentioned in the literature review from Lartey (2020), the following six points will we used in the data analysis process in order to answer the following research question: How do students and lecturers perceive the impact of chaos theory on fostering deeper learning and critical thinking in academic settings? The six points are as follows: nonlinearity, feedback, bifurcation, strange attractors, fractals and self-organisation. From the data received from students and lecturers the focus will be on the effect of chaos method of instruction. This viewpoint requires an approach in which the data will be organised into themes and will then be compared with the theoretical framework as mentioned above.

4. Method

In this research a qualitative research design was used, to understand how students experience this theory in class. This design is suitable for this specific research, because the data, in the form of words were collected to discover how lecturers and students experience this method of instruction (Busetto, Wick & Gumbinger, 2020). A case study design was followed to discover how the method is implemented in class and students used an

open-ended questionnaire to explain their experience. The focus was on Higher Education Institution classrooms. Purposive sampling was used to determine who will be part of the study. The same module which are lectured on three different campuses were used in the research. First lecturers were asked if they will be willing to take part in the study, where after all the students in those classes were selected. The students and lecturers of final year Education were used in the research. Lecturers were provided specific content to lecture and discuss with students, to make sure all students received the same information. The process was the same on all three campuses:

- Students received a notification reminder to come to class to solve a mystery, and another reminder was sent through the Learning Management System to make them excited and create a build up towards the activity itself.
- Students only received the activity after the discussion in the class. The activity includes scenarios of different barriers in reflection. This is a completely different way of for students to analyse the barriers.
- Students could divide (spontaneously) into groups to complete the activity if they would choose to do so. It was important to allow students to choose their own groups or they could work on their own should they choose to.
- Only once the students completed the activity could they get access to the link to complete an open-ended-questionnaire. This allows all students to first experience the complete activity, before they explain their experience. The questionnaire includes questions regarding the change in the learning process, predictable learning, resilience and adaptability to find out if chaos theory as a method of instruction could contribute to deeper learning.
- Lecturers were also asked to complete a questionnaire after the students completed the activity to get their point of view.

This activity was used to offer a structured way to enhance student engagement and critical thinking, creating opportunities for intellectual growth and innovative learning experience.

5. Data Collection

One hundred and forty-four students took part in the activity in class and had to answer an open-ended questionnaire. Before students had access to the questionnaire, they were asked to provide their consent to the researcher to use the information in the research. The first question was only an introductory question to understand if students are used to very structured lessons or a variety of methods of instructions. The questions that followed were focused on the impact on students regarding the different method of instruction and if deeper learning did take place. Lecturers lecture according to their own teaching strategy which are formed from their own experiences in life. In the same way, different students experience classes and methods of instruction in different ways because they have a different viewpoint in life (Kampen, 2024). Students were asked questions regarding the activity and if they experience something different in the method of instruction? Finally students were asked to reflect on their experience of the activity and if they could see how they developed deeper learning or something else.

6. Data Analysis

In this research the use of chaos theory in Higher Education Institutions classrooms was researched. As explained earlier the theory was used as a method of instruction. With the analysis of data, it was clear that students answered the question from their own experience but what was very interesting is the fact that they also recalled situation during their Teaching Experience where teachers used chaos theory as method of instruction and provide information regarding those situations as well. Even though this research only focuses on Tertiary Education, the focus was on the Faculty of Education, as such, the researchers would also incorporate those answers which focus on school situations.

With the use of chaos theory as a method of data analysis it was clear with the data that all different parts overlap and connect to each other. Please see Figure 1 below.

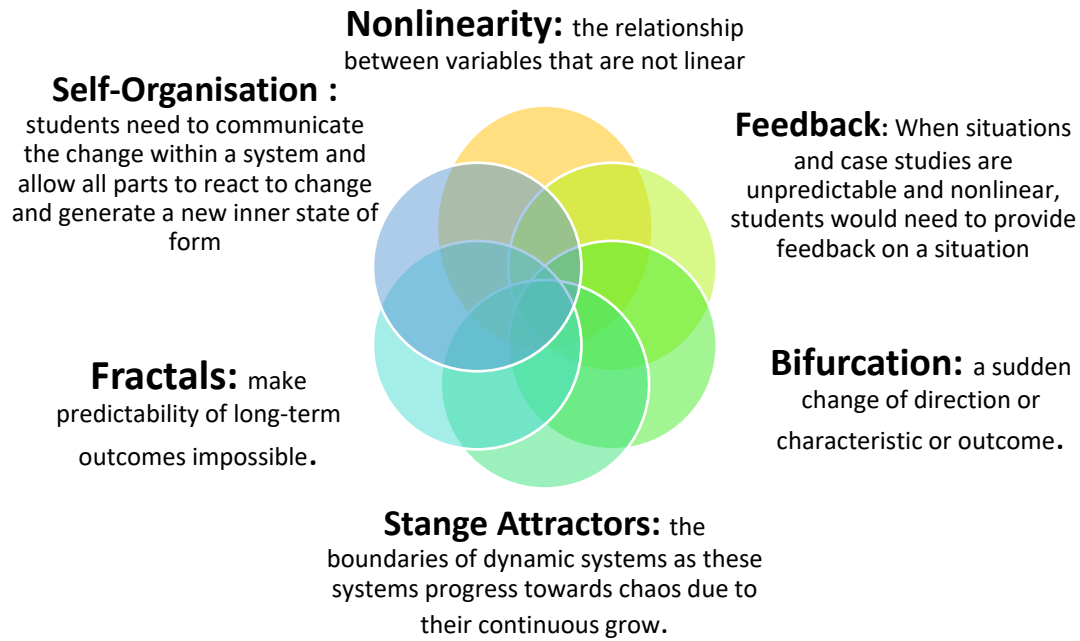


Figure 1: Connection between the different parts of chaos theory

Nonlinearity: During this class, students had to solve a mystery and could only move to the next question if they the correct answer. This was different from the previous classes. Lecturers experienced different behaviours from learners. Lecturer 1 said: *"Some students jumped in and start to do the activity, excited and figure everything out. Others were just sitting there"*. This is just an example how methods of instruction have a different effect on learning for different students. Students explained that the atmosphere in a class also contribute to the level of learning. Lecturer 2 explain that because students received more than one chance to try to complete the activity it contributed to the fact that they explored more and started over again if they got something wrong. This could also put emphasis on the fact that students need to develop the confidence to try and answer questions even if they are not hundred percent sure if this is the correct answer.

Students were asked how classrooms foster exploration and discovery or if they prioritize linear, predictable learning. Some of the student participants mention as follows Student 1: *"It is context dependant. Given the difference in teaching approaches by various teachers, the methods used provide different outcome in learning"*. Student 4 explains as follows: *"Linear and predictable learning is the most common way of teaching"*. Student 18 said the instructor influence how much exploration and discovery could take place in the classroom irrespectively of the content of the work. Student 9 mention the importance of lecturers who teach in the 21st century need to teach their students or learners how to explore and discover. Everything does not need to be predictable. Student 20 mention the following: *"Teaching needs to foster exploration and discovery, teachers need to allow learners to explore and express their thoughts."*

Student 108 explain as follows: *"In my experience, classrooms can be quite diverse in how they approach learning. Some prioritize exploration and discovery, allowing students to engage in project-based learning, hands-on activities, and inquiry-based methods."*

The comment above links a lot to the comment of Student 73 explained as follows: *"Traditionally, many classrooms prioritize linear, predictable learning, focusing on standardized curriculum, lecture-based instruction, and memorization. This approach often limits exploration and discovery, as students are not encouraged to ask open-ended questions, explore topics in-depth, make connections between subjects, or learn from failures and mistakes"*.

Lecturers and educators realise that discovery and exploration is very important, especially for deeper understanding and leaning, however it seems as if the linear and predictability of a lesson could be more convenient and comfortable for the lecturers.

Feedback & Bifurcation: This is to see how students' responds to chaotic or non-predictable activities in the classroom. It also shows when students identify critical moments where small instructional approaches can lead

to a significant shift in the instructional approach and led to a significant shift in students' behaviour or understanding. Lecturer 2 explain that this learning unit had to be covered and with this approach as it contributes to some fun in the classroom and students were given the opportunity to discover and try to link the content of the learning unit to real world situations and try to solve how they can apply the content. Lecturer 3 were amazed by the fact that the activity contributed to the students pursuing a line of questioning and displayed curiosity: *"Some students were patient and persistent knowing what the correct answers was and try to complete the assignment with enthusiasm. Others were very hesitant to start and try to look at other groups to see how they complete it and what they discuss. They look quite lost."*

During this activity in the classroom students were asked how they build resilience and adaptability when faced with the inherent uncertainty of the learning process. Student 2 explained that if students are provided with more challenges and difficult activities or tasks, they will develop a tolerance for discomfort. Student 5 said as follows: *"The key is building resilience and adaptability. Building your mental fortitude."* Student 7 mention on a personal level if he/she is confronted with difficult situations activities, the student will re-think and read again and then also start to ask questions.

Student 23 explains students need to be provided the opportunity to practice developing resilience and adaptability: *"By encouraging students to see the challenges as opportunities for growth and learning, they can approach uncertainties with a positive outlook and a willingness to preserve through difficulties."* Student 32 mention that students will develop resilience by working through their challenges and adapting to the learning process. The comment of student 33 connect to the previous comment and mention how students need to be encouraged to step out of their comfort zone and take on challenges. More participants mention the fact that students need to be trained to use problem-solving and develop resilience.

Students were asked how this experience of chaos theory as a method of instruction perhaps influenced their view of learning. Student 6 explain that during the session, while the students were stuck on a problem, another student explained something considering a real situation and showed the comparison, student 6 said as follows: *"This event completely changed my view on the learning because it showed me that importance of real-world connections in understanding abstract concepts."* This comment highlighted the fact that students need to be given some time to grapple with a problem and be comfortable to be uncomfortable. Student 15 explain as follow: *"This experience made me realize the importance of attention to detail and the impact that minor mistakes can have on the overall outcome. This experience reinforced the idea that continuous learning involves not only grasping complex concepts but also paying close attention to the finer details to ensure a comprehensive understanding of a topic."*

Student 29 explain that this method did not influence his/her viewpoint. Student 30 felt the chaos theory left him/her frustrated and tedious and explained that learning was not effective because of the different atmosphere in the class. Student 35 explain as follows: *"It made me more anxious about the content as I had to completely change my perspective of what the topic entails."* Student 52 also mention a negative experience: *"This experience influenced my view of learning by doubting myself."* Student 54 also experience this method negatively: *"This experience also caused me to feel negative towards the learning process because there was a struggle in understanding when it was questioned by a minor event. Nothing made sense."*

Student 43 felt more positive towards this method of instruction and explain: *"This gave me the opportunity to reflect on what went well and what went wrong and therefore it was an avenue of more improvement and growth as a student."* Student 59 mention this method influenced his/her view of learning and the student said that he/she realises that learning can happen through unexpected sources and change his/her viewpoint of the learning process.

Strange Attractors: This is when students look for recurring patterns or behaviours and how students gravitate toward chaotic instruction. Lecturer 3 explains that students are normally not participating and engaging in the class and when they received the activity, some groups were very excited and started to solve the mystery and you could see how they became excited about it and shared their different views with the group. Other students kept on looking at other groups as if they were unsure what to do. Those students reacted negatively on the different way of instruction. Lecturer 1 said: *"The activity and instructions contribute to chaos for some students. For other students this was exciting, and they enjoy discovering the answers and took part in group discussions."*

Students were asked when during the activity did, they experience it to be chaotic. Student 3 explain as follows: *"When we started the breakout activity, very few people understood what needed to be done and the lack of context made the questions very difficult and confusing we had no clear expectations of the outcomes."* Student

27 said the activity become chaotic when students began working in groups and discussing their different ideas and there was disagreement within the groups. Student 32 explain that the chaos began just after their received the instructions. Some students in the group wanted to complete the assignment quicker than others. Student 44 explain that the chaos started in the beginning because some of the group members did not understand the activity completely.

Fractals: This makes predictability of long-term outcomes impossible. Students need to work with what they have and will not be able to predict the outcome. As seen in the comments from students under Strange Attractors, there was confusion for a lot of students, and others who merely jumped in and started to see what they could discover.

Self-Organisation: Students could spontaneously form groups and develop unique methods of tackling problems or collaborate to solve some problems. Lecturer 1 explain as follows: *"Personally I think students need to be placed in more situations like this to discover work on a different method than the usual"*.

Students were asked how they experience the class environment and the groups, which they could create on their own. Student 15 explain as follows: *"To work in groups come spontaneously but the classroom setup was not ideal."* Student 42 said: *"The seating arrangements were in groups which allow for a seamless interaction."* Student 48 explain that it was difficult when every group were on a different stage of the activity, and you could hear some of the answers before you get to the specific question. Student 51 explain the fact that groups could form spontaneously result in the fact that there were groups which were too big, and some students did not even take part in the activity but just answered the questions while others were searching for the answers. Student 63 explain as follows: *"The classroom environment played a significant role in the chaos. The seating arrangement, with desks pushed together for group work, made it difficult for students to focus on their own discussions without being distracted by neighbouring groups. The noise level escalated quickly, making it hard for anyone to hear or be heard clearly, which further fuelled the disorder"*.

7. Results and Implications

From the research and data analysis it is clear that small changes may lead to a significant shift in the learning process. With a different method of instruction students' needs to think differently, and deeper learning takes place. This can be seen when the same types of challenges occur across different student groups or individual students show similar patterns in learning. Some students mention the effectiveness of a mix between linear and exploration way of instruction. Especially in a classroom where there are a lot of resources available, teachers need to use it and allow learners to explore and discover, especially in a life science classroom. One participant also explain that teachers sometimes only give activities straight from the textbook which do not support learners to be more creative and explorative, and it do not always link to the real world.

Effective classrooms balance is so important to increase a deeper learning with students. Structure and predictability with flexibility and autonomy, allowing students to explore and discover concepts in a supportive and guided environment, leading to a more engaging and meaningful learning experience.

When students face this different method of instruction, they shift their understanding of learning and view problems from a different point. More respondents mention the fact that the moment confusing topics are linked to real-world-situations or examples, it changes their viewpoint to the situation and at the end help them to resolve the situation or problem. Some students did not have a clear sense of the expectations that were set for them, causing them to feel lost, in discomfort and confused. This contribute to the fact that students need to be taught to receive different methods of instruction. In the same activity other students felt that the open opportunity allowed them to discover. Both groups had the same amount of chaos and unpredictability in front of them and their approach to the activity is what set apart how the learning took place.

8. Conclusion

From this case study it was clear that both lectures and students' attitude towards a different method of instruction was very positive. With the introduction to lecturers, they hesitated and were cautious about if it will work, but they were more than willing to take part and looked forward to discovering the outcome. When the introduction was made to students, because of the unusual introduction to the class, students were very curious and their positive attitude towards this method of instruction contributed to the fact that they wanted to explore this method. Especially in the 21st century, more contemporary approaches and method of instruction need to be used to encourage exploration and discovering information (Yavas, 2022). Chaos theory is not an unusual theory in education. Education includes different situations mostly unpredictable and nonlinear. Students with

different personalities, and different levels of development are in the same environment and each of these students and lecturers learn and interpret work in different ways (Davis, Smith and Leflore, 2008). With this specific case study students and lecturers indicate that they feel that this method of instruction needs to be explored on a more regular basis to allow students to learn how to explore this kind of situations, build on their level of resilience and adaptability.

Tise (2021) emphasis the fact that uncertainty in classrooms need to be reduced and the classroom environment need to be ideal for exploration and discovering. When lecturers use this method of instruction on a more regular basis, students become comfortable with the instability, unpredictability and uncertainty and become more resilient to explore and discuss different viewpoints with their peers (Su, 2021). From this research and the results, it is evident that students develop the ability to explore situations and information together with their peers in the classroom. Different personalities react differently to these unpredictable situations but in all the groups students comment on the fact that they become more resilient and would like to discover more possibilities with the chaos theory as a method of instruction. Some students had a negative experience of this method and most of them explain that this was very unusual and different from the previous method. However, from the feedback students express the fact that communication and exposure to situations where different methods of instruction are used contribute to their personal development. As mentioned earlier, chaos theory does not represent disorder or chaos in the sense of unplanned and unorganised, however it represents unpredictability and involved complex interactions (Lartey, 2020).

This chaos method of instruction contributes not only to a deeper understanding of the work but also to a more explorative and open-minded viewpoint of students as well as lecturers. A crucial component of teacher training, particularly within Higher Education Institutions, should be the provision of comprehensive instruction on the chaos method of instruction. This training should equip educators with the skills to effectively guide students in the discovery and exploration of complex, non-linear concepts. Such preparation is essential to equip students for the unpredictable and dynamic nature of the modern workplace. This is not only applicable on education but in all fields of studies. The world and situations in the world of work is constantly changing and we need to prepare graduates to be willing to explore situations and discover the best solutions.

The only constant in life is change - Heraclitus

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Exploring Opportunities and Obstacles in the Decolonisation of South African Higher Education Curriculum

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Abstract: This research investigates the intricacies of decolonising the higher education curriculum in South Africa, with the ultimate goal of advancing social justice, a cornerstone of democracy. Drawing on an extensive review of literature and institutional analysis, the study delves into the multifaceted nature of decolonisation efforts within the South African higher education landscape. Central to this inquiry, is the conceptualisation of social justice, encompassing principles of equity, inclusivity, and the warranted recognition of historically marginalised perspectives. Through an exploration of both the opportunities and obstacles inherent in the decolonisation process, this research sheds light on key themes including potential institutional resistance and epistemological shifts. Furthermore, it underscores the significance of embracing indigenous knowledge systems, fostering critical pedagogies, and promoting culturally responsive teaching practices as pivotal strategies in advancing social justice agendas. By critically examining these dynamics, this study contributes to a deeper understanding of the complexities involved in curriculum transformation initiatives aimed at promoting social justice in South African higher education. This paper will inform institutional stakeholders on objective realities of the implementation of this progressive practice.

Keywords: Decolonisation, Social justice, Higher education, Curriculum transformation, Inclusivity

1. Introduction

Decolonisation of educational curriculum in Higher Education Institutions is a reality faced by institutions in a bid to illustrate democracy, transformative constitutionalism and equitable progression. With 2024 marking 30 years of democracy for the Republic of South Africa, a reflection into transformative practices in education becomes pertinent in assessing the country's democratic progression. The conundrum arises in balancing these fundamental interests and acknowledging obstacles that could prejudice this progression. Decolonisation of curriculum involves the re-evaluation and transformation of the content taught and the methodology implemented in educational institutions. The rationale behind decolonisation is to dismantle colonial legacies and structures of power (Lebeloane, 2017). The process of decolonisation has fundamental aims to challenge Eurocentric bias while promoting indigenous knowledge which furthers recognition of the heritage of indigenous persons in South Africa (Dastile, 2013). It addresses historical injustices through acknowledgment and confrontation while simultaneously celebrating cultural diversity and inclusion of the marginalised and underrepresented groups of people (Dastile, 2013). In empowering marginalised communities through relatable education, culturally, a sense of belonging and self-worth can be argued as significant benefits thereto (le Grange, 2016). Critical pedagogy is also cultivated through the encouragement of critical thinking on issues to do with power, privilege, and oppression (Machingambi, 2020). In essence, the decolonisation of curriculum seeks to create an educational environment that is inclusive, equitable and relevant to the diverse realities of learners in tertiary education. This study has classified decolonisation to primarily include transformed use of language for instruction, module selection, prescribed material and assessment criteria. This classification will form the basis for the discussions on opportunities, obstacles, case studies and recommendations to be made for a sustainable decolonisation of a curriculum.

2. Research Methodology

The research methodology for this paper is primarily based on an extensive literature review. The objective was to gather, analyse and synthesise information from a wide range of academic materials and research papers to identify key themes, opportunities, and obstacles related to the decolonisation of a curriculum. The initial phase of research involved a search of academic databases, including JSTOR, Good Scholar and Institutional repositories, to identify relevant literature published in the last decade. Keywords such as "decolonisation of curriculum", "higher education", "curriculum reform", "post-colonial education", and "educational transformation", were used to ensure a broad and inclusive search. The inclusion criteria prioritised peer reviewed articles, books, conference papers and theses that specifically addressed decolonisation efforts in Higher Education. The selected materials were systematically reviewed to extract relevant data and insights. Each of the sources were examined for its discussion on decolonisation processes, theoretical frameworks, practical implications, challenges that were faced and outcomes observed. The review

was structured in a way that highlights both the successes and barriers encountered in various contexts, providing a balanced perspective on the issue.

For the synthesis of findings, the analysis of the collected literature was conducted using a thematic approach. Key themes were identified and grouped into categories of relevance and relatability, inclusivity and diversity and critical thinking and analysis. The thematic analysis enabled an understanding of the multifaceted nature of curriculum decolonisation. Based on the thematic analysis, conclusions were drawn regarding areas of opportunity and obstacles in the decolonisation of curriculum. Opportunities were identified in innovative pedagogical practices, interdisciplinary approaches, and community engagement strategies that have shown promise in fostering a more inclusive and representative curriculum. Conversely, obstacles like entrenched institutional norms, lack of resources and resistance to change were also highlighted. This provided a nuanced view of the challenges that need to be addressed. By systematically analysing a diverse range of materials, this study provides understanding of where progress has been made or can be made. It also identifies the barriers that must be overcome in a bid to further the agenda of decolonising curriculum in higher education.

3. Opportunities and Obstacles to be Realised in the Decolonisation of Curriculum

Advocacy for decolonisation of curriculum has been driven for a multitude of reasons. Positive changes have been attributed to decolonisation of curriculum for a just and inclusive society. The below are some of the opportunities that can be realised, together with obstacles that can delay or in some instances, hinder the active implementation of the categorised forms of decolonisation identified in paragraph 1 above.

3.1 Relevance and Relatability

Decolonised curricula are inevitably more relevant to local contexts. Benefits to be realised from this are enhancement of practical application of learning (Le Grange, 2016). Learners are better equipped to tackle real life situations with skills cultivated through relatable hypothetical scenarios (Le Grange, 2016). An example would be a psychology student who is informed on certain mental ailments that are identified in the South African context but not acknowledged by western curriculum. In practice, should a patient come and present the ailment, the learner (now professional) would be equipped to assist or have literacies to make the relevant referral. Through decolonisation, the dominance of western knowledge paradigms are challenged (Lebeloane, 2017). There is also a systematic reshaping of knowledge production and increase in indigenous representation which is crucial to a country's identity (Abdi, 2012).

A fundamental challenge to the above benefit through decolonisation is the unfortunate reality of possible resistance to change. Established faculty and academic traditions in some institutions tend to resist change to curriculum as they perceive it as an attack on their expertise or as an unnecessary overhaul of successfully proven teaching methods. A recent case study done at an unnamed South African University had one Senior Department staff member allude to the following, *"I am sitting with an older staff, who still believe that the old topics in the curriculum is fine"*, (du Plessis, 2021). It is imperative to acknowledge that decolonisation must encompass elements extending to more than just curriculum (du Plessis, 2021). The methodology or teaching and lecturer attitudes and deliveries are also crucial (du Plessis, 2021). Democratic advancement, social justice and constitutionalism warrant that these challenges be addressed at thirty years of democracy. Reworking faculty academic training and recruitment is a lengthy process, and this research acknowledges the time that it will take for a comprehensive decolonisation in this regard. The importance thereof, however, needs to continuously be emphasised on to foster more, relevance, relatability and confidence in learners of all racial and cultural demographics.

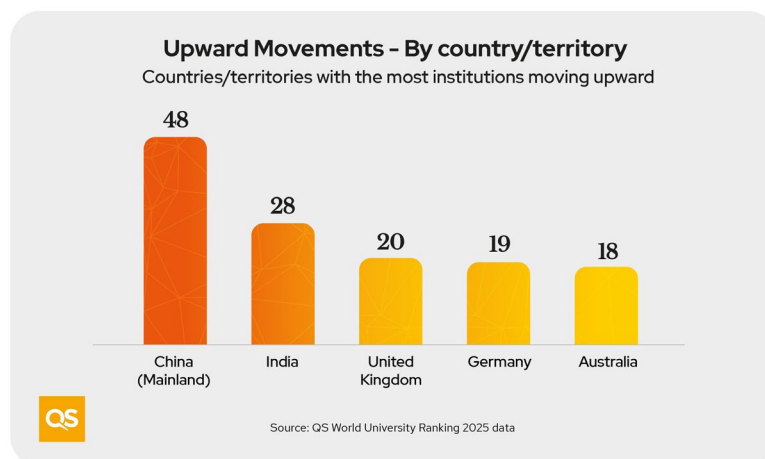
3.2 Inclusivity and Diversity

Imperialism has been criticised to have brought about lack of identity and confidence in indigenous cultures and practices given the negative connotations that were projected onto these practices by the imperialist ideologies (Martin, 2013). With independence and exposure there is a move towards self-realisation and actualisation by the indigenous persons (Bond, 2014). Furthermore, with decolonisation of curriculum, comes the incorporation of diverse perspectives and knowledge into the curriculum (Machingambi, 2020). This can be attributed to allowing students from various backgrounds to see themselves reflected in their education and therefore further cultivating a sense of belonging (Machingambi, 2020). It affirms respect for diverse cultures and experiences (Le Grange, 2016). By virtue of confronting the nuanced historical injustices and inequalities, decolonisation inevitably promotes social justice values in South Africa (Fataar, 2018). John Stuart Mill contextualised social justice in contemporary politics, social science, and political philosophy and defined it as the fair treatment and equitable status of all individuals and social groups within a state or society (Dilulio,

2022). In a democratic dispensation, it is pertinent that students have prescribed material and modules that equip them with the critical skills and knowledge to advocate for diversity and societal inclusion (Le Grange, 2016).

Arguments have been levelled against South African education for not having made the necessary strides in education to uphold social justice (Badat & Sayed, 2014). Assertions made suggest that social justice is threatened by the gatekeeping academic practices of the South African higher education institutions (Jansen, 2004). Attributed to the gatekeeping have been aspects such as complexified language of instruction (English and/or Afrikaans) and somewhat exorbitant fees to which the South African masses cannot afford (Badat & Sayed, 2014). A study at 20 years of democracy established that, *"Twenty years later, formally desegregated yet class-based educational institutions, continuing disparities and inequities, and poor academic achievement are key features of the contemporary educational order."* (Badat & Sayed, 2014). In endorsing the agenda for multifaceted decolonisation of curriculum, the aim would be for the disparities and prejudices to be systematically reduced, and, eventually eradicated (Albertyn, 2019). Principles of social justice are enshrined in the Constitution of the Republic of South Africa (from hereunder referred to as "The Constitution"). This is evident in the bill of rights as a whole, the equality and non-discrimination clause in section 9, socio economic rights and affirmative action. It therefore becomes imperative that academic practices in higher education institutions, implement transformative practices that promote the agendas of social justice and correct historical injustices.

Section 6(2) of the Constitution states that, *"Recognising the historically diminished use and status of the indigenous languages of our people, the state must take practical and positive measures to elevate the status and advance the use of these languages"*. In a bid to further this constitutional objective, it is imperative that the use of the indigenous languages (acknowledged in Section 6 (1) of the Constitution) in Higher Education institutions be endorsed and implemented where benefit may be realised. Germany, as a leading academic and economic state, advocates for a German taught curriculum despite the popularity of English as an academic language of instruction. A study at the Technical University of Munich, found that the 71% students receiving education in their native language (first language, German), comprehended the taught curriculum more, excelled at assessments and became formidable professionals in their specialised industry (Fulda and Missal, 2021). This fared higher than a success rate of 56% in an unnamed institution where students received instructional learning through the use of a second language to them (Fulda and Missal, 2021). The Technical University of Munich is ranked thirty-seventh (37th) in the Quacquarelli Symonds (QS) World University Rankings 2024 and thirtieth (30th) in the Times Higher Education (THE) Rankings 2024 (QS, 2024). "Being the first of its kind to incorporate both employability and sustainability factors into the methodology, the QS World University Rankings provides the higher education sector, governments, and students a reliable rankings system that identifies the world's leading universities in a range of performance metrics." (QS, 2024). The above constitutional provisions and case study would inform a motivation in support of native languages being used for teaching and learning in Higher educational institutions. The below image illustrates the projected highest upward movement in ranking for specific countries' universities in 2025. Of note is the 48% climb of China which has some exclusive standard Chinese speaking and learning institutions or standard Chinese option of educational delivery. Also, Germany is projected at a 19% climb, with a learning environment that also offers some exclusive German speaking and learning institutions or German option of educational delivery (QS, 2024). While it cannot be substantiated that the climbs are subsequent to the use of indigenous languages, it is evident that institutions in countries incorporating indigenous languages for instruction are thriving. The upward movement would create a rebuttable presumption that there is minimal to no detriment from use of indigenous knowledges. A finding was made that less Chinese descent students chose to take up studies outside of China as they have a sense of belonging within their local institutions (Gao, 2021). Although international students tend to render a mixed review on student experience due to the indigenous languages used for instruction in some institutions, student enrolment boosts in China can also be attributed to the low emigration rate (Gao, 2021).



Source: QS World University Rankings Website (2024) - <https://www.qs.com/rankings-released-qs-world-university-rankings-2025/>

Contextual criticism can be levelled against the upward movement in China given the complexities of a very diverse South Africa. The reality of curriculum transformation into the implementation of indigenous languages will be more complex in the South African context than it would be for other jurisdictions. Germany has only German as their official language while South Africa has eleven (11) officially recognised languages. This entails a multitude of curriculum translations, and several other factors would ripple from that. For instance, there would be budget implications to acquire resources for the transformation and the question becomes whether the state's educational department has sufficient resources to fund the exercise. Several international learners seek education in South African Institutions and the multilingual identity of South Africa would require an English alternative to be maintained. The academics to deliver the academic material would also be subject to literacy in the specific indigenous languages and the question then arises on whether there would be multiple sessions to cater for each indigenous language. A pertinent question also prompted by that would be if the institutional premises would have capacity for the different groupings, whether the education is delivered physically or virtually. Resource availability would be nucleus to this transformative exercise and funding avenues, by the state and private stakeholders, would need to be established.

3.3 Cultivating Critical Thinking and Analysis

Pursuant to tertiary studies, learners are expected to possess reasonable critical thinking skills (Golden, 2023). Faculties bestowing professional qualifications such as accounting, law, engineering, and medicine, require a superior possession of critical thinking and analytical skills (Golden, 2023). Decolonised curricula which amplify the voice of the marginalised and promotes inclusivity and equality encourages critical thinking. Learners can be encouraged to critique power structures, colonial legacies and historical injustices (Fataar, 2018). This would cultivate an educational environment that is democratic in nature, and it could engrain essential qualities such as the challenging of stereotypes and dominant westernised narratives (du Plessis, 2021).

A risk that can be levelled against the above submission is the risk of a prejudiced global competitiveness on the part of the learners who receive a decolonised curriculum educational delivery. There is concern to be noted that the curriculum may not adequately prepare students for the global job market. This will particularly apply to job markets where international standards and knowledge are crucial. This study in no way intends to cast doubt on the ability of South African higher educational institutions to decolonise curriculum in a way that competes in the international space. However, in light of this risk posed, it would be pertinent that caution is exercised as far as curriculum structuring is concerned.

Another risk worth acknowledging is that of exclusion of minority groups not covered under the decolonisation agenda. The transformed curriculum poses a risk with regards to inadvertently excluding other minority groups. For instance, contextual relatability will not be realised by international learners in institutions, and neither will the incorporation of indigenous languages. One could aim to debunk this theory through an assessment of China and Germany and acknowledge the continued influx of international learner enrolments in their higher education institutions. However, there are several other factors that need to be acknowledged, such as the substantial subsidising of fees for international learners in the several institutions in those

respective countries. South African public higher education institutions currently subsidise some international learner fees too which could incentivise and still promote international student enrolments. An example of this is the subsidies for students from the Southern African Development Community (SADC). SADC member countries include Angola, Botswana, Comoros, Democratic Republic of Congo, Eswatini, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Seychelles, Tanzania, Zambia, and Zimbabwe (Chawarika, *et al*, 2024). SADC students pay annual local tuition fees, which are more affordable than international fees in South African public universities (University of Witwatersrand, 2024). International undergraduate students from outside of SADC pay double the local tuition fees (University of Witwatersrand, 2024). The international learner enrolment may not be prejudiced in light of incentivised enrolments such as the above, however, it will be crucial that the transformative practices towards decolonisation do not amount to segregation of minority groups as they also contribute to the fiscus income and the academic reputation of the South African Higher Education Institutions.

4. Conclusion and Recommendations

This exploration of the opportunities and obstacles in the decolonisation of the South African higher education curriculum has revealed a multifaceted process that possesses aspects of potential as well as notable challenges or risk areas. Undoubtedly, the decolonisation of the curriculum presents an opportunity to enhance inclusivity as well as diverse knowledge systems and African epistemologies. There is significant benefit to be noted for the marginalised persons within South Africa through an active academic acknowledgement of their histories. This will inevitably enhance student learning experiences.

However, the path to decolonisation of curriculum is not without obstacles. Traditional academic paradigms pose a threat to implementations thereof as institutional resistance may be faced. Overcoming this hurdle will require faculty development programs with sustainable dialogues that are inclusive in nature. Where intervention programs are already in place, constant reflections on the effectiveness and impact thereof will be critical. Additionally, financial, and human resources, if lacking, may cause a delay in the effective implementation of aspects of the decolonisation process. In a bid to address the challenges identified and harness the opportunities previously identified, the following recommendations are proposed by this paper:

4.1 Institutional Commitment to Demonstrative Leadership and Faculty Development and Support

The leading authorities within higher education institutions will be required to demonstrate a strong commitment to the decolonisation agenda. Institutional culture needs to be constantly driven towards diversity and inclusion. Furthermore, comprehensive development and support programs must be implemented within faculties. The developed programs must be sufficient to equip academics with the knowledge and skills that are needed to integrate diversified teaching perspectives. Lastly, collaboration must be encouraged and celebrated and extend to interdisciplinary collaboration where necessary. This paper acknowledges some progresses made to date but in light of du Plessis' case study, it is evident that some institutions continue to maintain stagnancy and have not implemented any transformative processes while others have formulated policies in theory but have neglected to implement same.

4.2 Resource Allocation

Secure funding and resources are essential to continuing to drive a multifaceted agenda such as curriculum decolonisation. In the case of a developing economy like South Africa's, it will be invaluable for institutions seeking to implement particular agendas, to seek external funding for specific projects. While always seeking government support is essential and mostly useful, partnering with philanthropic organisations (if successful), will also be a step in the right direction. Government funding can be subject to political agendas and shifts, which may affect the consistency and direction of curriculum reform. Philanthropic organisations can provide a more stable and apolitical source of support, ensuring that decolonisation efforts remain focused on educational goals rather than political ones. Philanthropic organisations often also have extensive networks and can collaborate with other independent bodies without fettering of a political nature.

4.3 Monitoring and Evaluation

Like any multifaceted project, it will be imperative for institutions seeking to implement decolonisation of curriculum projects to establish sound monitoring and evaluating mechanisms. In the absence thereof, there is no accountability and progress assessment. Information gathering sessions from academics and students alike will be instrumental in monitoring impact and informing future strategies.

4.4 Closing Remarks

The decolonisation of curriculum, even in the specific categories identified in this paper, is a progressional exercise. The key aspects that institutions who aim to further implement effective mechanisms must uphold are social justice, inclusivity, and democracy. Rome was not built in a day. The progress to date by some institutions and faculties can and must be applauded. However, this movement is an uphill movement that will require constant monitoring and evaluation as well as accountability. It cannot be treated as a tick box exercise and requires genuineness and sincerity in correcting the wrongful past of the democratic Republic of South Africa. With the objectives of the Constitution in mind, it can and will be done, gradually and with inevitable lessons and obstacles along the way.

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A Model for Effective Implementation of Contemporary Assessment Methods in Higher Education Institutions

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Abstract: This review study investigates the effectiveness of assessment methods in higher education institutions, focusing on the significance of contemporary and innovative methods such as project-based assessments, portfolios, simulations, and collaborative activities. The paper offers instructions for applying efficient assessment methods, policy suggestions for institutions, and potential topics for further study. The results have consequences for improving assessment methods and equipping students for their future professions since the future of assessment in higher education is seen as fertile ground for innovations. A model for effective implementation of the contemporary assessment methods is proposed.

Keywords: Assessment, Higher education institutions, Traditional examinations

1. Introduction

Assessment methods are of utmost importance in higher education institutions as they monitor students' progress and ascertain their degree of comprehension of the course (Winstone & Boud, 2022). Nevertheless, there is an increasing concern that many traditional assessment methods may not adequately equip students for the practical demands of the professional environment. Yustina et al. (2020) allude that a significant number of students lack the self-confidence to transition into the workforce due to the discrepancy between the assessment methods used in some higher education institutions and the actual demands of professional environments. The discrepancy between these two factors prompts inquiries into the appropriateness and effectiveness of existing assessment methods, necessitating a reassessment of their suitability in equipping students for the challenges of the professional world.

Assessment is a method used to assess a student's understanding, abilities, and proficiencies in a particular field of study (Daka et al., 2021). It offers vital input to students and instructors, influencing teaching methods and assisting personalised learning paths. Efficient assessment methods are crucial for fostering profound comprehension, analytical reasoning, and problem-solving skills in learners (Sahera et al., 2022). Moreover, assessments function as a standard for ensuring the quality of higher education institutions and are essential for accrediting objectives (Cao et al., 2023).

Conventional or traditional assessment methods, such as written examinations, have long been the primary means of assessing student learning (Sahera et al., 2022). Nevertheless, these approaches might have constraints that might impede their capacity to gauge practical abilities and proficiencies precisely (Asamoah et al., 2022). Sahera et al. (2022) argue that traditional written examinations generally emphasise the rote memorization and recitation of facts, sometimes overlooking the cultivation of crucial adaptable abilities such as effective communication, collaborative cooperation, and analytical problem-solving. Furthermore, these assessments may not accurately represent the ever-changing and cooperative characteristics of work settings, where immediate decision-making and flexibility are highly regarded.

Considering these difficulties, higher education institutions need to reassess their assessment procedures and ensure they are in line to generate graduates who are prepared for the workforce. This paper seeks to investigate alternative assessment methods that may accurately monitor students' progress, bolster their self-confidence in transitioning to the professional world, and bridge the gap between academic requirements and industrial standards.

Based on the discussion above, the following research questions serve as a guide for the upcoming empirical study on the effectiveness of assessment systems in higher education institutions:

- Are traditional sit-down exams still relevant and do they contribute to real work-life situations?
- What alternative assessment methods can be employed to ensure graduates are assessed in a way that makes them work-ready?
- What are the challenges and factors to consider during implementation of contemporary assessment methods?

Through investigating these research questions, the study seeks to provide significant perspectives on enhancing assessment methods in higher education to more effectively correspond with industry demands and increase students' preparedness for employment. The review of improved assessment methods has significant consequences for both higher education institutions and students. Higher education institutions might use the results to enhance their assessment methods and elevate the quality of education they provide. Employing efficient assessment methods may optimise student academic achievements, involvement, and contentment, consequently equipping students for success in their professional pursuits (Cao et al., 2023). Improved assessment methods may provide students the chance to display their knowledge, skills, and abilities in real and relevant ways, resulting in benefits for them. These strategies have the potential to cultivate profound learning, analytical reasoning, solution-oriented thinking, cooperation, and other abilities necessary for their personal and professional growth.

2. The Progression of Assessment Methods in Higher Education

2.1 Historical Overview of Assessments in HEIs

The assessment methods used in higher education have undergone substantial development throughout the years, mirroring changes in educational philosophies, teaching strategies, and social demands (Daka et al., 2021). In the past, assessment mostly involved evaluating the student's comprehension of course concepts via assignments or written tests/examinations (Yustina et al., 2020). These examinations often assessed the memorisation of information and the repetition of facts. Although they offered a method to assess students' comprehension of the subject matter, they did not always assess their capacity to apply information in real-world situations (Daka et al., 2021).

Over the last several decades, there has been a change in educational models towards learner-centred methods that prioritise active participation, critical analysis, and the cultivation of skills that can be used in many contexts (García-Peñalvo et al., 2020). This change has seen a restructuring of assessment methods to correspond with wider learning objectives and results. Educators and academics have acknowledged the significance of assessing not only the acquisition of information but also the application of knowledge, problem-solving capabilities, communication aptitude, and collaborative skills (Guo et al., 2020).

2.2 The Need for Alignment Between Assessment Methods and Real Work Scenarios

HEIs are increasingly acknowledging the need for assessment methods that closely resemble actual work conditions to better equip students for the job (Villarreal et al., 2020). Traditional written examinations, while effective in assessing academic knowledge, may not sufficiently evaluate the practical abilities and proficiencies necessary in professional environments (Asamoah et al., 2022). The disparity between assessment methods and actual job scenarios might erode students' confidence and hinder their capacity to seamlessly transition into the work environment (Cao et al., 2023).

To rectify this discrepancy, higher education institutions need to reassess their assessment procedures and find alternative approaches that more accurately replicate authentic professional situations. This entails integrating assessments that evaluate problem-solving, critical thinking, creativity, collaboration, and adaptability (Sahera et al., 2022). Higher education institutions may enhance the preparedness of graduates for professional challenges by matching assessment methods with the skills and competencies highly valued in the industry (Daka et al., 2021).

In addition to the above, the rapid progression of technology has generated fresh prospects for assessment in HEIs (García-Peñalvo et al., 2020). Digital technologies and platforms provide novel methods for evaluating students' learning, including simulations, case studies, project-based examinations, and online portfolios. These approaches provide a more thorough understanding of students' capabilities and create opportunities for genuine assessment in the digital era (Martin et al., 2020).

The history of assessment systems in higher education therefore demonstrates a transition towards learner-centred approaches and the need for congruence with true work scenarios. By adopting alternative assessment methods that surpass conventional written tests and integrating technology-driven approaches, higher education institutions may more effectively equip students with the necessary skills and knowledge required in today's intricate job market.

2.3 Analysis of Traditional Assessment Methods

Traditional assessment methods, such as written examinations, have been widely used in higher education institutions for a considerable period (Daka et al., 2021). These examinations usually require students to respond to questions within a predetermined time limit, often in a supervised setting (Ishaq et al., 2020). Although sit-down tests are useful for evaluating students' knowledge retention and comprehension of subject matter, they are limited in assessing higher-order thinking abilities and the practical application of information in real-world situations (Gallardo, 2021).

One of the downsides of sit-down examinations is their emphasis on rote memory and the mere repetition of knowledge (Daka et al., 2021). This technique may therefore not effectively capture students' capacity for critical thinking, complex issues analysis, and practical application of information. Traditional written examinations often emphasise the memorisation of facts rather than the ability to synthesise and apply information, which are crucial competencies in professional environments (Ishaq et al., 2020).

In addition, written examinations may not fully capture the whole spectrum of students' talents and competencies (Asamoah et al., 2022). Typically, they evaluate individual performance rather than assessing collaborative abilities or the capacity to work in teams, both of which are highly esteemed in several professional environments (Villarreal et al., 2020). Moreover, the combination of time constraints and the high level of importance placed on tests may result in heightened levels of stress and anxiety, which may hurt students' academic performance and entire educational journey (Schultz et al., 2022).

Consequently, while sit-down examinations have been a traditional assessment technique in HEIs, they may not completely correspond to the requirements of the contemporary labour market (Ishaq et al., 2020). Their constraints, including their emphasis on factual memorisation and restricted assessment of advanced cognitive abilities, have spurred a reassessment of their effectiveness. It is therefore important for HEIs to continuously look for alternative assessment methods that provide a more thorough and genuine assessment of students' capabilities, ensuring their enhanced readiness for the problems they will encounter in the professional sphere.

2.4 Contemporary Assessment Methods

HEIs are considering various alternative assessment methods that surpass conventional written examinations (Gallardo, 2021). These methods strive to provide a more thorough assessment of students' knowledge, abilities, and competencies and more effectively correspond to the requirements of the job market. Several novel assessment methods are now emerging and these are discussed below.

2.4.1 Project-based assessments

Project-based assessments involve students' engagement in authentic projects or case studies that replicate professional situations (Guo et al., 2020). Students use their acquired knowledge and expertise to resolve intricate challenges, exhibit analytical thinking, and display their aptitude for collaborative work (Almulla, 2020). Project-based assessments in higher learning have become increasingly common because they facilitate the evaluation of students' practical skills, ability to think critically, and application of learned knowledge in reality (Yustina et al., 2020).

Project-based assessments encourage active learning by involving learners in the process, enhancing their understanding of the topic through inquiry, evaluation, and synthesizing information from multiple sources (Guo et al., 2020). They also develop essential skills like problem-solving, collaboration, time management, and communication (Almulla, 2020). Furthermore, project-based assessments foster creativity and innovation, as there are no standard procedures for completing assignments, allowing for experimentation (Nguyen, 2021).

Project-based assessments have some drawbacks, including their subjective nature, time-consuming nature for both students and teachers and difficulty managing workloads (Yustina et al., 2020). Instructors may have different criteria for grading assignments, leading to discrepancies in grading. Students may struggle to manage their workload and turn in projects on time, while teachers spend more time creating, supervising, and evaluating projects (Nguyen, 2021). To make project-based assessments more effective in evaluating student-learning outcomes in higher education, clear assessment criteria, sufficient student assistance, and uniform evaluation procedures should be established (Almulla, 2020).

2.4.2 Performance assessments

In higher learning, performance assessments refer to evaluations that focus on observation, and assessment of students' abilities to apply their knowledge and skills in realistic, real-life settings (Chernikova et al., 2020). The

assessments may include presentations, demonstrations, simulations, or exhibits, which enable students to demonstrate their practical abilities and apply their knowledge in real-life situations (El Firdoussi et al., 2020).

Performance assessments offer several benefits, including providing a comprehensive view of students' capabilities, fostering motivation, and providing more activity opportunities than written tasks (Chernikova et al., 2020). They measure practical skills, problem-solving, and critical thinking, helping students bridge the gap between theoretical knowledge and practical skills (Asamoah et al., 2022). By working on real-world tasks, students gain a deeper understanding of the subject, enhancing their learning experience (Villarreal et al., 2020).

Performance assessments however have some disadvantages such as logistical complications and resource constraints, as well as the potential for subjective evaluations (Asamoah et al., 2022). To ensure success, appropriate space, quantity, and facilities must be prepared (El Firdoussi et al., 2020). Multiple groups and supervisors may be difficult to manage in larger groups or limited facilities (Chernikova et al., 2020). Additionally, the evaluation of skills and abilities may differ depending on the instructor, necessitating the use of agreed-upon assessment criteria to maintain compliance and fairness (El Firdoussi et al., 2020).

2.4.3 Authentic assessments

Authentic assessments in higher learning imply assessing the student's knowledge, skills, and abilities in a real-world setting related to their professional environment or advanced study area (Villarreal et al., 2020). These assessments often require students to participate in tasks such as performing research, analysing data, producing reports, or devising solutions to complex issues (Schultz et al., 2022).

Authentic assessments provide a valid way to evaluate students' abilities by showcasing their practical application of learned knowledge and skills (McArthur, 2023). These assessments eliminate the risk of evaluating students based on rote-memory skills and vocal mastery of concepts (Jopp, 2020). They also motivate students to learn more deeply and develop transferable skills. Recognizing the applicability of education to real-life situations inspires better performance and higher intrinsic motivation, making students more purposeful and willing to engage in their studies (Villarreal et al., 2020).

However, authentic assessments have some disadvantages, such as being challenging to design and align with learning outcomes, being time-consuming for both students and teachers and being overloaded with tasks (McArthur, 2023). Students may require more time for projects and detailed tasks, while teachers may need to spend time issuing feedback (Jopp, 2020). Nevertheless, with careful consideration, student support, and proper workload management, authentic assessments can be a valuable way to assess students' real-world skills and abilities (Villarreal et al., 2020).

2.4.4 Portfolios

Portfolios are compilations of students' work that display their educational progress and accomplishments across a period (Edwards & Burnham, 2023). Portfolios may include a wide range of items, including essays, projects, reflections, and tangible demonstrations of skill improvement (Herianto, 2022). They provide a comprehensive perspective on learners' capabilities and development, highlighting their aptitudes, ingenuity, and analytical reasoning (Almulla, 2020).

Portfolio assessments in higher learning involve collecting and evaluating a student's work samples, projects, and artifacts (Händel et al., 2020). They offer a comprehensive view of a student's learning, encompassing various types of evidence like essays, reports, artworks, and creative outputs (Edwards & Burnham, 2023). This approach helps develop a better understanding of a student's growth beyond simple knowledge obtained from exams or one-time assessments. Portfolio assessments also promote student reflection, self-assessment, metacognition, and self-regulation, encouraging students to evaluate their strengths and weaknesses and identify growth potential (Herianto, 2022).

The challenges of portfolio assessments include the lack of appropriate guidelines for assessment, as diverse work samples or artifacts can be time-consuming to develop (Edwards & Burnham, 2023). Instructors must assess the significance and relevance of the artifacts to evaluate students' ability or learning. Additionally, it can be time-consuming for students and faculty members to select and create their work, while faculty members need sufficient time to evaluate and provide feedback (Händel et al., 2020). Despite these challenges, portfolio assessments offer appropriate evaluation and support for students.

2.4.5 Peer assessments

Peer assessments involve students evaluating their classmates' work according to pre-established criteria (Chang et al., 2020). This method encourages individuals to evaluate their performance, engage in analytical thinking, and provide helpful comments (Double et al., 2020). Peer assessments are very helpful for cultivating students' capacity to assess and provide feedback, which are crucial proficiencies in professional environments (Li et al., 2020). Peer assessments in higher education promote active learning, allowing students to critically evaluate and form a reasoned attitude toward the material (Zhou et al., 2020). This approach also fosters shared responsibility, as all students are responsible for each other's progress. Students can share experiences and evaluate their peers, providing feedback on their knowledge and skills (Double et al., 2020).

However, peer assessments may face difficulties due to the need for reliable guidelines, training, and a trusting and fair setting (Zhou et al., 2020). The assessors must understand criteria, objectives, and suggestions, while students must trust the measurement and be sure it is fair. Some students may struggle to assess their peers' work or be arrogant, which can negatively impact ratings and subjectivity (Chang et al., 2020). Instructors should address these issues and provide calculated feedback and guidelines to minimize difficulties (Li et al., 2020). Despite these challenges, peer ratings have numerous benefits in higher education, promoting active learning and critical assessments among students.

2.4.6 Problem-Based-Learning (PBL)

PBL is an educational approach that focuses on solving real-world problems as a means of learning (Liu & Pásztor, 2022). PBL is an educational method that positions students as active participants in solving real-world problems. Students collaborate in groups to identify and resolve intricate, practical issues (Thorndahl & Stentoft, 2020). The assessment in PBL focuses on appraising students' proficiency in identifying and analysing issues, applying knowledge, collaborating, and communicating with effectiveness (Alfares, 2021). PBL fosters active learning, allowing students to analyse situations and make decisions (Thorndahl & Stentoft, 2020). PBL also helps develop essential skills like problem-solving, collaboration, communication, and self-directed learning (Alt & Raichel, 2022). It helps students develop teamwork and relationships, enabling them to thrive in professional settings.

However, PBL faces challenges, such as promoting passive learning and requiring students to face real problems (Liu & Pásztor, 2022). Moreover, PBL can be time-consuming and may not be suitable for educational institutions with specific course periods. Additionally, students may not be used to the self-directed and inquiry-based approach, which requires certain skills and confidence (Alfares, 2021). Some students may need scaffolding to develop the capabilities to deal with PBL properly (Alt & Raichel, 2022). With proper guidance, time management, and resources, PBL can foster skill development and deep learning in higher institutions.

2.4.7 Simulations and virtual environments

Simulations and virtual environments are tools that simulate real-world situations, offering students a safe and controlled environment to experiment and apply their skills (Luo et al., 2021). Simulations accurately reproduce real-life situations; and provide students with the opportunity to refine their abilities in a secure, and regulated setting (Nesenbergs et al., 2020). Virtual environments, such as virtual reality (VR) or augmented reality (AR), provide immersive experiences that enable students to participate in genuine activities and get instant feedback (Chernikova et al., 2020).

These technologies encourage interaction, decision-making, and direct observation, making them more effective than other learning methods (Luo et al., 2021). They can also simulate complicated scenarios, such as those in applied sciences where real-life labs are difficult, expensive, and dangerous. This allows students to practice virtually in labs where the worst-case scenario is simulation failure, enhancing their performance in real-world situations (Nesenbergs et al., 2020). However, not all scenarios and disciplines can benefit from these technologies.

Simulations and virtual environments for higher learning have disadvantages such as high costs, complex design, unreliable technology, contradictions, difficulty in learning, and counter-intuitive use (Chernikova et al., 2020). Furthermore, not all simulations are realistic or can be restrained, and some scenarios are completely different from the real world due to the lack of real-world experiences (Radianti et al., 2020). For example, medical sciences courses may not fully benefit from virtual reality. These challenges require new considerations that are not present in other forms of learning, making simulations and virtual environments a valuable alternative for learning (Chernikova et al., 2020).

2.4.8 Capstone

Capstone projects in higher learning refer to culminating projects or experiences that integrate and apply the knowledge and skills provided through an academic program (Cheng et al., 2020). Capstone projects serve as the final and comprehensive culmination of students' academic programmes, integrating their acquired knowledge and skills (Salem et al., 2020). These assessments require learners to use their knowledge and talents to resolve a complex issue or accomplish a substantial task. Capstone projects sometimes include cooperation with industry partners, affording students the chance to tackle real-world problems and receive input and feedback from experts (Friess & Goupee, 2020). Capstone projects offer numerous benefits, including demonstrating subject mastery, facilitating interdisciplinary learning, and fostering collaboration among students from various fields (Memon et al., 2021). They help students apply their knowledge and develop analytical skills, critical thinking, and practical expertise (Salem et al., 2020).

However, there are risks associated with capstone projects, such as the need for careful planning, clear objectives, curtailments, and assessment timelines (Cheng et al., 2020). Faculty and department leaders should support correspondence programs to guide students and meet project methodological and scope requirements (Memon et al., 2021). Proper access to data or resources may be necessary for projects involving database creation, and subjective assessments may take time. Therefore, it is crucial to ensure all papers and criteria are considered and documented.

Table 1: Contemporary assessment methods description, disadvantages and mitigating disadvantages

Contemporary assessment methods	Description	Disadvantage	Mitigating disadvantages
Project-based assessment	Projects and case studies that replicate professional situations	Different criteria for grading	Proper guidelines for assessment criteria and student assistance
Performance assessment	Observations through presentations and demonstrations	Resource constraints	Financial support from the institution
Authentic assessment	Participating in tasks such as research, analysis of data and producing reports	Designing and aligning learning outcomes and workload for both students and staff	Student support and proper workload management
Portfolios	Displaying educational progress through submission of a portfolio of evidence with essays, projects, reflections	Lack of appropriate guidelines for assessment	Proper guidelines for assessment criteria
Peer assessments	Evaluating classmates work	May be subjective and unfair	Reliable guidelines and training for students to do peer assessments.
Problem-based learning	Educational approach to solving real-world problems (group work)	Promotes passive learning	Proper guidance, time management and resources
Simulation and virtual environments	Reproducing real-life situations	High costs	Support financially from the institution
Capstone	Using knowledge to resolve complex issues. Includes corporation with industry partners	Planning	Clear objectives and assessment timelines

2.5 Challenges and Factors to Consider During the Implementation of Contemporary Assessment Methods

Introducing innovative ways to assess in higher education might pose diverse difficulties and necessitate meticulous thought. Some of these issues and concerns include the following:

2.5.1 Faculty training and development

Faculty members have a vital role in the designing and implementation of assessments (Winstone & Boud, 2022). Nevertheless, they may need to undergo training and engage in professional development activities to get acquainted with contemporary assessment procedures and methods (Gallardo, 2021). Institutions need to

ensure that faculty members are adequately supported to properly adopt and evaluate alternative assessment methods. This may include conducting seminars, implementing training programmes, and providing continuous assistance to faculty members to develop their assessment proficiency (Cao et al., 2023).

2.5.2 Resource allocation

Resource allocation refers to the process of distributing and assigning resources efficiently and effectively (Martin et al., 2020). Introducing new assessment methods may require additional resources, including both technological and temporal aspects. HEIs must deliberate on the distribution of resources to facilitate the deployment of alternative assessment methods (Yustina et al., 2020). This may include allocating resources toward technological infrastructure, software, or equipment that are essential for implementing simulations, virtual environments, or other cutting-edge assessment methods. Furthermore, faculty members may need extra time for the creation of assessments, the assessment of student work, and the provision of feedback (Asamoah et al., 2022). Optimal allocation of resources is crucial to guaranteeing the effective deployment of new assessment methods (Gallardo, 2021).

2.5.3 Assessment of reliability and validity

Valid and reliable assessment methods are necessary to provide an accurate measurement of desired learning outcomes and consistent findings (Schultz et al., 2022). HEIs ought to meticulously devise assessments and create unambiguous standards for assessing student success (Nguyen, 2021). Ensuring that assessments are in line with the learning objectives of the course or programme and provide proof of students' knowledge, skills, and competencies is crucial (Winstone & Boud, 2022). Periodic assessment and verification of assessment procedures are also essential to preserving their validity and reliability over time (García-Peñalvo et al., 2020).

2.5.4 Ensuring fairness and diversity

When incorporating contemporary and innovative assessment methods, it is important to take into account the principles of fairness and inclusivity (Sahera et al., 2022). Institutions must ensure that assessments are equitable and inclusive for all students, irrespective of their various origins, talents, or learning capabilities (Boström & Palm, 2023). It is important to consider accessibility elements, such as offering alternate formats or accommodations, to assist students with impairments or unique requirements (Nguyen, 2021). HEIs should also be cognizant of possible prejudices in assessments and endeavour to establish comprehensive assessment standards that do not unfairly harm any of the students (Martin et al., 2020).

2.5.5 Ethical considerations

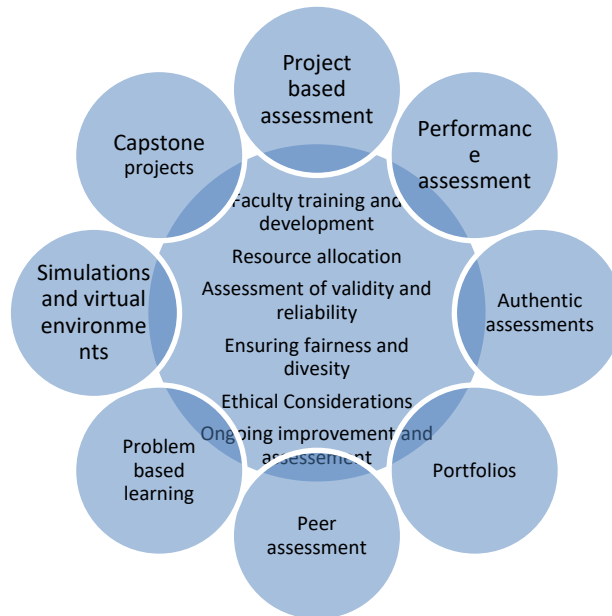
Ethics are crucial during the designing and implementation of assessments (Asamoah et al., 2022). HEIs therefore need to ensure that assessments respect students' privacy, confidentiality, and intellectual property rights (Ishaq et al., 2020). To help ensure the ethical conduct of assessments, it is crucial to create and disseminate clear ethical principles to professors and students (García-Peñalvo et al., 2020). HEIs must also take into account the ethical ramifications of using nascent technology, such as artificial intelligence, in assessments, ensuring fairness, impartiality, and responsibility in their execution (Händel et al., 2020).

2.5.6 Ongoing improvement and assessment

The implementation of new assessment methods is a continual process that requires continual improvement and review (Guo et al., 2020). HEIs should therefore periodically evaluate and appraise the effectiveness of assessment systems in measuring intended learning outcomes and improving student learning experiences (Boström & Palm, 2023). Feedback from teachers, students, and education boards may provide significant perspectives on the merits and shortcomings of the assessment methods. This feedback should be used to make incremental modifications and adjustments to ensure that assessments stay relevant, valid, and aligned with the changing demands of the workforce (Ishaq et al., 2020).

2.6 Model for Effective Implementation of Contemporary Assessment Methods

Based on the literature reviewed on contemporary assessment methods and challenges faced with the implementation of the contemporary assessment methods the following model proposed for effective implementation of contemporary assessment methods is proposed:



Source: Authors' construction

Figure 1: Model for effective implementation of contemporary assessment methods

Introducing contemporary assessment methods in higher education necessitates tackling diverse obstacles and concerns. Figure 1 shows that the successful implementation of contemporary assessment methods requires attention to faculty training, allocation of resources, validity and reliability assurance, promotion of fairness and inclusion, ethical issues, and continual development. Institutions may improve assessment methods and better equip students for the needs of the contemporary workforce by thoughtfully addressing these issues and concerns.

3. Conclusion

The future of assessment in higher education harbours the significant potential for innovation and enhancement. The literature review has shown that some contemporary assessment methods that can be used in place of or alongside traditional examinations include: project-based assessments, performance assessments, authentic assessments, portfolios, peer assessments, problem-based learning, simulations and virtual environments, and capstone projects. The literature has also identified various challenges and factors to consider during the implementation of contemporary assessment methods, including, faculty training and development, resource allocation, assessment of validity and reliability, ensuring fairness and diversity, ethical considerations, as well as ongoing improvement and assessment. With the continuous advancement of technology, assessment methods may be enhanced to be more personalised, adaptable, and in line with real-world requirements. Integrating developing technologies, such as artificial intelligence, virtual reality, and learning analytics, may improve the authenticity, efficiency, and effectiveness of assessments. Moreover, assessment processes will persistently develop to tackle concerns of fairness, inclusiveness, and prejudice. Measures need to be taken to guarantee that assessments are impartial, easily approachable, and accommodating to learners from all backgrounds. HEIs ought to create assessment environments that empower students and ensure equitable possibilities for achievement.

4. Recommendation

To improve assessment methods in higher education, it is essential to define clear educational objectives, use diverse assessment methods, ensure authenticity and relevance, integrate formative and summative methods, provide prompt feedback, promote accessibility and inclusiveness, provide faculty development and support, offer incentives and rewards for faculty members who participate in innovative assessment methods, and promote collaboration and sharing across institutions. These recommendations will help ensure that students can access and participate in assessments, regardless of their backgrounds, skills, or learning styles. Additionally, faculty development and support will help them improve their understanding and proficiency in assessment, and incentives and rewards can be offered to encourage active participation in innovative assessment methods.

Future studies in the field of assessment methods might look into empirically testing the proposed model in higher education institutions. Furthermore, there is a need for the use of technology to better the assessment process. Researchers can also explore the possibilities of future technology, such as artificial intelligence, virtual reality, or learning analytics, in improving assessment procedures. Moreover, researchers can examine how these technologies might provide fresh possibilities for genuine, individualised, and flexible assessments.

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Implicit to Explicit: A Framework for Supporting Blended Design Education With Microlearning

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Abstract: Design is an iterative process involving cycles of divergent and convergent thinking. To navigate these cycles effectively, designers need a range of competencies. These include information gathering, sense-making, imagination, ideation, shape-giving, iterative reflection, critical evaluation, collaboration, and discipline-specific knowledge. To develop these competencies, design education typically occurs in a studio environment that follows a learning-by-doing approach, simulating industry practices. However, the tacit knowledge—unspoken insights and intuitions—that informs the application of domain knowledge is often not visible, making it difficult for students to connect theory with practice and potentially hindering their learning. The cognitive apprenticeship model is a pedagogical approach that enhances learning-by-doing by integrating theory and practice throughout the design process, making tacit knowledge explicit and accessible. Within the context of blended learning, where face-to-face classes are complemented by technology-enabled learning, microlearning emerges as an innovative teaching and learning approach that delivers activities in structured, bite-sized pieces. This method is designed to minimise cognitive load and to help students grasp complex implicit concepts. In this paper we explore how microlearning, an innovative teaching and learning approach, might be integrated into learning by doing approaches within blended learning settings in the design studio to make tacit knowledge explicit. The paper is the first part of a larger study exploring how microlearning activities might support learning-by-doing within blended learning environments during the various phases of the design process. An integrative review of literature on the design process and related design competencies, cognitive apprenticeship and microlearning, theoretically informed the development of a conceptual framework outlining the dynamics between learning-by-doing and microlearning activities to foster connections between theory and practice. The framework will be used in subsequent research to inform the design and trialling of microlearning activities to support learning-by-doing in practical design modules. This research contributes to existing understanding of educational approaches that support learning-by-doing in design education and lays the foundation for further research to inform the design of appropriate and meaningful microlearning activities.

Keywords: Microlearning, learning-by-doing, Cognitive apprenticeship, Design competencies, Design education, Blended learning

1. Introduction

Design is an iterative process characterised by cycles of divergent and convergent thinking, essential for developing purposeful and meaningful outcomes (Design Council, 2021). Key competencies required during this process include information gathering, sense-making, imagination and ideation, shape-giving, iterative reflection, critical evaluation, collaboration, and discipline-specific or domain knowledge (Cross, 2007; Dorst, 2017; Sanders, 2017; Burger, 2018). Design education traditionally occurs in a studio environment at many higher education institutions, however due to recent shifts, many design institutions have adopted a blended learning approach, where face-to-face classes are supplemented with online content, activities and lecturers, offering flexible learning experiences in the design classroom (Fleischmann, 2023). This approach emphasises a learning-by-doing approach that mirrors industry practices. Despite these advancements, the tacit knowledge—unspoken insights and intuitions—that inform the application of domain knowledge is often not visible, making it difficult for students to connect theory with practice (Friedman, 2001).

The cognitive apprenticeship model, a pedagogical approach to mentoring in a learning-by-doing setting, supports real-world problem-solving and the integration of theory and practice by making tacit knowledge explicit and more accessible (Collins, Brown & Holum, 1991). Within the context of blended learning, microlearning, an innovative teaching and learning approach, might further enhance connecting theory and practice by guiding students to achieve specific learning goals, accommodating individual learning needs, and providing timely feedback through appropriate activities. By delivering content in structured bite sized chunks, microlearning allows students to consume the content at their own pace, with activities integrated into the larger learning experience (Hug et al., 2006; Kohnke, 2023).

In this paper we explore how microlearning activities might theoretically support the development of appropriate knowledge and understanding to foster principle-based design practice within blended learning settings. A literature review of pedagogical approaches and cognitive processes involved in design education,

informed our understanding and the development of a conceptual framework describing the dynamics between microlearning and the cognitive apprenticeship approach. This framework will guide future research about designing and trialling microlearning activities to support learning-by-doing within blended learning environments. The research contributes to existing understanding of assessment approaches that support learning-by-doing in design education and lays the foundation for future research to inform the design of fit-for-purpose and meaningful microlearning activities.

2. Learning-by-Doing: How Design Students Learn

Design is a problem-solving process involving various stakeholders and requiring multiple competencies. Competency encompasses knowledge, skills, abilities, attitudes, values, and behaviours necessary for performing specific tasks within a discipline (Burger, 2018). Design, as a discipline with distinct processes and practices demands distinct competencies such as information gathering, sense-making, imagination, ideation, shape-giving, iterative reflection, critical evaluation, collaboration, and domain knowledge of principles, theories, tools and methods (Cross, 2007; Dorst, 2017; Sanders, 2017; Burger, 2018). Some competencies are applied only in specific phases of the design process while other competencies, such as collaboration and reflection are applied throughout the process.

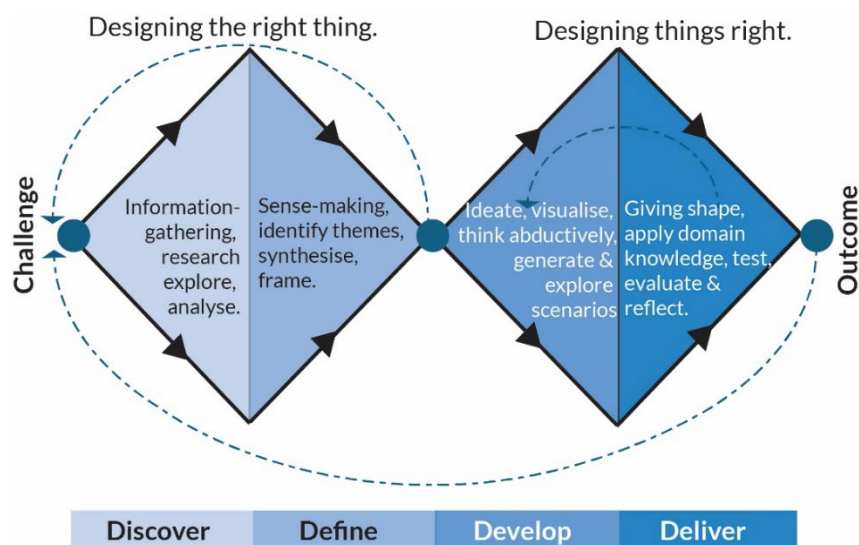


Figure 1: The Double Diamond Design Process (Design Council, 2021)

The Double Diamond Design Process (figure 1), a widely applied model, depicts iterative cycles of the design process involving divergent and convergent thinking and consisting of four different phases: discover, define, develop and deliver (Design Council, 2021). The initial discovery phase requires research competencies for information gathering to explore the existing situation from multiple perspectives and understand stakeholders' needs and expectations (Dorst, 2017). Interpretation competencies are needed for sense-making to analyse findings, identify patterns, synthesise information, and through abductive thinking, identify alternative ways of looking at the design problem to make sense of and frame it (Dorst, 2004; Cross, 2007). In the develop phase, giving shape to possible solutions is crucial (Sanders, 2017). Designers start with vague ideas and test them to explore how they might look and work (Cross, 2007). As ideas are explored and tested, experienced designers reflect on their work and learn from their actions, informing new problem frames, possibilities, and directions (Schön, 1983; Dorst, 2017). This ability to reflect and iteratively develop and test possibilities enables designers to bridge the gap between the problem space and the solution space and select concepts to develop into solutions (Dorst, 2017). In the deliver phase, designers must identify the strengths and weaknesses of ideas and prototypes to deliver refined design outcomes (Sanders, 2017). As the challenges the world faces become ever more complex, designers find themselves working on problems in fields outside of their own discipline that they have not been trained in. Consequently, they become generalists who must reach across disciplines to collaborate and co-create with different designers and non-designer stakeholders (Sanders, 2017; Dorst, 2018).

Design education occurs in a studio environment and follows a learning-by-doing approach (Meyer & Norman 2020; Pontis & van der Waarde, 2020). The studio serves as a space where students are supported while they complete carefully designed learning activities that simulate industry practices, both in physical face to face and virtual environments, providing opportunities for exploration and productive failure, facilitated by constant

dialogue and cooperation, which are crucial for learning (Celikoglu & Ogut, 2013). Studio culture aims to cultivate autonomy, curiosity, and motivation among students, fostering a deeper understanding of design principles and practices (Pontis & van der Waarde, 2020). Students are required to constantly consider the "bigger picture" (Kirschner & Hendrick, 2020 ; Southall, 2016), emphasising the importance of thinking about the entire design process and not just individual design tasks (Southall, 2016). Knowledge in this context can be described as "active" and integrated into cognitive processes such as perception, judgement, problem solving and decision making and metacognitive processes such as modification, articulation and reflection, related to design (Southall 2016:54). These cognitive processes are informed by tacit knowledge which Southall (2016:54) describes as "the informed guesses or hunches that are part of an exploratory act." Tacit knowledge is predominantly personal and requires pedagogical methods and strategies that reveal the processes associated with such knowledge.

To make tacit knowledge more explicit, requires breaking the lineage from a traditional 'Master-apprentice' model to a pedagogical approach that integrates knowledge, skills, and understanding in design education within blended learning environments, rooted in heutagogy, user-centred research, and scientific explanations (Pontis & van der Waarde, 2020). While the 'Master-apprentice' model is very effective in skills transfer, as the apprentice copies the master faithfully, it can result in a carbon copy of the master and apprentices that do not evolve beyond their master's abilities. This model is therefore inadequate to support design as action informed by theoretical knowledge and demanding an awareness of *what* must be known and *when* during the design process.

Students must become aware of cognitive and metacognitive processes early in their learning journey to develop the required depth of knowledge and understanding of the design process. Theory supports practice and provides contextual awareness. Celikoglu and Ogut (2013) note students struggle to transfer theoretical knowledge, especially across different modules, into their design practice. Attaining contextual awareness promotes a deeper appreciation for the historical context of design and its implications for sustainable practice (Calvelli, 2010), highlighting the interconnectedness of historical study and practical application in the field of design (Ghefaili, 2003). Given the complexities, these elements are in continual flux requiring students to constantly adapt and to develop a critical awareness of how the design process can be adapted in response to create positive impact (Findeli, 2001).

There is a clear shift towards an appreciation for the cognitive processes in the design process beyond mere skills transfer (Findeli, 2001; Meyer & Norman, 2020). One such pedagogical approach can be found in the cognitive apprenticeship model (Burger & van Zyl , 2020, Pontis & van der Waarde, 2020) which addresses the gap in design education by emphasising learning-by-doing through problem-solving approaches (Roux & Batchelor, 2023). Recent literature demonstrates the impact of cognitive apprenticeship on critical thinking and interaction, particularly in online learning environments (Alwafi, 2023).

3. What is Cognitive Apprenticeship Theory?

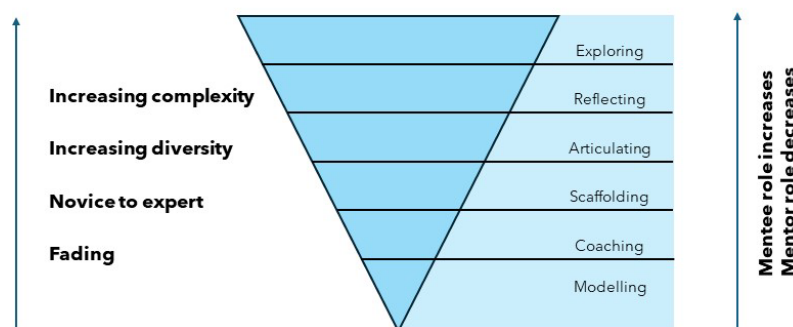


Figure 2: The Cognitive Apprenticeship Model (adapted from (Collins et al., 1991)

The cognitive apprentice approach draws on real-world problem-solving experiences to support learning in authentic contexts. The approach aids students in developing expertise through meaningful encounters with the subject matter (Wilson and Cole, 1996) and highlights the complementary nature of problem-solving and perception, suggesting that experts develop expertise through progressive encounters with the domain (Wilson & Cole, 1996). One of the defining features of the approach is its usefulness to teach complex tasks (Collins, Brown & Holum, 1991). Initially developed for secondary education, the approach has been adopted in creative

disciplines-where the Master Apprentice model is still prevalent, to address the changing needs of industry and emphasise 21st century skills. Highlighting the cognitive and metacognitive processes in design equips students with the ability to adapt and expand their knowledge to diverse and complex situations. Wilson and Cole (1996) stress the importance of supporting students in becoming efficient in procedural performance and deliberate in self-reflection and understanding, emphasising the grounding of instruction in complex problems, cases, or performance opportunities. Burger and van Zyl (2020) highlight the importance of theory and evidence-based design activities in transforming learning, while Southall (2016) highlights the need to nurture diverse forms of knowledge to enhance problem-solving and creative thinking skills.

Six methods are commonly used to promote the development of expertise within the cognitive apprenticeship approach (figure 2). These methods include modelling, coaching and scaffolding, where the mentor or lecturer is the main actor, and articulation, reflection and exploration where the mentee or student becomes the main actor (Collins et al. 1991). During modelling the mentor demonstrates the task or project at hand. Mentees observe the activity, which helps them develop a conceptual model of the completed activity before attempting it themselves. Coaching involves guidance and feedback from the mentor, although in a studio setting coaching can also come from peers. The mentor scaffolds learning by initially offering clear support and then gradually withdraws, providing less structured support, asking guiding questions instead.

Articulation is encouraged by the mentor throughout the process with the aim to make tacit knowledge and thinking processes explicit. Ghefaili (2003:2) describes this as “teaching the cognitive and metacognitive skills associated with a specific domain of knowledge”. The mentor also articulates their tacit knowledge to help the mentee understand the process. Reflection and self-evaluation are strategies to help mentees evaluate their progress and determine what they need to do to achieve their goals. Finally, exploration results from independent exploration by mentees and furthering of knowledge and experience.

During application of the six methods the focus gradually shifts from the mentor to the mentee with the desired outcome for the mentee to eventually complete the activity independently. Mentees are actively involved in determining their own learning path and develop some agency over their own learning process (Celikoglu & Ogut, 2013). While they initially participate from the periphery, they gradually become central to the activity and critical members of the community and eventually, the experts (Collins et al., 1991; Dennen & Burner, 2007).

4. How do Cognitive Apprenticeship Approaches Support Design Learning?

The cognitive apprenticeship approach guides students through authentic tasks and processes rather than isolated instances, to develop skills, understanding and knowledge (Southall, 2016). There is a constant interplay between learning and doing, where knowledge acquisition and practical application do not always align (De Rosa, 2015). As a result, a complex inter-relationship exists between conceptual- content knowledge and procedural knowledge. This inter-relationship underscores the importance of dynamically integrating theoretical knowledge with practical skills in design learning to develop a comprehensive understanding of design principles and techniques (Southall, 2016). With an eye on the whole picture, knowledge and understanding are accessed only when needed (Southall 2016; Kirschner & Hendrick, 2020) and the mentor uses their role as coach to establish clear links between knowledge and practice throughout the creative process. While the cognitive apprentice approach provides a useful outline for how to share the different types of knowledge that creates the expert, in the context of design education, much room is left for interpretation.

Using the methods put forward in the cognitive apprentice model, students can complete different activities to support their learning and depth of understanding. Articulation can be done using visual tools, such as sketches, diagrams, and prototypes to communicate their tacit understanding of a design solution, making it more tangible and understandable to others involved in the design process (Burger & van Zyl, 2020). Throughout the design process tacit knowledge is articulated and exchanged in discussions, critiques, and collaboration with various stakeholders, leading to a deeper understanding and appreciation of diverse perspectives and approaches. Reflecting on their design decisions, processes, and outcomes, students can articulate and document their tacit experience, making it accessible and transferable to others (Roux & Batchelor, 2023). Design educators should therefore foster a culture of independent reflection, collaboration, documentation, and knowledge sharing to support future designers in articulating and sharing tacit knowledge, enhance their design capabilities and contribute meaningfully to the increasingly complex field of design (Southall, 2016; Burger & van Zyl, 2020; Meyer & Norman, 2020).

A significant shift towards technology-enhanced learning, brought about by wider access to online learning materials, the internet and consumption of content on smartphones, is altering learning expectation and

demands (Shatte & Teague, 2020). However, media multitasking reduces students' information processing capabilities, making them more susceptible to distraction and cognitive overload (Uzun, 2023). The question therefore arises how the adoption of microlearning to break learning into small, manageable chunks might enhance a learning-by-doing approach in design education.

5. What is Microlearning?

Cognitive Load Theory (CLT), a framework that explains how the human brain processes and stores information, suggests that working memory has a limited capacity, capable of handling only a certain amount of information at a time. When this capacity is exceeded, cognitive overload occurs, hindering both learning and problem-solving. To mitigate cognitive overload, learning design must account for students' intrinsic load (related to the complexity of the material) as well as extraneous (how content is presented) and germane (effort required to understand and process information) loads. Effective learning design should aim to optimise these cognitive loads to facilitate better learning outcomes (Sweller et al, 2011).

Microlearning has emerged as a promising educational approach that focuses on integrating short learning activities into students' daily routines. In the context of blended learning, where online and face-to-face instruction are combined, microlearning closely aligns with the principles of CLT, as content is delivered in structured, small segments designed to minimise cognitive load, followed by small activities completed within a limited timeframe to help students grasp complex, implicit concepts. This approach support students in meeting specific learning outcomes and retaining core principles before applying them (Samala et al., 2023) and keeps them engaged by providing practice opportunities and immediate feedback. Bite-sized chunks of information help students better process material, improve knowledge retention, and foster engagement and active learning (Uzun, 2023; Lopez, 2024), resulting in improved grades, increased participation, and faster, more accurate task completion (Shatte & Teague, 2020). By reducing extraneous load through thoughtful content design and focusing on essential concepts (intrinsic load) and the construction of meaningful mental structures (germane load), educators can leverage microlearning within blended learning environments to improve learning outcomes (Lopez, 2024).

6. Guiding Principles of Microlearning Activities

Microlearning design involves not only the creation of microcontent but also the development of micro activities based on that content (Buchem & Hamelmann, 2010). Key design principles for microcontent include a small format for immediate perception, a clear focus, autonomy (requiring no external information), structure as a single resource and addressability. Microlearning activities must address what students need to know, provide useful resources, and positively impact their learning (Kohnke, 2023). Activities should be clear and focused, presented one step at a time, without oversimplifying the content (Kohnke, 2023).

Various forms of media and formats can be used in microlearning activities, including text-based micro copy such as contextual short messages, error messages, hints and tooltips as well as videos followed by interactions such as fill in the blank, a quiz, poll, etc. Other formats also include micro challenges and games such as quizzes, polls, flashcards, simulations, doodles, prototyping, learner recordings and infographics, microblogging, podcasts, AI chatbots with reflective questioning, discussion boards and peer feedback. The chosen media and format must be specific and relevant to the topic, considering what students need to know before, during, and after the activity (Kohnke, 2023; Samala et al. 2023; Peters, 2020, Gabrielli et al, 2005; Javorcik, 2022; Marshalsey & Sclater, 2020, Wang & Bonk, 2001).

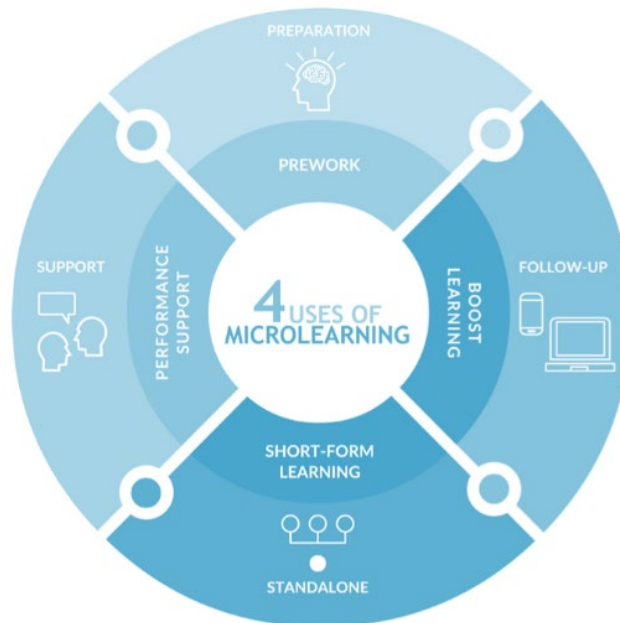


Figure 3: The four uses of microlearning (Torgerson and Iannone, 2020: 111)

Torgerson and Iannone (2020) identify four ways to use microlearning: As preparation before a learning event, as follow-up to reinforce a learning event, as standalone training, or as performance support (figure 3). These four tactics can be integrated into the cognitive apprenticeship approach (figure 4), to support learning-by-doing.

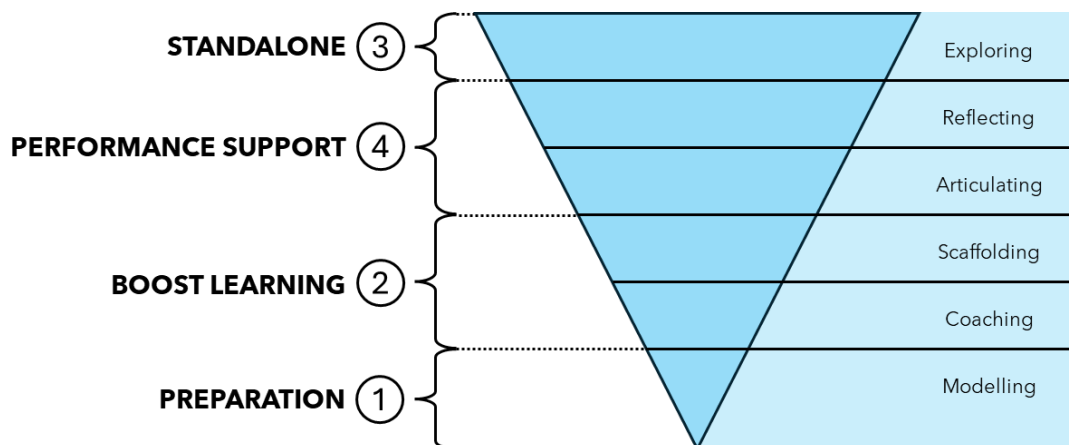


Figure 4: Four ways of microlearning overlapped in the Cognitive Apprenticeship Model

Firstly, microlearning activities can be used as preparation for a learning event. For example, when a lecturer employs modelling as the initial step in the cognitive apprenticeship approach to develop a specific design competency, students may first need to observe the activity before attempting it themselves. This observation requires them to understand a significant amount of didactic content before they can meaningfully engage in discussions or activities (Torgerson & Iannone, 2020). Pre-event preparation, such as short videos introducing key ideas (introductory teasers) can support students in grasping this didactic content more effectively (Kohnke, 2023).

Coaching and scaffolding require the lecturer to provide guidance and feedback, initially offering clear and structured support. Over time, this support is gradually reduced, transitioning to less structured assistance while incorporating guiding questions to promote independent thinking. Here, microlearning activities can be used strategically to reinforce or supplement learning events. Learning could be enhanced through challenges such as quizzes that test comprehension and reinforce key concepts, or infographics that summarise or clarify complex ideas. Additionally, AI chatbots might be employed to simulate conversations and pose guiding questions, fading the direct involvement of the mentor (Kohnke, 2023).

Articulation and reflection can be supported by microlearning activities that offer performance support, helping students articulate their understanding, reflect on their learning and foster expertise. Performance support can be provided through microblogging or discussion forums, where students are required to articulate their thought processes and the reasoning behind their interpretations and to exchange ideas (Wang & Bonk, 2001). Small reflection activities such as self-assessment, goal setting or reflective questions, for example, might enable students to quickly assess their performances and identify areas for improvement (Kohnke, 2023).

During exploration, microlearning activities can be standalone. Standalone activities support just-in-time learning, which renders learning more realistic and contextual. For example, short video tutorials may guide a student through a specific topic or skill they are struggling with or quick interactions with AI chatbots may allow them to test ideas or receive feedback or role play scenarios (Kohnke, 2023).

7. The Conceptual Framework

The conceptual model in figure 5, integrates the six steps or methods of the cognitive apprenticeship approach with the four different applications of microlearning activities to support the development of competencies during each phase of the design process. The four quadrants in the circle represents the phases of the design process, each requiring distinct competencies, and some competencies required across all phases. Using a cognitive apprenticeship approach in a blended learning context, lecturers and students' progress through the learning steps during each phase of the design process to develop each competency, as presented in the inverse blue pyramid. As they progress through the learning steps the lecturer's role fades and the student's increases. The green concentric circles denote the increasing complexity and depth of knowledge as students move from preparation microlearning activities (Prep) to activities that boost their learning (Boost), to activities that support performance (Support), to standalone microlearning activities (Standalone).

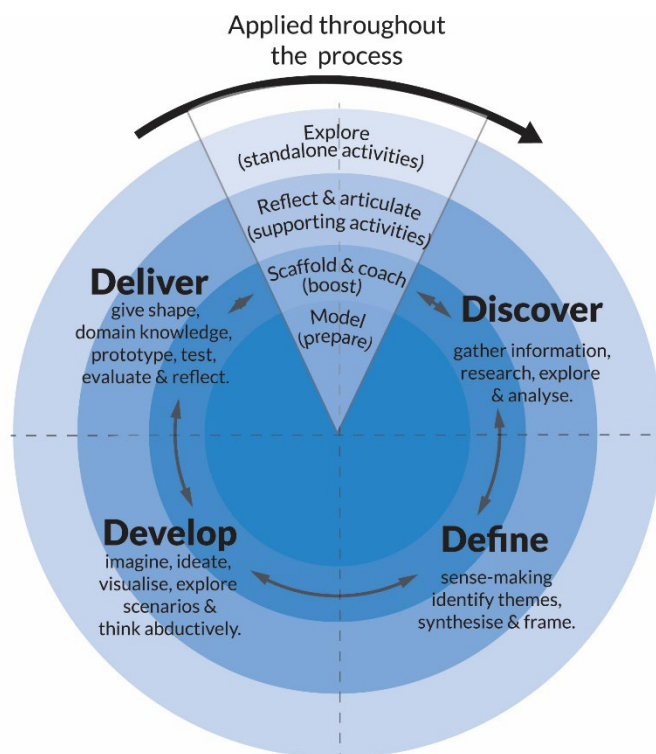


Figure 5: Conceptual framework of the way microlearning activities support learning-by-doing throughout the design process

For example, during the discovery phase of the design process, students must develop information-gathering competencies. Using the cognitive apprenticeship approach, the lecturer selects a suitable a micro activity to prepare students before modelling information-gathering methods and tools. Subsequently, activities that boost learning are used to support coaching and scaffolding. As the student's role in learning increases in the articulation and reflection steps, appropriate micro activities for performance-support and self-evaluation are included in the learning material. The learning cycle completes with students exploring the application of information-gathering methods in new contexts. Standalone, micro activities support them in doing so. As the

class progresses through the phases of the design process the cognitive apprenticeship steps repeat for each competency with fit-for-purpose micro-activities that support learning-by-doing.

8. Summary

This study employed a literature review to conceptually explore the integration of microlearning activities within a learning-by-doing approach across the various phases of the design process, particularly within the context of blended learning environments. The purpose of the study was to theoretically explore how the key competencies required during the various phases of the design process, might be supported in blended learning settings. The study started with identifying key competencies required in each phase of the widely accepted double diamond design process. Subsequently different types and uses of microlearning activities were identified from the literature. By focusing on the intended purpose of the intended activities rather than the type and aligning these different uses with the various steps in the cognitive apprenticeship approach, a framework was established for integrating microlearning activities and a learn-by-doing approach. Overlaying the design process with this framework we developed a conceptual model for introducing microlearning activities that help students develop a deeper understanding of the design process and an ability to apply theoretical knowledge in practical settings. This study adds to current knowledge on educational approaches that facilitate learning-by-doing in design education, especially in technology-enhanced blended learning contexts. More research is needed to test the ideas presented in this framework, but we hope that this integrated approach can foster design competencies that ultimately support structured and accessible learning and application of complex design principles. This approach aims to ensure that students can make the connection between theory and practice by making implicit knowledge explicit.

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Making Teaching and Learning a Collaborative Process by Adopting Research Informed Teaching on Executive Education Programmes

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Abstract: In a current, fast changing digital environment, the fact how fast business market is changing and how society's perceptions evolve to become more inclusive and diverse in terms of viewpoint, and overall workforce composition is a strong indication that the education system also requires a change. To remain relevant, business and management education must reflect the realities that influence its subject matter, while at the same time addressing societal needs and expectations. Especially on the Executive Education (EE) programmes, which are driven by changes in technology, the marketplace, and the demand of individual organisation for organisation change, business schools are expected to do more than simply disseminate knowledge. Having learners or clients who are coming from a diverse range of background, who are bringing a variety of learning styles, abilities, and rich learning experience is a challenge to satisfy all stakeholders. Thus, in those programmes where we are trying to bring academic rigour and real-world experience to scale up businesses and help them growth, some innovative and inclusive ways of teaching, learning and assessment are very important to ensure learners' personal and professional development and to demonstrate a real-world impact for those involved. This article presents a reflective analysis of introduced innovative learning, teaching, and assessment methods for one of EE programmes in one of the UK's higher education institutions. The innovative methods employed in this course were to address the above-mentioned challenge, to demonstrate a real-world impact for those involved, in addition to ensuring learners' personal and professional development by making teaching and learning a collaborative process. This was achieved by incorporating an active and action learning strategies in flipped classroom settings. More specifically this was achieved by introducing all elements (research led/tutored teaching, research oriented or research based) of research informed teaching, which focused on real-life problems that client companies are or were facing instead of traditional case study approach. Effectiveness of this approach was acknowledged by both colleagues, who were involved in teaching and supervisory activities and learners. Colleagues reported that learners seemed to be more enthusiastic and attentive in classes after introducing this practice. On the other hand, learners indicated that having an opportunity to work with or supervised by research active staff encourage them to conduct their own research with high quality manner. In addition, it has been observed that this practice also worked well in supervisor-learner engagement and engagement with the material especially in the flipped classroom settings. Effectiveness of the introduced methods and recommendations are based on learners' feedback and the secondary data that demonstrates the impact for the client organisation. As this study was taken purely for the pedagogical reasons and is not conceived as pure research, at this stage study didn't go through the ethics approval, which is an acknowledged limitation of this study, however there is an intention for farther developing this limitation to strengthen the research findings and recommendations.

Keywords: Business and management education, Executive education, Action and active learning, Research informed teaching

1. Introduction

In a current, fast changing digital environment, the fact how fast business market is changing and how society's perceptions evolve to become more inclusive and diverse in terms of viewpoint, and overall workforce composition, is a strong indication that the education system also requires a change. It has been suggested (Carrington Crisp, 2024) that 375 million workers may need to switch occupations and consequently, need to learn new skills or advance their qualifications. To remain relevant, business and management education must reflect the realities that influence its subject matter, while at the same time addressing societal needs and expectations. Lockhart (2013) suggests that a successful business school must serve two communities: the research community and the business community. Although there is a significant increase of business education over the last few years, it has been argued (Cuplin and Scott, 2011; Lockhart, 2013) that business schools are too theoretical and not sufficiently address the real-world business challenges that corporates face. Thus, EE programmes both non-Degree courses and Executive MBA/MSc programmes believed to be a critical strategy among the traditional MBA for many business schools. However, it must be acknowledged that although EE courses and MBA programmes are two recognised pathways in business and management education, they serve to different career objectives and professional needs. Therefore, understanding these differences is critical for potential students to make informed decisions on which pathway to take (Murray, 2024).

On the EE programmes, which are driven by changes in technology, the marketplace, and the demands of individual organisations for organisation change, business schools are expected to do more than simply

disseminate knowledge. Having learners or clients who are coming from a diverse range of background, who are bringing a variety of learning styles, abilities, and rich learning experience, Pfeffer and Fong (2004) believe that education should focus

more on learning process, how to learn rather than being content driven to satisfy all stakeholders. Thus, in those programmes where we are trying to bring academic rigour and real-world experience to scale up businesses and help them growth, some innovative and inclusive ways of teaching, learning and assessment are very important to ensure learners' personal and professional development and to demonstrate a real-world impact for those involved.

This article presents a reflective analysis of introduced innovative learning, teaching, and assessment methods for one of EE programmes (Executive MSc in Strategic Management) in one of the UK's higher education institutions. The innovative methods employed in this course were to address the above-mentioned challenge, to demonstrate a real-world impact for those involved, in addition to ensuring learners' personal and professional development by making teaching and learning a collaborative process. This was achieved by incorporating an active and action learning strategies in flipped classroom settings. More specifically this was achieved by introducing all elements (research led/tutored teaching, research oriented or research based) of research informed teaching, which focused on real-life problems that client companies are or were facing instead of traditional case study approach.

Effectiveness of the introduced methods and recommendations are based on learners' feedback and the secondary data that demonstrates the impact for the client organisation.

2. Literature Review

2.1 Background of EE landscape

Very early definition of EE introduced by Ballou et al 1999, (p. 340) states that EE is a "*management education for people who are in executive roles or who hope to be*" in such roles. An implication of this definition is that the focus on EE is the executive's development and importantly the impact that can make on business performance. According to Burgoyne and Reynolds (1997) management learning should include both professional practice and theoretical enquiry. Thus, an underlying assumption of effective EE providers should be to develop executives, who are expected to be better equipped to develop, contribute to, and lead initiatives that enhance the performance of their current or future organisations (Lockhart, 2013). Suggested by Burgoyne and Reynolds (1997) curriculum design on EE programmes should focus on developing the critically reflective practitioner. Critically reflective practice is where the practitioner is consciously operating out of a best available working theory but is willing to critique it and is aware of and open to other perspectives. Thus, the curriculum also should include several tools: reflexive and reflective conversations (Cunliffe, 2016) and a dedicated learning journal (Lockhart and Franklin, 2008).

Introduction of the case study method by the Harvard Business School beginning of the 20th century as a novel pedagogical approach, which was marked as a significant shift from purely theoretical to more applied forms of learning, reinforced further development of EE. The case study method involves students learning through real-world business problems, fostering a practical understanding of business management and decision-making (Cuplin and Scott, 2014). Thus, using this method, on EE programmes aimed to provide an immersive learning experience that bridged theoretical knowledge with practical business skills (Lockhart, 2013). According to Harvard business School, EE refers to an immersive learning experience empowering senior executives to reflect, recharge, and improve their performance in their organizations (Harvard Business School, 2016). Thus, currently EE has become a vital tool for leaders aiming to navigate complex challenges and drive innovation.

To keep up with the fast-changing environment of the business and to be successful on the higher education market, collaboration with the businesses and engagement with practice should be in every Business school's DN. It has been argued (Arai et al., 2019) that the process by which teaching is conducted on EE programmes is also critical for its success. Thus, going beyond the case study method and introducing more innovative and exclusive methods for teaching and learning on these programmes are critical. Advancement in digital technology and globalisation making EE more accessible and flexible. Blended (BL) learning models, combining online and in-person sessions, became popular, accommodating executives' busy schedules and extending programs' global reach. Graham (2006) highlights that BL offers more flexibility and improves the teaching and learning process, providing more opportunities for feedback and reflection. In addition, incorporating an active and action learning and teaching strategies are becoming very popular on those programmes.

2.2 Active Learning and Teaching Strategies for EE

Currently, debates about EE suggest (Earley, 2014, Ellis and Goodyear 2016; Roman and Uttamchandani 2018, Rich et al., 2019, Saeed et al., 2020) to incorporate active learning strategies and real-world assignments in EE teaching and learning process rather than accumulating knowledge as it is often done in traditional courses. Active learning refers to learners-centred approach that emphasises learners' engagement in active and meaningful construction of their learning (Yao and Collins 2018). The key idea behind active learning and student engagement is reflecting on the experience of learning by doing (Chickering and Gamson 1987; Gibbs 1998; Healey, et. al., 2010). Active engagement in learning may take different forms: flipped classrooms, internship, group discussions collaborative assignments and project, problem solving approach, case study, business simulations, subject-based research, and inquiry etc. All these tasks and activities are intended to engage learners actively and deeply in learning about business and management issue.

2.3 Research-Based and Research-Informed Curricula for EE

Suggested by Healey and Jenkins (2009, pg. 3) learners in all higher education institutions should experience learning through and about research and inquiry. Thus, authors propose a fundamental conceptual shift from the notion of learners as a passive audience for the research output of individual academics to the idea of learners as active stakeholders in a research community. This has been supported by different authors (Levy 2011; Levy and Petrulis 2012; Spronken-Smith and Walker 2010) who are also recommending integrating various forms of research informed/based learning in the mainstream curriculum for all learners, where learners learn through some form of inquiry, or research-based, or problem-based learning.

Healey and Jenkins (2009, Pg. 6) proposed four principal ways of conceptualising the research-teaching relationship in higher education: research-led teaching, where students "learn about research in their discipline"; research-tutored teaching, where students engage in research discussion; research-oriented teaching, where students develop research skills and techniques; and research-based teaching, where students undertake research and inquiry. Authors believe all four ways of engaging students with research and inquiry are valid and valuable, thus curricula should contain elements of all of them. This is useful because it gives opportunity to instructors to talk about the different ways in which they may introduce their students to research and inquiry.

There is no doubt that recent discussion in higher education has focused on providing personal learning and explore a Problem Based Learning (PBL) approach to the teaching (Rich et al., 2019). PBL is a student-centred method of learning in which students learn by doing. Students are presented with a real-life problem similar to those they will face in their work. They spend most of the course sessions working in small discussion groups addressing the given case questions. The key differentiator from other forms of active-based learning is the nature of the problem. This is chosen or designed to be complex. The student discussion groups, need to make up their minds about how they would manage it and what actions they would recommend.

Currently teaching research methods is a part of the curriculum in most of EMSc/EMBA include a research project, leading to the production of a dissertation. However, Saeed et al, (2020) observed that many executives joining the programmes do not have sufficient experience in writing a sound research proposal or have appropriate research skills. Learners are challenged by selecting their research topics, formulating their research aim, objectives, and potential research questions, writing the literature review, and selecting appropriate research design for their proposals and final projects (Wang and Li, 2008; Nielsen, 2016; Saeed et al, 2020). Based on the discussion above the potential of curricula which require learners to construct their understanding of complex knowledge actively (Healey and Jenkins, 2012) assumed to be favourable for EE programmes.

3. Case Study

The present study used a qualitative evaluative case study with elements of reflective analyses. This type of approach allows the instructor to observe, analyse, and assess the effects of a particular situation on individuals or groups (Keen and Packwood, 1995). The case introduced below focuses on a particular case of introducing all elements (research led/tutored teaching, research oriented or research based) of research informed teaching, which focused on real-life problems that client companies are or were facing instead of traditional case study approach.

3.1 The Study Setting and Participants

The study was carried out in one of the EMSc courses in one of the UK's higher education institutions. This was a one-year program, as normal MBA, but was targeting business executives with five years or more experience. Majority of learners on the course had senior management responsibility and were from local clients such as: NHS, Local Council, and Police services with diverse educational and business and management background.

On this EMSc course learners were required to join several compulsory modules, one of which was Work Based Integrated Project (WBIP) which aimed to enable each participant to: work independently on a topic of direct relevance to their own career, while developing the analytical skills to locate, critically evaluate, present and analyse relevant theories and data to support integrated work-based project's conclusions and recommendations. The module had an integrated component, Applied Research Skill module which carried 15 credits on its own. Successful completion of the research proposal was a prerequisite for progressing to the delivery of the IWBP.

In this module students were evaluated through continuous assessments which included:

- **Completion of a Client Information Form (CIF):** The CIF provided an outline of issue that client organisation was faced and confirmed employer support arrangements. This was used to identify an appropriate supervisor who would support learner through the IWBP, including the development of research proposal and obtaining the ethics approval by the university's ethics committee. The IWBP is a piece of management research and therefore it was mandatory to have an ethics approval prior to commencing data collection.
- **Production of a Research Proposal:** The research proposal was assessed by the module leader and carried 15 credits. Successful completion of the research proposal was a prerequisite for progressing to the delivery of the IWBP.
- **The final IWBP Report/dissertation:** Which included background of a client's problem/issue, critical evaluation of appropriate literature and research methods, presenting and analysing findings, drawing conclusions, and reflecting on personal learning.
- **The Client Report:** Which included a reflection on the implementation of the project.

The module was taught and guided by the module leader (who is the author of this paper) and was supported by project supervisors. The syllabus, course materials and tasks for assessment was same to all groups. All module related materials (PowerPoint slides, books, book chapters, case study, short videos, journal articles and assignment briefs) were uploaded and posted on the module's Canvas site.

Dedicated workshops/guidance sessions were held during the IWBP process to ensure continuous progress and provide timely feedback. In addition, the work on the project was supervised in a flexible manner as appropriate to the business under consideration.

3.2 Innovative Methods on the Module and Reflective Analyses

The innovative methods employed on this module by the module leader were to address the above-mentioned challenge, to demonstrate a real-world impact for those involved in project, in addition to ensuring learners' personal and professional development by making teaching and learning a collaborative process. This was achieved by incorporating an active and action learning strategies in flipped classroom settings. Flipped classroom settings consistent with research-informed/led, research tutored, and research-oriented practices were deployed and flanked by reflection and critical analyses to ensure that different learners' learning needs and preferences were met, regardless of their learning styles, abilities, and backgrounds.

The idea was to create an interactive environment where learners could master technical and theoretical information through research inquiry, reflection, and critical analysis. The module delivery structure included:

1) Preparation stage: Pre-class self-study (Research-led teaching, where students "learn about research in their discipline").

Up to date research materials about Strategy and Leadership were available on the module Canvas. In addition, learners could find relevant reading materials and short videos on the module Canvas.

2) Face-to-face Seminar (Research-oriented teaching, where students develop research skills and techniques). During the seminars learners were asked to prepare for and participate in a Learning Set Conversation (LSC) which was facilitated by tutor. As a Learning Set, seated in circular arrangement learners were exploring each

other's research case and research progress. Facing each other, making eye contact, and engaging in a meaningful discussion, breaks down barriers and promotes active participation. Using action learning strategy mentioned above, which could be defined as a process that involves a small group working on real problems, taking action, and learning as individuals, as a team, and as an organisation, helped to make teaching and learning collaborate process, which was one of the aims of this project. With a small difference from active learning, action learning necessarily occurs in a closed group or 'set' and, while individuals in the set may each have their own unique problem to work on, learning occurs via the interaction between members of the 'set' (Revans, 2011).

After each LSC, each member of Learning Set was asked to reflect on their LSC and produce a Reflective Piece of Work Reflective Diaries (RD) which was discussed later with supervisor.

3) 7 one to one supervision sessions (Research-tutored teaching, where students engage in research discussion) having reflective diaries helped learners to have constructive discussion with supervisors.

4) Post-class/self-study working on the IWBP (Research-based teaching, where students undertake research and inquiry). Learners were undertaking a significant research project to explore a work-related problem or business opportunity, integrating theory from taught modules, and proposing strategically relevant and operationally viable recommendations for their organisations.

4. Reflective Analyses

For teaching and delivery on the thought sessions, instead of traditional case study approach, all elements (research led/tutored teaching, research oriented or research based) of research informed teaching (Healey and Jenkins, 2009), has been introduced by the module leader, focused on real-life problems that client organisations are or were facing. Suggested by Jenkins at al. (2002) when instructor incorporates their own research into teaching, learners perceived their courses as up to date, and this increased engagement as it stimulated intellectual excitement. On the other hand, authors also found that, instructors also becoming enthusiastic about what they are teaching, which helps to create a positive atmosphere during the face-to-face classes which is also very important for enhancing learning and engagement on those programmes. Thus, all module staff were encouraged to incorporate their own or up to date research during the delivery of module. In addition, research active staff including our PhD researchers and colleagues from other institution were invited as a guest speaker to share their research experience with our learners. According to our colleagues, who were involved in teaching and supervisory activities, learners seemed to be more enthusiastic and attentive in classes after introducing this practice. Effectiveness of this approach was also acknowledged by learners. They indicated that having opportunity to work with or supervised by research active staff encourage them to conduct their own research with high quality manner. In addition, it has been observed that this practice also worked well in supervisor-learner engagement and engagement with the material especially in the flipped learning approach.

Majority of students reported that the module had effective structure. Having flipped class settings helped students to access the module content including recorded lectures outside of face-to-face class time (during "Preparation" stage pre-class self-study and post-class self-study). As a result, learners could review course materials anytime in their convenience. The LSC during the tutorials also was acknowledged to be effective way of delivering module. Using the LSC during the tutorials and Reflective Diaries (RD) encouraged students to share their experiences - good and bad - and reflect together to draw out the learning. The learning came not only from lecturer/tutors bringing new information or insight (which normally is done during the lecture), but from the members of the LSC sharing their experiences and reflecting on it.

5. Data Collection and Ethical Consideration

As this study was taken purely for the pedagogical reasons and is not conceived as pure research at this stage study didn't go through the ethical approval. Thus, unfortunately at this stage the author couldn't provide direct quotes from learners' and teaching staffs' feedback, which is an acknowledged limitation of this study (there is an intention for farther developing this limitation). However, few examples presented below (secondary data source) indicate the real-world impact that some of the projects made on the client organisation and beyond. Please note that this is only minor piece of large data from one cohort.

Example 1:

Project Title

Challenges and impact of implementing a 'seven day' consultant led service in Medicine at Basildon Hospital

New model and recommendations for the seven-day consultant led services for the Basildon university hospital in London was recognised to have a positive impact not only on hospital's operational efficiency, but it also believed to have an impact on the quality of care. Developing model for possible change based on resource-based view and dynamic capabilities theory and testing it as a Pilot project has indicated that proposed change would provide value to patients and to other taxpayer since the services provided through this change believed to be a cost and resource effective.

Example 2:

Project Title

How to reduce disproportionality and thus build trust and confidence within the communities that we serve.

The aim of the project was to understand why disproportionality exists within Bedfordshire and the impact police culture could be having on the decision to arrest and whether those arrests could have been avoided.

The project has been a success by not only understanding the existence of disproportionality within Bedfordshire but having provided valuable research material that has given an insight into potential causes of disproportionality and how it relates to organisational culture. The project has provided opportunity to work in partnership with other agencies and the communities of Bedfordshire to make improvements.

6. Conclusion

The innovative methods discussed in this paper were employed to address the above-mentioned challenge, to demonstrate a real-world impact for those involved in project, in addition to ensuring learners' personal and professional development by making teaching and learning a collaborative process. The discussion is based on the author's personal reflection and experience, delivering IWPB module on one of the EE programmes in one of the UK's higher education institutions.

Effectiveness of the introduced methods and recommendations are based on learners' feedback and the secondary data that demonstrates the impact for the client organisation. As this study was taken purely for the pedagogical reasons and is not conceived as pure research at this stage study didn't go through the ethics approval, which is an acknowledged limitation of this study, however there is an intention for farther developing this limitation.

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A Social Realist Perspective in Urban Planning Curriculum Transformation for Sustainability Mainstreaming: Learning From the University of Johannesburg

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Abstract: Transforming higher education curricula has gained traction in the past few decades, particularly in post-colonial Africa. The discipline of urban planning has not been spared especially in the context of South Africa. Numerous efforts have been exerted to infuse several aspects that among others include locally contextualized curriculum, the fourth industrial revolution tenets and sustainable development principles. However, the extent to which sustainability values have been successfully mainstreamed to ensure transformative practices that promote students' access and success remains an uncharted territory. Consequently, in this paper, I explored the experiences of the urban planning department at the University of Johannesburg in transforming its curricula. In the paper, literature on curriculum development and reform in South African Higher Education was distilled. I adopted a case study research design and a qualitative research approach to gather qualitative data through the application of positionality and documents analyses to reveal the extent to which social realism perspectives have shaped curriculum transformation in the departmental programme development and reviews. The results reveal that curriculum development and reviews within department of urban and regional planning is a complex and messy reality that is shaped by Margeret Archer's structural, cultural and agential emergent powers and properties. This is very evident within the Master in Sustainable Urban Planning and Development (MSUPD), an interdisciplinary programme which enables and supports lifelong and blended learning in sustainable development education. It trains a variety of professionals who find solutions to complex urban sustainability challenges. In conclusion, I recommend that concerted efforts are need to strengthen and infuse sustainability orientations and building blocks of sustainability education that include societal, institutional, environmental and economic imperatives.

Keywords: Curriculum, Transformation, Urban planning, Sustainability, University of Johannesburg

1. Introduction

Globally, higher education has transformed in many ways over the past decades. The changes have been ushered in by shifting social, economic and political organisational systems such as the promotion of the free market system worldwide which has been at the heart of the wide-ranging adjustments in higher education. Globalisation and specifically neo-liberalism has ushered consumerism attributes into higher education, resulting in high numbers of paying students being enrolled to support the competitiveness of institutions. Consequently, higher educational institutions have increasingly been losing their social role as they assume new and diversified roles, mainly linked to providing services which are informed and shaped by market forces. Higher education has gone through massive transformation and adjustments in response to both local and international pressures and demands (CHE, 2016). This was in response to the partial acceptance and enrolment of black students who were believed to have many academic problems (Boughey, 2002). Since the dawn of the democratic dispensation in 1994 in the country, the higher education landscape has been inundated by several contextual factors and challenges ((SADHET 2014; Badat, 2019). Amongst these has been an urgent need to redress the previous imbalances which were brought to the fore by the former Apartheid government which segregated black students. This was coupled with the need to achieve competitive international rankings (Akojee and Nkomo, 2007; Badat, 2003; Barnett, 2004). Thus, chasing international recognition and accolades at the same time has put higher education institutions in a conundrum (Sugrue, Englund, Solbrekke and Fosslund, 2018). In this paper, I adopt and apply Margret Archer's social realism theoretical framework to demonstrate curriculum transformation at the University of Johannesburg (Archer, 1995; Quinn, 2006; Vorster, 2010). I specifically, focus on the influence of conceptualisations and explanations of the structure, culture and agency in shaping the programme development and reviews in the University of Johannesburg (UJ). I start by presenting a brief literature review and research methods before zooming on the findings specifically demonstrating how structural factors influence curriculum transformation in the department. I then discuss the culture which has been shaping programme development within the institution, followed by the influence of the various agents on the way curriculum reform is practised and experienced within the Department of Urban and Regional Planning in the University of Johannesburg.

2. Literature Synopsis on Curriculum Development and Reform in South African Higher Education

The ever-changing South African higher education context demands constant engagements with curriculum development and reform (Luckett and Shay, 2020). Curriculum includes the structure and content of modules and programmes of study; the student experiences of learning and the dynamic and interactive processes of teaching and learning (Fraser and Bosanquet, 2007). It is a product which includes both plans and intentions of modules and programmes as well as a process, which refers to the activities, and effects of modules and programmes (McKenna, 2003b; Clarence-Fincham and Naidoo, 2013). Although multiple efforts have been made to engage with demands for curriculum reforms and revisions, more work still needs to be done to ensure both the product and process orientations of programmes are realised (Fraser and Bosanquet, 2007). A curriculum which is epistemically diverse ensures that all the forms of knowing and knowledge domains including propositional knowledge, practical knowledge, epistemic knowledge and experiential knowledge are infused into meaningful student learning and influence the holistic development of students (Luckett, 2001). Through the production of knowledge and information, universities have been transformed towards having direct influences on high economic productivity at local, regional, national and global scales (Moll, 2004; Vorster and Quinn, 2017). According to Moll (2004), there is a need to improve the theorisation, understanding and implementation of curricula in higher education institutions in response to economic, cultural, disciplinary and learning-related needs of societies and students (Bernstein 1990; Luckett 1995, 2001; Biggs 1996, 2012; Singh 2002; Moll 2004; Fraser & Bosanquet 2007; Barnett 2009)

2.1 Curriculum Development and Reform Concepts and Theories

There are extensive concepts and theories which describe curriculum development and reform. For example, Basil Bernstein's pedagogic device sheds light on curriculum development and reform. It proffers ideas on how knowledge is produced, recontextualised and reproduced to facilitate student learning through the selection, sequencing, pacing and ultimately assessment of appropriate knowledge domains (Sadovnik, 1991; Singh, 2002). Furthermore, Maton's specialisation dimension of the Legitimation Code Theory (LCT) makes a strong argument for the different kinds of knowledge and the knowers which emerge from different disciplines (Luckett, & Shay, 2020). There are ontological (legitimate knowledge) as well as epistemic (legitimate ways) consequences of curriculum development and reform engagements (Clarence, 2017).

3. Theoretical Framework: Social Realism

Social realism as a theory has three components that include, structure, culture and agency. Structure can best be defined as the various societal components which include gender, race and class (Archer, 1995; 1996). In the case of the University of Johannesburg, structure relates to the concepts such as university funding, degree programmes, regulations, policies, strategies, committees which run the institution, the different races, genders and classes of staff and students as well as the classroom venues where lecturers and students meet. The institution operates through a system of strategies which may range from 5 years, 3 years and 1 year to drive the teaching and learning operations. These have a huge bearing on the academic projects of the university. On the other hand, the concept of culture relates to components of social life which include ideas, beliefs, values, ideologies and theories (Archer, 1995; 1996; 1998). Within the University of Johannesburg, there are several dominant ideas, beliefs, theories, values and ideologies which underpin teaching and learning. The institution as a whole and the various teaching departments, schools and faculties have an assortment of values, theories and beliefs about teaching and learning which comprise its culture. Agency on the other hand is best be defined as the social and psychological makeup of individuals which influences the way they respond and act in different situations (Archer, 2000; 2007). In higher educational institutions, such individuals include Vice Chancellors, the Deputy Vice Chancellor, the Executive Deans of faculties, Vice Deans, Heads of Departments, co-ordinators, programme and year co-ordinators and student representatives. These sit in various committees such as industrial advisory boards, regulatory and accreditation bodies, Department of Higher Education and Training committees, Council for Higher Education and the related boards and committees, and representatives of student bodies such as the Student Representative council.

4. Research Methods

This paper explores the experiences of curriculum development and transformation in higher education, particularly how they have influenced sustainable development education. I adopted a case study research design and a qualitative research approach to gather qualitative data through the application of positionality

and documents analyses to reveal the extent to which social realism perspectives have shaped curriculum transformation in the departmental programme development and reviews. A phenomenological case study design and a qualitative research approach were applied specifically to focus on the department of Urban and Regional Planning within the faculty of Engineering and the Built Environment (FEBE) at the University of Johannesburg. The data used in this paper were purposively gathered through semi-structured interviews and observations. Interviews with 25 students and 7 staff members assisted in generating the much-needed data for this work. I conducted online interviews that yielded very rich data, as participants were willing and could conveniently contribute to this work. In particular, the Master of Sustainable Urban Planning and Development (MSUPD) was studied in detail. It is an interdisciplinary programme which was developed and co-ordinated by the Department of Urban and Regional Planning (Table 1). It involves six faculties of the institution which are actively participating in its teaching.

Table 1: MSUPD Modules

First Semester – Foundation and Compulsory Modules - 45 Credits				
Sr#	Code	Description	Faculty	Credits
1	AUPT019	Advanced Urban Planning Theory	FEBE	15 Credits
2	PSUD019	Principles of Sustainable Urban Development	FEBE	15 Credits
3	SUSC019	Sustainable Urban Infrastructure and Smart Cities Development	FEBE	15 Credits
Second Semester – Elective Modules - Choose 3 Modules - 45 Credits				
Sr#	Code	Description	Faculty	Credits
1	UFE9X02	Urban Financial and Economic Management	FEFS	15 Credits
2	UEPG029	Urban Environmental Planning and GIS Applications	FOS	15 Credits
3	UED9X02	Urban Entrepreneurial Dynamics	FOM	15 Credits
4	SOC9X07	Urban Sociology and Social Development	FOH	15 Credits
5	MUP9X02	Urban Policy and Design	FADA	15 Credits
6	IHSD029	Integrated Human Settlements Development	FEBE	15 Credits
Research and Dissertation – 90 Credits				
Sr#	Code	Description	Faculty	Credits
1	MSUP019/ 029	Minor Dissertation	ALL	90 Credits

Source: (Adapted from the Urban and Regional Planning Department Degree Programme Documents; 2022)

These include Faculty of Humanities (FOH); Faculty of Science (FOS); Faculty of Management (FOM); Faculty of Economic and Financial Services (FEFS); Faculty of Arts, Design and Architecture (FADA) and Faculty of Engineering and the Built Environment (FEBE). The programme incorporates perspectives from fields such as urban and regional planning, architecture, civil engineering, construction management, building sciences, public policy, sociology, anthropology, development studies, psychology, geography, environmental studies and real estate. The programme trains a variety of professionals who find solutions to complex urban problems such as city planning, municipal service provision, transport, housing and urban design. The MSUPD programme consists of 6 modules; contributing 90 credits; and consisting of three (3) compulsory modules which are completed within the first semester. Three (3) optional modules are completed during the second semester together with a mini dissertation contributing 90 credits. The modules include advanced urban planning theory, principles of sustainable urban development, sustainable urban infrastructure and smart cities development, urban financial and economic management. The compulsory and elective modules balance out the foundational and optional

knowledge and skills. The MSUPD takes cognisance of the needs, expectations and active participation of all the appropriate knowers.

5. Findings and Discussions

The findings of my study reveal concerted efforts in designing and reviewing Curriculum to infuse sustainable development education at the University of Johannesburg. Just like many South African public universities, the University of Johannesburg has adopted curriculum transformation in the past few years. Specifically, the Department of Urban and Regional Planning (DURP) in the faculty of Engineering and the Built Environment (FEBE) has developed new programmes at both undergraduate and postgraduate levels have been developed, which reflect and infuse the sustainable development pillars and building blocks such as the economic, environmental and societal imperatives. Such programmes include the Bachelor of Urban and Regional Planning (BURP) and the Bachelor of Urban and Regional Planning Honours (BURP Hons) at the undergraduate and graduate levels, and the Master in Sustainable Urban Planning and Development (MSUPD), the master's in urban and Regional Planning (MURP), and the PhD in Urban and Regional Planning at the postgraduate level.

5.1 Structures for Curriculum Development and Reform in the University of Johannesburg

There are various committees at department, school, faculty and senate levels which are tasked with handling and advising on curriculum development and promote lifelong learning. There are also policies and roles which guide the designing of new programmes, and these include among others, the Deputy Vice Chancellors, Deans and their Deputies, Education Specialists, Programme Advisors and Heads of Departments, their deputies and programme co-ordinators responsible particularly for managing new programme development and reviews. There are small units within teaching departments which initiate the whole process of curriculum development. The departmental units work closely with a programme development specialist who resides within faculties. When the programme has been put in place, the departmental board advises on changes to be effected before the programme is submitted to faculty committees. At faculty levels, the programmes are perfected, and consultations are done with the Programme Working Group (PWG) which operates at university level. The faculty board assist in shaping the programme before it is submitted to senate structures for checking, approval, and recommendations to external structures such as the Department of Higher Education and Training (DHET), Council for Higher Education (CHE) and South African Qualifications Authority (SAQA). These external structures have guidelines on programme development and reform; hence the institution follows them religiously whenever there are new programmes which are being developed and when existing programmes are being renewed. The MSUPD strongly incorporates and infuses economic, cultural, disciplinary and learning facets and imperatives (Moll 2004). The programme captures and reflects the complexity of higher education in general and the curriculum responsiveness. The purpose and outcomes of the qualification reflect four curriculum paradigms that include positivist (technical knowledge and skills); interpretivist (practical knowledge and skills); critical (emancipatory knowledge and skills) and post-structural (post-positivist knowledge and skills) (McKenna 2004). The design of the programme fulfils what Kathy Lockett coined an Epistemically Diverse Curriculum. The epistemically diverse curriculum device is made up of four quadrants that include Propositional knowledge; Practical knowledge; Epistemic knowledge and Experiential knowledge. It is divided into two halves denoting objective and reductionist knowledge on one hand and subjective and contextual knowledge on the other. On the other hand, Lockett's four ways of knowing is infused into the programme. The first quadrant relates to propositional, or basic knowledge students receive through traditional ways of learning such as attending, listening to lectures, making notes, reading and studying to acquire new knowledge. Students get inducted into the basics of qualifications and knowledge to enable them to build their identities within their disciplines. The second quadrant is about practical knowledge which is obtained through the application of propositional knowledge. Practical knowledge is useful in doing the actual tasks to give students practical competencies and is reflected within the elective modules such as urban policy and design as well as geographical information systems (GIS). The third quadrant relates to experiential knowledge, acquired outside classroom and laboratory environments. Experiential knowledge makes sense because the learning takes place in the real-world contexts through work- integrated learning, various forms of placements and internships which are common that must be maintained in curriculum development and reform. This knowledge is useful, as students are given platforms to engage in reflective and meta-cognitive thinking to develop their personal competencies. The fourth quadrant focuses on epistemic knowledge acquired through evaluation and challenging of existing theories. Students are trained not to just reproduce disciplinary knowledge but engage in epistemic scaffolding. Students develop their own conceptual frameworks and understanding within the research and dissertation writing component of the MSUPD.

5.2 Cultures in Curriculum Development and Reform in the University of Johannesburg

There exists a strong culture of curriculum development and reform within the University of Johannesburg as revealed by data obtained from the semi-structured interviews. The strong values, ideologies, theories and beliefs of the institution shape, inform and guide curriculum development practices to ensure the provision of relevant, empowering and competitive programmes to students. Additionally, there is the idea that knowledge must be relevant to society which the students serve and come from, hence the programmes and teaching materials are developed in such a way that they directly reflect social issues and needs. There is an appreciation that curricula must be relevant to the needs of the industry which employs the graduates. Therefore, programmes are developed to solve industry problems. The institution is also guided by the learning-to-be philosophy, where graduates are trained to attain life-long learning. The graduates are equipped with the necessary knowledge, skills and values to adjust readily to multiple career changes and make a significant contribution. The new education and training system is tailored to support the development of an adaptable workforce. According to Moll (2004), economic responsiveness is the development of programmes to meet labour market requirements. The MSUPD responds well to the needs, expectations and demands of the economic sectors about the training and education of the adequate quantities and qualities of graduates in sustainable cities. The MSUPD curriculum is structured to meet the demands for high qualifications and skilled personnel. The MSUPD was developed to enable it to utilise multiple cultural resources and reflect different cultural heritages and social realities. Students pursuing the MSUPD come from different backgrounds in terms of their work experiences and previous degrees (qualifications). The MSUPD is being constantly updated through the production of new knowledge, as lecturers and discipline experts engage in ongoing new inquiry. The MSUPD programme ensures epistemological access and ontological access which promote student success. Consequently, higher education curricula must be responsive to students' learning needs. The stratified model of curriculum responsiveness means that multiple levels in higher education curriculum transformation need to be recognized and layered to reflect the various forms and strata.

5.3 Agency in Curriculum Development and Reform in the University of Johannesburg

There are several agents which drive curriculum development processes and practices within the University of Johannesburg. These include the active participants such as students, academics, programme co-ordinators, departmental heads and their deputies who have direct influence on what the programme and module contents. In particular, Deputy Vice Chancellors, Deans and their Deputies, Education Specialists, Programme Advisors and Heads of Departments and their deputies as well as programme co-ordinators have a strong bearing on the structure and content of the programmes. There are also academic developers such as co-ordinators and facilitators, educational specialists and programme advisors who offer invaluable advice and train and support academic staff responsible for programme development and reform. These play a critical role in shaping programmes and influence how they are implemented within the institution. There are also external agents who exercise influence on what is taught such as the various facilitators and co-ordinators from the relevant National Department of Higher Education and Training (DHET), Council for Higher Education (CHE) and South African Qualifications Authority (SAQA) officials. There are also accreditation bodies such as the South African Council for Planners (SACPLAN), industrial advisory bodies which inform our curriculum development and reform practices in the university. The application of managerialism assists in ensuring the success of programme development and reform practices within my institution. According to Biggs (2003), alignment of curricula must be reflected within the outcomes, purpose of the module and programme; the content, methodology and pedagogy as well as the assessment methodologies. The UJ has always made efforts to ensure that there is alignment, coherence and differentiation of curricula over the years. Curriculum coherence refers to the alignment or logics of curriculum elements such as their purposes, learning outcomes, teaching and learning activities, and assessment and evaluation activities. Curriculum differentiation refers to distinguishing of qualifications, for example between national diplomas and bachelor's degrees or between postgraduate diplomas and honours degrees, or between Master of Philosophy degrees and Masters of Science degrees (Clarence, 2017). The curriculum alignment, differentiation and coherence concepts are clearly reflected and fulfilled by the MSUPD programme as demonstrated in the ensuing sections. The MSUPD structure, purpose, modules, credits and exit level outcomes comply with the department of Higher Education and Training (DHET), the Council for Higher Education (CHE) and South African Qualifications Authority (SAQA) officials. There are also officials of accreditation bodies such as the South African Council for Planners (SACPLAN) and industrial advisory bodies which inform our curriculum development and reform practices within my institution. The MSUPD programme is pitched at the NQF level 9 and has a total of 180 credits; hence it is clearly aligned with the requirements of a master's degree.

A blended learning approach at module levels is also emphasised, and this corroborates with the alignment at macro levels. The adoption of contact classes on a block basis, and online and remote classes and engagements supports student learning and success, particularly for part time students who are working and who do not have enough time to attend face to face classes. The use of technology for teaching purposes is commendable, given some of the pressures and inconveniences such as the covid-19 and lockdown which has discouraged movement and congregants. The different types of assessments ensure that evaluations on the level of learning and understanding are done, and more support is provided where necessary. There is a system of consultation times, platforms and support from tutors, and all these provisions are commendable.

5.4 Knowledge Structures Within the MSUPD

There exist several disciplinary and knowledge structures. According to Clarence-Fincham and Naidoo (2013), knowledge structures can be classified into hard sciences and soft sciences. The hard disciplines include degree programmes such as chemistry, physics, mathematics and biology, whilst soft disciplines include history, sociology and politics. However, other domains include social sciences characterised by a combination of attributes from both hard sciences and soft humanities, for example, town planning, construction management, quantity surveying, real estate and urban design. As an interdisciplinary programme, the MSUPD falls within the social sciences domain. There are basically two hierarchical and horizontal curriculum structures (Clarence-Fincham and Naidoo 2013). Firstly, hierarchical structures are associated with cumulative and vertical progression and the growth of epistemic access and knowledge production. Secondly, horizontal structures are associated with lateral refinement and growth of epistemic access and knowledge production. The MSUPD is a hybrid structure, where both hierarchical and horizontal elements are combined to give an interdisciplinary programme. In this programme both epistemic access and knowledge production is experienced hierarchically and horizontally.

The Higher Education Qualification Sub-Framework (HEQSF) identifies three qualification pathways which include vocational, professional and general formative. The MSUPD is a professional degree with a combination of both conceptual and contextual coherence and logics and this is reflected in the three foundation and compulsory modules which make up the basic concepts of the programme and the three elective modules which give the main contextual knowledge of the degree.

According to Clarence-Fincham and Naidoo (2013), there are generally three different types of knowledge domains, and these include propositional knowledge, procedural knowledge and dispositional knowledge. Firstly, propositional or body of knowledge can be referred to as the 'know-thats' which are the main theories, concepts and ideas of a discipline. Secondly, procedural knowledge is the 'know-how' which refers to the way knowledge is imparted. Thirdly, dispositional knowledge constitutes the attributes of the students in the whole process of learning. It is also important to note that curriculum logics are comprised of conceptual and contextual coherences or logics. The MSUPD programme demonstrates the presence of all the three types of knowledge and also the two coherences or logics. All the modules have multiple theories and concepts of the sustainable urban planning and development imbedded within them as represented by ideas from the various disciplines. Thus, the programme has both the propositional and conceptual coherences. It is important to note that propositional knowledge is built into conceptual logics, and it is critical to be cognisant of how both the 'know-that' and 'know-how' knowledge progresses in both logics. There are also modules which create opportunities for students to learn appropriate contexts of the programme within the field. The procedural knowledge is explicitly represented by the teaching and learning as well as the assessment strategies. Lastly, the dispositional knowledge is evident within the admission requirements and selection criteria of the candidates willing to enrol for the programme.

6. Conclusions and Policy Implications

Transforming higher education curricula has gained traction in the past few decades, particularly in post-colonial Africa. Preliminary results reveal that curriculum development and reviews within the University of Johannesburg is a complex and messy reality that is shaped by Margeret Archer's structural, cultural and agential emergent powers and properties. This is very evident within the MSUPD. The programme trains a variety of professionals who find solutions to complex urban sustainability challenges. I recommend concerted efforts to strengthen the sustainability orientations of the programmes, there is need to infuse all the building blocks of sustainability education. With the massive transformations taking place in South African universities of all types, academic staff need to have strong disciplinary knowledge and experience. Sometimes they have limited knowledge about educational theories, concepts and ideas, and have been given the daunting responsibility of developing and reforming curricula. Improved understanding assists in curriculum development, reform and its

implementation to ensure ontological access, epistemological access and equity of outcomes, particularly for the majority of formerly disadvantaged students

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Optimising Instructional Design Strategies to Mitigate Cognitive Overload

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Abstract: A lack of unified instructional design strategies to mitigate cognitive overload in higher education necessitated this study to explore how instructional design could mitigate cognitive overload in first-year commerce students. Grounded in the Cognitive Load Theory (CLT), which posits that excessive information impedes conducive student learning experiences and metacognition. The research is situated within a South African private higher education institution (PHEI) and explores a qualitative analysis using a three-pronged approach. Firstly, a literature review on CLT and its application in instructional design impacting students' learning experiences was conducted. Secondly, the researchers evaluated the institution's 2023 instructional design of modules and their presentation through the learning management system (LMS) using multimedia learning. The purposive sample consisted of eight first-year modules within the Bachelor of Commerce degree program to assess the learning design elements against the principles of CLT. The researchers, being three instructional designers used secondary data and peer-reviewed the module evaluations to validate the findings and verify the impact of CLT on students' learning based on the institution's existing instructional design strategy. By evaluating the PHEI's current instructional design practices against CLT principles, this study aimed to identify effective strategies to manage cognitive load and enhance the student learning experience within the higher education context. The research findings of this study indicated that the integration of CLT into instructional design could mitigate cognitive overload, thereby improving the student learning experience, and metacognition and providing guidelines for the refinement of instructional design strategies. The value of the research outcomes was anticipated to contribute to the development of improved instructional design strategies using multi-media learning to address cognitive load. The value of the research outcomes was anticipated to contribute to the development of improved instructional design frameworks and strategies that addressed cognitive load, enabling effective and conducive learning environments in higher education. These insights aimed to guide future research in curriculum design and teaching and learning practices in higher education and to recommend instructional design strategies to manage cognitive load thus mitigating the challenges of cognitive overload experienced by students and enhancing the student learning experience.

Keywords: Cognitive Load Theory (CLT), Cognitive overload, Higher education, Instructional design, Metacognition, Student learning experience, Multimedia

1. Introduction

Instructional design is essential for understanding and applying Cognitive Load Theory (CLT), a framework addressing challenges in learning and problem-solving due to working memory limitations (Chandler and Sweller, 1991). CLT suggests that these challenges are not fixed but can be mitigated through well-designed instructional strategies. This study, conducted at a private higher education institution (PHEI) in South Africa, aimed to optimize instructional strategies to reduce cognitive overload, with a specific focus on multimedia learning. The research examined the design and delivery of the 2023 first-year Bachelor of Commerce modules using a learning management system (LMS). An evaluation of eight modules using a bespoke tool informed by CLT principles was employed. Recent advancements in CLT have introduced distinctions between "old" and "new" CLT, with scholars urging transparency in the theoretical choices made by researchers (Duran, Zavgorodniaia and Sorva, 2022). The role of instructor-managed strategies in multimedia learning has gained attention as critical for enhancing student outcomes (Castro-Alonso et al., 2021). This paper reviews the relevant literature, outlines the qualitative methodology used, and discusses how CLT-informed strategies can reduce cognitive overload and improve student learning and metacognition.

2. Literature Review

The concept of cognitive load (CL) was first presented by Sweller (1988) related to the effectiveness of conventional problem-solving methods for acquiring domain-specific knowledge and skills. Sweller (1988) indicated that working memory has a limited capacity and stressed the importance of minimising extraneous cognitive load to maximise learning. Specifically, Sweller (1988, p265) noted "Human short-term memory is severely limited and any problem that requires a large number of items to be stored in short-term memory may contribute to an excessive cognitive load". The theory emanated in the 1980s and progressed in the 1990s when CLT investigated cognitive processes and instructional design. CLT emphasizes the significance of instructional

design where complex cognitive tasks manifested through the quantity and interaction of information are simultaneously processed and the cognitive processes that occur before learning is initiated (Kala and Ayas, 2023). The literature delves into human memory and CLT types, strategies and multimedia learning.

2.1 Memory and CLT Types

The Multi-Store memory model (Jawabri and Cascella, 2024) relates to three separate memory stores, and that memory is transferred between these three stores in a linear sequence. The three stores are sensory register memory, short-term memory (STM) and long-term memory (LTM). Each store of memory differs in the way information is processed, encoding how much is stored (capacity) and for how long (duration). The passing from one store to another is similar to the computer input, process and output hence the description and the information processing model. Sensory stimuli through human organs enter the first store of sensory and the interaction with this information may enter the STM if it is given meaning (rehearsal) it is passed to LTM (Jawabri and Cascella, 2024). There are three discrete types of CL namely: Intrinsic, extraneous, and germane (Clark and Kimmons, 2023). CLT relates to instructional implications concerned with the structure of the ways information and activities are presented to learners, where the load exceeds working memory and is not automated by learners, the extraneous CL should be reduced through non-conventional procedures (Paas, Renkl and Sweller, 2004). The general assertion of CLT is that the capacity of working memory is limited (Chandler and Sweller, 1991) is not disputed. de Jong (2010) explored questions and the boundaries of CL theory and identified several problematic conceptual, methodological and application-related issues. Technical issues and conceptual misunderstandings regarding the efficiency measure, the original measure is a measure of the quality of the resulting knowledge and not of the instructional condition (de Jong, 2010). Germane load arises from the additional cognitive effort dedicated to deeper learning, which includes reflection and self-explanation (Clark and Kimmons, 2023).

2.2 CLT Strategies and Multimedia Learning

Castro-Alonso *et al.*, (2021) averred that to optimise instructional materials and manage CL, several strategies can be employed, using the multimedia principle (Mayers, 2002) suggests using visual elements to complement text. The split-attention or spatial contiguity principle integrates visualisations and text close to each other whilst the redundancy effect involves eliminating unnecessary information Castro-Alonso *et al.*,(2021), the signalling principle emphasises essential information, while the transient information effect, or segmenting principle, allows for controlling the pace of animations and videos. Instructional designers can use these strategies to determine their level of agency in the learning process.

The CLT effects by Sweller *et al* (2011) were explored in the summary that follows and captures the key cognitive load effects, providing a concise overview of how different instructional strategies can impact learning efficiency.

Goal-free: Sweller *et al* (2011); and Paas and Kirschner (2012) state that the goal-free effect is when novice learners solve problems backward if there is a specific goal, this is heavier on the cognitive goal as opposed to a goal-free, for example, if the goal was given in a specific problem and students need to solve this, the problem should ask for many possibilities of solutions rather than one, for example, to calculate a specific variable, the goal should be to calculate as many as possible

Worked example: Referred to within the CLT suggests that using examples, especially for novice learners would assist learners and is considered superior to unguided problem solving to reduce CL and facilitate knowledge retention. Providing explicit step-by-step instructions in the first few steps will help students during the learning process (Chen, Retnowati, Chan and Kalyuga, 2023).

Split attention: Arises when information is presented separately in space or time, such as a diagram on one screen and text on another. This forces learners to switch between sources, increasing CL and disrupting the learning experience by consuming working memory and breaking the explanatory chain. Effective instructional design must consider CL and adapt to learners' experience levels to optimise outcomes (Ayres and Cierniak, 2012).

Modality: Using the dual auditory and visual channels can enhance learning by distributing CL. Using both visual and auditory modes together is more effective than presenting information in just one mode. For example, a diagram must be shown visually, but the accompanying text can be spoken instead of written. This approach reduces the CL on visual working memory to process the information across both auditory and visual systems (Low, 2012).

Redundancy: Occurs when learning is impeded by the presentation of more information than necessary. For example, when the same content is provided in multiple forms, such as pictures, text, and audio, reducing it to only the essential format can enhance learning. Similarly, eliminating the full text when a summary is available can also improve learning outcomes (Jin, 2012).

Expertise reversal: As learners advance from novices to experts, instructional methods should be adjusted to gradually remove scaffolding, thereby encouraging independent learning. This process is known as the expertise reversal effect. For example, novice drivers may process information piece by piece, while experienced drivers integrate information into a cohesive schema that guides their behaviour automatically (Sweller, Ayres and Kalyuga, 2011c).

Guidance fading: Involves gradually decreasing the amount of guidance given to learners as their knowledge or skills improve. This includes reducing the information provided and the support in the learning process (Renkl, 2012). High levels of guidance can hinder advanced learners. In novice learners, it is important as part of instructional design to reduce the extraneous load that distracts learners from learning the central concepts and principles still to be learned

Imagination: Refers to the imagination effect within a CLT, for novice learners the number of interacting elements may exceed the capacity of the working memory rendering an imagination procedure ineffective (Sweller, Ayres and Kalyuga, 2011a). Contrarily experienced learners could have sufficient task-relevant schematic knowledge stored in long-term memory where associations can be made making substantial familiar information to be processed within the working memory. Thus the imagining may be more suitable for expert learners than novice learners

Self-explanation: Connected to the imagination effect involves mentally simulating procedures and relating them to established domain principles (Clark, Nguye, and Sweller, 2006). It was found that in more experienced learners, explaining procedures and solutions in worked examples improved learning (Singh, Marcus and Ayres, 2012).

Element interactivity: Estimates the complexity of learning materials based on learners' knowledge level (Sweller, Ayres and Kalyuga, 2011a). Design must consider element interactivity to manage and reduce extraneous CL in complex materials is crucial to prevent exceeding working memory capacity, while expert learners may not benefit from such adjustments due to the expertise reversal effect

Collective working memory: CLT research indicates that in complex tasks, groups outperform individuals due to the distribution of information across collective working memories. Collaborative learning mitigates individual working memory constraints through the collective working memory effect and collaborative interactions are crucial to effective group problem-solving (Kirschner, Paas and Kirschner, 2011).

Multimedia learning: Effective strategies include using visuals alongside the text (multimedia principle), integrating text and visuals spatially (spatial contiguity principle), removing redundant information (coherence principle), using cues to highlight key content (signalling principle), and segmenting complex materials into manageable parts (segmenting principle), these approaches are grounded in cognitive theories and aim to enhance learning by reducing CL and improving retention through instructional design (Mayer 2002; Castro-Alonso et al. 2021). The transient information principle in multimedia learning focuses on the distinction between information that is temporary or lasts for short periods, and permanent information (Singh, Marcus and Ayres, 2012). Learning is improved when the information is presented in a permanent form thus it reduces CL and improves self-efficacy, consistent with CLT (Niegemann and Heidig, 2012).

2.3 Metacognition

Cognition is about thinking but the metacognitive process refers to planning, monitoring, evaluation of understanding and performance, being aware of one's thinking and learning, and importantly conducting the reflective exercise of the metacognitive processes (Chick, 2013). The importance of metacognition strategies helps learners transfer knowledge to working memory, enabling them to manipulate and summarise information effectively by incorporating strategies that develop students' problem-solving, critical thinking, and learning management skills should be promoted. Collaboration and communication are important for metacognitive development (Tezer, 2024).

In summary, the literature reviewed instructional design through CLT focused on balancing the types of cognitive loads. Strategies such as the goal-free and worked-example effects, multimedia principles, and collaborative learning were discussed. The optimization of instructional materials considers visuals, reduces redundant

information, segments complex content, and adapts methods as learners gain expertise. Metacognitive learning delved into self-regulation and reflection to improve retention and learning efficiency.

3. Methodology

This study employed a qualitative research design explored how instructional design strategies can mitigate cognitive load in first-year commerce modules at a South African (PHEI). A qualitative approach is ideal for this study as it allows for an in-depth examination of instructional materials, to assess their alignment with CLT principles and identify strategies to mitigate cognitive overload. This approach aligns with the research objectives and the study's primary question of how instructional design can be optimized to reduce cognitive overload in online learning environments (Creswell and Poth, 2007).

A qualitative document analysis was chosen as the most appropriate method for this study because it focuses on analysing secondary data, specifically the instructional content used in the selected modules. This approach enabled a systematic evaluation of textual and visual content to determine its CL characteristics. Document analysis has been widely accepted as a rigorous method for analysing instructional materials in educational research (Bowen, 2009), and it aligns with the study's focus on cognitive load and instructional design principles (Sweller, Ayres and Kalyuga, 2011a).

The rationale behind this approach lies in its ability to provide rich, contextualized insights into the structure and organization of instructional materials, which is central to addressing the research questions. The qualitative nature of this study also ensures that subtle but important aspects of instructional design, such as sequencing and content structure, are thoroughly examined (Merriam and Tisdell, 2015).

Data was drawn from secondary sources, specifically the instructional materials of eight purposively sampled first-year commerce modules on the LMS. The LMS was selected because it provides a comprehensive view of the course content delivered to students. This method ensures that the data collection aligns directly with the research objective of evaluating the cognitive load in existing instructional materials (Bryman, 2016). Ethical considerations were adopted by obtaining an ethical clearance waiver from the PHEI the reference number is R15960.

The instructional materials were analysed using a bespoke evaluation tool developed by the research team, designed to assess the content's alignment with CLT principles, drawing on established theories in cognitive and multimedia learning (Sweller, Ayres and Kalyuga, 2011a; Sweller, Ayres and Kalyuga, 2011b, Sweller, Ayres and Kalyuga, 2011c and Mayer, 2002). The evaluation tool consisted of closed-ended questions with a five-point Likert scale and open-ended questions focusing on content structure, organization, multimedia use, and instructional strategies. The questions were developed based on established cognitive load strategies and multimedia learning guidelines (Castro-Alonso et al., 2021).

The instructional materials were evaluated using a content analysis method based on a bespoke evaluation tool. Three researchers independently assessed each module, focusing on elements contributing to cognitive overload, such as content density, sequencing issues, and misaligned multimedia. After independent evaluations, a peer review process resolved discrepancies through discussion, ensuring consensus (Johnson, Adkins, and Chauvin, 2020). The evaluation tool was refined through pilot testing to improve reliability and ensure accurate measurement of cognitive load indicators. Triangulation was employed by cross-referencing findings with the literature, enhancing the study's validity and reliability (Kimberlin and Winterstein, 2008; Johnson et al., 2020).

4. Results

The analysis of the instructional design frameworks revealed several key insights into the alignment of current practices with the principles of CLT. The guidelines used to evaluate the design of modules and their accompanying LMS presentation were included in an online qualitative questionnaire using Google Forms to ensure consistency and provide computer-aided analytics to the responses from the three researchers. Eight modules in MSWord™ format were renamed as modules A, B, C, D, E, F, G, and H. Twelve main questions extended into twenty-seven questions that included sub-questions were completed between the three researchers. An initial pilot run was conducted. Important improvements were made. All the modules were evaluated by the researchers against this guidelines tool, the results were finalised in the Google form, the results were exported to MSExcel™, where pivot tables assisted the interpretation of data. The table represents the evaluation of modules.

Evaluation of Instructional Design Using CLT: Questionnaire
Module
1. Worked examples: Are there any worked examples in the current design?
2. Are there worked examples where needed in the module?
3. Are the worked examples clear and allow for scaffolded learning?
4. The worked examples are scaffolded to allow for independent problem solving.
5. [The information in the current design is taxing the working memory.]
[The information in the design is chunked, or sectioned logically.]
[The information in the design is repeated.]
[The images are presented in a manner where the text is next to the image, rather than on the image.]
[The images are essential and clear.]
[There is a balance between graphics and text.]
[Scenarios cover essential information.]
[Diagrams and infographics are simple and clear.]
6. Presentation of essential information [Essential information grouped together.]
[The design provides a logical manner in which the essential information is laid out including additional material where applicable.]
[Visuals and text are close to each other.]
[Feedback is provided next to relevant questions.]
[The steps or directions for an activity are presented on the same screen.]
[The visual cues to assist students with the grouping of essential information.]
[The material is personalised in terms of using everyday language and demographics of the target audience.]
[Attention is drawn to vital information by emphasising key points with for eg. Arrows, callouts, highlights or bold text.]
7. Oral and visual presentation [There is a balance between oral and visual presentation in the current design.]
[There is more than one form of media used in the current design.]
[There is a combination of visual cues and oral presentation in the current design.]
[The visuals aid in assisting in clarifying meaning or enhancing comprehension.]
[There is a section that deals with the connection with prior knowledge.]
[There are activities that link to prior knowledge.]
8. How would you improve this module?
9. The module integrates the principles of CLT.
10. Are there areas in the module that allow for metacognition in students - provide an explanation.

11. Provide relevant examples of where CLT is present and where not and how can the lack of CLT be improved.

12. Feedback on the Evaluation.

4.1 Alignment of Current Instructional Design Strategies with CLT Principles

The document analysis indicated that while some instructional design elements incorporate CLT principles, there is a notable inconsistency in their application across different modules. For instance, worked examples are utilised in the majority of the modules where applicable, however, the effective use can be revisited by allowing for more independent problem-solving or a scaffolded approach posited through the worked example effect (Sweller et al, 2011 Chen et al., 2023). Inessential information could be eliminated to decrease extraneous CL and strain on the working memory based on the following feedback from the evaluation of the instructional design of modules. Chunking or sectioning some of the information better in some of the modules may lead to a decrease in strain on the working memory and a better experience for the student which aligns with the segmenting principle to manage CL (Castro-Alonso et al., 2021). Repeated information is present in the instructional design of modules contributing to extraneous CL. Images are presented in a manner where the text is next to the image rather than on as per the coherence and redundancy principles (Castro-Alonso et al., 2021). There is a strong indication the diagrams and infographics present in the instructional design of modules are simple and clear. The majority of responses indicated a balance between graphics and text and the essential information is covered by the scenarios.

Essential information is presented in a logical manner that includes additional material where applicable. Visuals and text are presented close together including some visual and oral cues to assist students in grouping essential information aligning with the modality and redundancy principles (Mayer, 2002). There is a strong indication that feedback is not provided next to relevant questions potentially exacerbating extraneous load. The steps for activities are provided on the same screen, and attention is drawn to vital information by emphasising key points with either arrows, highlights or bold text. A connection with prior knowledge exists in the material predominantly in the activities that contribute to reducing strain on the extraneous load as well as the working memory. Material is personalised in terms of using everyday language and demographics of the target audience aligned with the personalisation principle (Mayer, 2002). Visual and oral presentation assists in clarifying the meaning or enhancing comprehension to contribute to a lesser strain on working memory, aligning with the modality principle (Mayer, 2002). The instructional design of modules contains more than one form of media being used that contributes to a better balance between oral and visual presentation noted in the spatial contiguity principle (Castro-Alonso et al., 2021).

Feedback received to establish whether the existing design of modules integrated CLT principles has even spread in terms of feedback on whether it is integrated or not. This was further investigated for improvement of the different modules' instructional design. Some feedback provided by the researchers who acted as evaluators of instructional material to improve the said modules is as follows by each instructional designer (ID):

ID1 stated, "At the onset, the text is overwhelming – it will appear to be cluttered." This was also mentioned by ID2: "Better integration of graphics." ID2 added, "Clearer images and more oral presentations."

ID3 emphasized, "Improve the images," a suggestion common among all IDs. ID1 suggested, "Include step-by-step instructions with visual and audio elements that support learning." ID3 supported this and added, "Eliminate videos that are distracting, for example, showing students in the video and not the actual content. Eliminate images that do not link to the topic."

A perspective introduced by ID3—"Make the module more current and focused, use more images in better quality, and chunk material better."—was consistently applied by all IDs. ID2 also mentioned, "More signalling and callouts would aid in preparing students; the information can be designed to show on the same screen, and videos can be used to explain the concepts more clearly."

Consensus was found in the ID review concerning ID1's recommendation to "Provide more feedback on the questions asked."

4.2 Integration of CLT into Existing Instructional Design Strategies

The study identified several potential areas for integrating CLT more systematically into instructional design. Key strategies include the use of scaffolding to manage intrinsic CL, the elimination of redundant information to reduce extraneous load, and the incorporation of problem-solving activities that promote germane CL. Implementing these strategies could help mitigate cognitive overload, particularly in content-heavy modules. In the PHEI one can include some of the strategies to overcome CL, for example, having the problem-solving activities marked as such. It is also important to eliminate redundant information especially when it is cluttering the pages and may overwhelm the students.

4.3 Support for CLT-Integrated Instructional Design

The findings suggest that instructional strategies that promote metacognitive activities, such as self-explanation and reflection (Chick, 2013), are effective in enhancing deeper learning. Modules that incorporate CLT principles, particularly those emphasising germane CL, show higher levels of student engagement in metacognitive processes. This indicates that well-designed instructional materials not only aid in content comprehension but also in the development of critical thinking and problem-solving skills. Tezer (2024) averred that well-designed instructional materials allow for planning, problem-solving, creative thinking and reflection, this was found in most of the modules, however, there is room for improvement.

5. Discussion

The results emphasise the critical role of CLT in optimising instructional design to enhance student learning outcomes. The inconsistencies in the application of CLT principles across modules highlight the need for a more standardised approach to instructional design within the institution. By systematically integrating CLT into instructional strategies, instructional designers can create more effective learning environments that manage CL and support metacognitive development. Future studies should explore whether intentionally integrating Cognitive Load Theory (CLT) into module design, based on the 2023 design of modules where CLT was not deliberately applied, improves learning outcomes to address the gap identified by the researchers being the lack of unified instructional design strategies to mitigate cognitive overload, including multimedia learning.

6. Limitations

Primary data could be included that seeks students' perspectives, The limitations identified in this study include the research focused on a specific cohort of first-year commerce modules at a single South African PHEI, which may limit the generalisability of the findings. Secondary data may not fully capture the complexities of instructional design and student learning experiences.

7. Recommendation and Future Research

For future research, it is recommended to incorporate primary data collection methods, such as interviews and surveys, to gain a more comprehensive understanding of the impact of CLT-based instructional design on students' learning experiences. Research efforts should focus on optimizing instructional design strategies on a larger scale, to include diverse academic disciplines and public higher education contexts. Future studies should further explore the integration of CLT principles and multimedia learning in mitigating cognitive overload. This would address the research gap by evaluating a broader range of instructional design strategies aimed at enhancing student learning through effective multimedia learning techniques.

8. Conclusion

This study explored the value of integrating CLT into instructional design to mitigate cognitive overload and enhance student learning experiences. By integrating instructional strategies with CLT principles, effective and supportive learning environments would facilitate conducive learning and metacognitive development. The findings provide a foundation for further research and practice in optimizing instructional design to support student success in higher education. Future studies should explore the application of CLT-based strategies across diverse educational contexts and student populations to build on the insights gained from this research.

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Pedagogical Presence as a Mediator of Tertiary Students' Unconscious Conflicts During Learning

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Abstract: This paper explores the notion of presence pedagogy in the private higher education sector, drawing on contributions from social constructivism and psychoanalysis, specifically the concept of affective containment. Higher education is a space that, by its nature, invokes feelings of defensiveness, uncertainty, weakness and anxiety in students, who arrive in the tertiary space carrying their own unconscious conflicts that interact with the external world. These unconscious processes culminate in behaviours and interactions that influence learning and relational dynamics with their educators. This theoretical paper presents an explanation of the unconscious, but observable processes that neoliberal students transition through in the learning process and offers a position that can usefully serve educators in negotiating and containing these unconscious processes. This paper offers the argument that presence pedagogy can be usefully employed as a method for the educator to perform the role of 'container' of these unconscious processes. Presence pedagogy is conceptualized as an educator's capacity to be reassuring and attentive to their students and draws on relational practices such as an ethics of care to enact appropriate psychological and pedagogical care for the student in learning contexts. This paper proposes that presence pedagogy can usefully mediate students' unconscious conflicts to settle into a productive place of learning, where the tensions between inner worlds and external demands are contained by the educator and adapted into meaningful learning experiences. By dovetailing an ethics of care with core constructivist tenets, educators can simultaneously hold the student, and the line, forging productive learning experiences while maintaining boundaries and professionalism. In so doing, the student is 'contained', and anxieties are mediated to facilitate a learning experience in which anxiety is tolerated and processed by both student and educator. This is not an easy task, nor without risks and limitations, but this paper offers imaginings of how a presence pedagogy might be enacted in a contact private tertiary environment to meaningfully engage with students' unconscious conflicts in the learning space.

Keywords: Presence pedagogy, Social constructivism, Psychoanalysis, Anxiety, Affective turn, Containment, Neoliberalism

1. Introduction

Recent research has explored the hypothesis that neoliberal higher education students have a low tolerance for anxiety, ambiguity, uncertainty, and failure in the context of increasing expectations of perfectionism amidst sociopolitical and economic turmoil (Malik and Perveen 2021; Paralkar and Knutson 2021). In South Africa, this is further complicated by a long history of sociopolitical conflict and unrest, and the resultant inequalities have bled into the higher education system (Leibowitz and Bozalek 2014). Though much of the research on anxiety and unconscious conflicts in tertiary students has been conducted in public, government-funded universities, the same inner conflicts and tensions exist for students enrolled in the private higher education sector, arguably more so due to the marketisation of higher education in the private sector, and this context warrants attention given the growing numbers of private tertiary student enrolments (Qureshi and Khawaja 2021).

This paper begins with a brief review of the landscape of higher education before exploring psychoanalytic conceptions of anxiety and unconscious processes during learning in higher education students, drawing in particular on Winnicott's theory of containment to elucidate the role of the educator in guiding the student through the inevitable difficult emotional experiences in their learning journeys. The paper then turns to the possibilities offered by presence pedagogy as imagined in a context of constructivist learning to propose competencies for educators to employ in their relational practices with their private higher education students. The context in private higher education is ostensibly unique in comparison to public education, with smaller class sizes, greater expectations regarding educator-student interactions and a propensity for marketisation of higher education as a business (Qureshi and Khawaja 2021). In light of this, an examination of the unique possibilities offered in this context provides opportunities for a nuanced demonstration of the importance of pedagogical presence in mediating unconscious conflicts in students. In other words, this paper proposes that pedagogical presence (usually a term reserved for online learning contexts) has the potential to serve as a practical method for educators to contain students' anxieties and unconscious conflicts and tensions, facilitating a learning experience in which students can tolerate and work through their anxiety rather than be overcome by it, with disappointing academic outcomes. Learning in higher education is mediated through relationships, a view shared by psychoanalysts and social constructivists. This theoretical convergence between psychoanalytic perspectives and constructivist pedagogy serves as the starting point for the proposition of presence pedagogy as a useful and productive recognition of the affective experiences of students.

2. The Private Higher Education Climate

The current higher education climate globally is characterised by neoliberalism. Neoliberalism is defined as “a theory of political practices that proposes that human well-being can best be advanced by liberating individual entrepreneurial freedoms and skills within an institutional framework characterised by strong private properties, free markets, and free trade” (Harvey 2005:2). Education is marketized and students are positioned in competition with each other, often fostering a deep concern with grades with the expectation that higher grades will result in a better chance to enter into postgraduate programmes and secure employment post-education (Mutuota 2024). This agenda is further prioritised in private higher education as students enter the system with higher expectation of institutional support in pursuit of these aims in relation to the fees paid (compared with lower fees of public institutions). This competitive context loaded with high expectations fosters anxiety in students and a weak tolerance for ambiguity and vulnerability (Karagiannopoulou 2011).

The focus on individualism, independent thinking, original contributions and the power of knowledge in neoliberal institutions fosters a sense of ‘omniscience’ (Karagiannopoulou 2011) and encourages students to believe that they alone control their academic destinies, unaffected by others in the learning journey. The neoliberal environment encourages students to take up a narcissistic position in relation to their learning. Karagiannopoulou (2011: 18) explains that “narcissistic ‘solutions’, while offering spurious fantasies of comfort, protection and self-sufficiency, in essence involve a retreat from the world and its complexities ... and a denial of the relational (since learning demands contact between minds).” One significant other in the learning process within the neoliberal context is the educator/ lecturer whose interactions with the student are affected by their pedagogical positions.

In higher education, there exists a pedagogical dualism and tension between constructivism and instructivism or objectivism as methods for approaching learning processes (Cholewinski 2009). There has been a move in higher education towards constructivism as a core pedagogy (Räihä et al. 2017). Constructivism presents more opportunities for uncertainty and ambiguity as students are encouraged to grapple with constructing their own knowledge through social collaborations (Vygotsky 1986). The educator is responsible for facilitating and embodying parallel processes of coaching, modelling and scaffolding of learning, centring the student (rather than the educator) as the agent of learning (Cholewinski 2009). This is in stark contrast to instructivism where the educator is positioned as all-knowing and responsible for the instruction and dissemination of knowledge.

Constructivist views of education situate the learner as existing in cognitive, social and emotional domains simultaneously, each of which influence the learning process and quality of learning that occurs (Brockbank and McGill 1998; Christie et al. 2008). Constructivism as a pedagogy exists in two main camps – social constructivism and cognitive constructivism (Cholewinski 2009). In this paper, I refer to Vygotsky’s social constructivism in order to forefront the role of relationships in the learning context. Social constructivism refers to the view that “learning is a situated, social, and collaborative activity in which learners are responsible for constructing their own knowledge” (Cholewinski 2009: 287). According to Vygotsky (1986) learning is seen as relational and social interactions are key to successful learning experiences. He takes an antirealist position to assert that learning and acquiring knowledge are products of our social interactions with our communities. In higher education, these communities can refer to other students in the class or institution, lecturers, tutors, faculty heads and other support staff. In this paper, I focus specifically on the relationship between lecturer and student.

Key to constructivist practices is the creation of space for students to grapple and to sit in the discomfort of not knowing but trusting the process of figuring it out for themselves with the guidance of their instructor and peers (Cholewinski 2009). From a psychoanalytic perspective, the social dimension of learning opens the student to unconscious intersubjectivities that may shape the learning process in ways beyond that described by social constructivists (Haselau, 2020). The acknowledgement and recognition of the role of emotion and unconscious processes in learning and teaching in higher education have been described in the literature as ‘the affective turn’.

3. The Affective Turn Higher Education

Cognitive processes in higher learning have been well documented and theorised (Cholewinski 2009). However, Karagiannopoulou (2011) notes that emotional dynamics in learning contexts at higher education level receive substantially less attention. Nonetheless, emotional and affective processes affect learning in higher education students especially when considered in the sociopolitical contexts in which they occur (Dale and James 2013). The affective turn in higher education refers to a curiosity with and active investigation of emotional and affective dynamics in higher education contexts, especially in relation to learning (Gravett and Lygo-Baker 2024).

While many researchers have conflated the terms affect and emotion when talking about experiences related to what a student is feeling during learning, Gravett and Lygo-Baker (2024) tease apart these terms to clearly forefront affect as the site of concern. Emotions refer to processes that are conscious to the student and can be articulated but affect refers more to sensory experiences are felt in the body, not able to be controlled and are not predictable. Emotion is conscious whereas affect is not (Gravett and Lygo-Baker 2024).

The affective turn gained momentum as researchers turned their attention to the contextual and structural nature of student anxiety in higher education, influenced by the pervasiveness of neoliberalism in the modern tertiary institution as well as the structure of educational organisations, which are characterised as “places of affective intensity” (Dale and James 2013: 1). Higher education is a space where uncertainty, doubt and ambiguity breed new ideas and generate authentic knowledge and creativity, at least on a cognitive level. On an emotional level, however, these same experiences can foster anxiety in students who are already facing unprecedented levels of change and uncertainty as they navigate a new phase of their lives (Dale and James 2013). Coren (1997: 70) notes that for tertiary students, “learning is like a relationship because it starts with the recognition of a lack, is painful, and we may yearn for simple expedient solutions which will precociously fill up the imagined deficit” (Coren 1997, p. 70).

One of the areas of interest for those writing about the affective turn in higher education is what is referred to as negative capability. Negative capability is a student’s ability or emotional capacity to tolerate anxiety, fragmentation, doubt, and frustration (Karagiannopoulou 2011). From a psychoanalytic perspective, a student’s capacity to develop negative capability is mediated by the relationships they develop in their learning contexts, particularly between student and educator. Gilmore and Anderson (2010) note that anxiety in learning experiences can be productive in terms of achieving particular learning outcomes but only if the educator can effectively ‘hold’ the student. The idea of ‘holding’ a student is rooted in Winnicott’s (1965) concept of containment. The notion of containment originally referred to the ways in which a mother acts as a container of the infant’s emotions, with the purpose of creating an expectation in the infant that the mother will actively deal with the difficult feelings that the infant projects into her (Winnicott 1965). The mother then transforms the difficult feelings into a more manageable state for the infant to tolerate, thereby acting as a mediator or container of the difficult or intolerable emotional or affective experience.

Educators may be able to recognise the ways in which our students sometimes recreate this phenomenon in their relationships with their lecturers, projecting their difficult feelings of uncertainty, anxiety, frustration and doubt into their lecturer with the expectation that the lecturer will bear the feelings, transform them and return them in more manageable forms. When this does not happen, students become overwhelmed with these negative emotional states and this culminates in unproductive learning outcomes, often observed as ‘giving up’ or acting out in other ways such as blaming others (labelling the lecturer as incompetent or module outcomes as too difficult). Karagiannopoulou (2011: 16), in recognising the important work the educator must do in acknowledging this (unconscious) action, writes that:

“The student’s difficulty in learning has to be uttered and recognised by the tutor, through acknowledging the nature of learning in higher education and the distance between everyday knowledge and academic knowledge ... Acknowledging and containing the difficulty may enhance students’ tolerance to confusion and disappointment, and increase their capacity to struggle with knowledge even if connections are tacit, meanings unclear, and competing interpretations a lot for a student to get to grips with.”

Essentially, what Karagiannopoulou (2011) is describing is what Bion (1961) refers to as ‘affective containment’, a term used to describe “structures and processes that enable the effective and authentic receptiveness of feelings, give opportunities for reflection on affective experience and learning, and enable feelings to be harnessed and the insights gained from affective experience to be used productively” (Dale and James 2013: 6). Affective containment is contingent on the relationship built between student and educator, as it requires a level of unconscious trust that the educator will safely transform the student’s unacceptable feelings into something manageable. What is not often explicit in discussions about affective containment is how to practically facilitate and enact this with students in real-time. Relationships mediate learning (Karagiannopoulou 2011) – this is an understanding shared by psychoanalysts and social constructivists, and this principle forms the basis of the role of the educator in productive learning on an unconscious affective level. The overlap between psychoanalysis and constructivism as a pedagogical guide (especially popular in private higher education contexts), opens up space to explore pedagogical solutions that encompass both the affective turn as well as constructivism.

Thus far, this paper has attempted to demonstrate the dovetail of psychoanalysis and social constructivism in positioning learning as inherently relational. Because of the relational nature, students are vulnerable to experiences of anxiety, frustration, confusion and despair. If we are to understand learning as relational, and anxiety in learning as something that needs to be contained, a practical solution is required to address cohorts of neoliberal students in private higher education where expectations for 'service delivery' are higher than in other educational contexts. This paper proposes that one way in which containment can be usefully enacted in the context of private higher education is through a pedagogy of presence.

4. Pedagogical Presence

Pedagogical presence or presence pedagogy has been described as an approach to teaching and learning that codifies the relational competencies of online educators in facilitating instructional practices that encourage reflection and support for students (Cheney and Bronack 2011). Presence pedagogy has been extensively used to frame relational competencies in online learning in the context of immersive technologies. The focus is on creating a sense of 'being there' even though the lecturer is not physically there. The implication in this line of thinking is that presence can be felt and enacted more naturally in a face-to-face setting. However, if we view pedagogical presence through a psychoanalytic lens, we explore the ways in which 'being there' is just as complex in face-to-face environments as it is in online environments, and physically 'being there' is not the same as emotionally 'being there'.

Davis (2016) has usefully explored pedagogical presence using a psychoanalytic lens, moving the concept out the online space and into the contact domain of higher education. He argues that education is an inherently risky endeavour because of the vulnerability that students are required to face in grappling with the unknown. Importantly, he notes that "the capacity of the student to keep learning and growing through the "weakness" and "risk" of education is somewhat dependent upon the teacher's capacity in turn to be attentive and reassuring" (Davis 2016:231). This capacity to be attentive and reassuring is encapsulated by the enactment of presence pedagogy in the facilitation of learning. Davis draws heavily on the work of Freud, but this paper takes Winnicott's concept of containment, mapping it against constructivism to position the private higher education student as one experiencing unconscious conflicts in need of 'holding' in order to produce a more conducive learning experience.

Presence has been defined as "a state of alert awareness, receptivity, and connectedness to the mental, emotional, and physical workings of both the individual and the group in the context of their learning environments, and the ability to respond with a considered and compassionate best next step" (Rodgers and Raider-Roth 2006: 265). Pedagogical presence is an educator's capacity to be reassuring and attentive to their students to support them in navigating the uncertainty in higher learning. Education is a risk that students take and for them to navigate this successfully, they need guidance and support from their educators (Davis 2016). To further unpack the importance of attentiveness in pedagogical presence, it is helpful to turn our attention to the Latin root of the word 'attend' which is 'attendere', meaning 'to stretch toward'. The stretching is what is of interest in the relational dynamic between lecturer and student. It offers responsibility to the lecturer to do the stretching. The counter-responsibility is of the student in reciprocating the stretching, though uncomfortable.

Gravett and Lygo- Baker (2024:2) describe what being attentive to students in a learning context means for educators:

"Attuning to affect is about noticing the micro-practices, frictions, and resonances of the everyday. It is about attending to the minor currents and gestures of daily life ... It is a 'politics of the ordinary' ...Attending to affect is about thinking about how education feels, and about how learners and teachers feel each educational encounter in diverse, different, and powerful ways."

What is key in the above quote is that attending to students' emotional states is a key competency of enacting presence pedagogy with students. It requires educators to pay attention to smaller details that in traditional education, are not considered relevant or significant for learning. Holding the affective turn in mind, we can begin to become more curious about the 'ordinary' micro-practices that at the surface may seem irrelevant to our goal of facilitating learning, but in practice are easily manipulated by a shift in the educator. Being mindful of how learning *feels* offers a space for students to acknowledge the ways in which their affective states interact with their capacity to learn. In more practical terms, Rodgers and Raider-Roth (2006: 271) note that attending to the student in the context of presence pedagogy involves a

"wide-open acceptance of the learner that is free of judgment and filled with awe of his [sic] capacity to learn... Our attention is not only on the learner but also simultaneously on the group, the environment(s)

in which they all work, the directions in which the individual and group might go next, the variegated terrain of the subject matter(s) at hand and the place and value of that subject matter in and to the larger society."

Uncomfortable emotional experiences are inevitable in the learning process in higher education, and students can feel these processes as an expression or exemplification of weakness. Our responsibility as educators, according to Davis (2016) and Rodgers and Raider-Roth (2006), is to help the student to continue to think and grow in spite of the risk they take in facing their own weaknesses. Presence pedagogy "would help to address the conflict between the unfolding interior unconscious life of the student and the exterior reality and demands of the outside world" (Davis 2016: 234). We need to be careful about how this is managed as we are at risk of either giving in to all (unreasonable and reasonable) student impulses and desires to maintain a sense of safety and support, especially in private higher education where consumer discourses predominate, or becoming rigid in our attempts to set boundaries with students, thereby inadvertently widening the gap between educator and student. Achieving a balance between these two positions requires us as educators to be present for our students through ongoing caring dialogue.

Nel Noddings (1998) conceptualizes presence pedagogy as an ethics of care. She argues that a defining feature of the relationship between student and teacher is 'presence' to distinguish it from other types of relationships. It's not about developing a personal or long-lasting relationship with each student, but rather facilitating an encounter that is 'total', where the educator is fully and non-selectively present for all students in the moment. Caring means holding on to what is best for the student, even if it is not what the student wants in the moment. In this way, the educator can 'hold' the student and assure them that their interests are with the student, though sometimes this means 'holding the line' and enforcing boundaries that will contain student anxiety. In this way, affective containment in the context of higher education can look like attentiveness to students, reassuring students they can trust the decisions and directions of their educator, caring for the student's emotional experiences and transforming difficult experiences into manageable and tolerable states through openly talking with students about these states. The educator, through their pedagogical position can open up space to invite students to talk about anxiety rather than suppress it and to embrace confusion and ambiguity rather than try to hide it behind other behaviours.

Gravett and Lygo-Baker (2024) refer to the process described above as developing an 'affective craft', where educators actively pay attention to the 'inconvenience' of education and leverage the dialogues with students about discomfort in learning to further educational aims. One practical way in which educators can do this is to share stories with students about their own experiences with receiving harsh feedback, for example (Gravett and Lygo-Baker 2024). In this way, the educator models how to manage this feedback and integrate it with other emotional experiences involved in learning and growing. This is a demonstration of stretching toward the students and inviting dialogue about emotion with the goal of working through it and exemplifying how anxiety, frustration and disappointment can be tolerated and resolved in pursuit of further learning.

This process involves developing trust with the students. This is arguably easier in smaller classes where the educator to student ratio is smaller, such as in the context of many private higher education settings. The educator can invest in noticing who is there, who is absent and why (physically, cognitively and emotionally). Enacting pedagogical presence in private higher education can involve the educator making space to talk about anxiety, frustration and tension with the goal of helping the student to work through it rather than for the educator to 'fix' it to provide a service or achieve customer satisfaction, as is often the discourse in privatised higher education in a neoliberal climate. We need to teach students that uncomfortable and difficult emotions are part of the learning process and can be tolerated and worked through, but this requires us as educators to be mindful of how we hold the student when we hold the line. Deadlines need to be met but we can open up space to talk about how these make the students feel without removing the deadline. Discipline-specific content might be hard to grasp but we can talk about the frustration in trying to construct knowledge without changing what it is we are learning about. In so doing, we invite emotion into the learning space and promote its role in constructivist learning pedagogies. We can then contain difficult emotional experiences and transform them with our students into tolerable and productive states that foster learning.

5. Conclusion

This paper has proposed the employment of presence pedagogy as a method of inviting the affective turn to join constructivism in the private higher education context. Rising anxiety levels in students have been linked to the marketisation of private higher education, especially with the neoliberal nature of most institutions (Mutuota 2024). This has necessitated conversations about more responsive approaches to teaching and

learning in private higher education institutions. This paper has drawn on several theoretical perspectives to propose a useful and productive response to the current climate of private higher education students. First, social constructivism was drawn on to elucidate the importance of collaborative relationships and the social dynamic in learning experiences. Additionally, Winnicott's theory of containment was employed to explicate the affective turn in higher education and provide a psychoanalytic perspective of how we can hold student anxiety and other difficult emotions. What is shared by social constructivists and psychoanalysts is an agreement that relationships mediate learning.

Affective containment is not a new concept in psychoanalytic writing about higher education, but what this paper has proposed is the usefulness of presence pedagogy as a way to dovetail social constructivism, the affective turn and an ethics of care in a holistic attempt to address student needs in the current climate. There is room to draw presence pedagogy out of the online space and into the contact, face-to-face settings in private education to more tactfully engage with our students and perhaps improve their learning experience on an affective level. Pedagogical presence in the private higher education space might then involve a stretching toward the student, noticing the ordinary micro-practices that are perhaps not so insignificant, talking about how learning feels with our students, holding the student by making space for emotion in the learning environment while also holding the line by providing the necessary boundaries that contain students' anxiety. As Rodgers and Raider-Roth (2006: 271) write, "presence is no small thing."

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Curriculum Transformation in South African Tertiary Institutions: Current Research on Narratives of Change

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Abstract: Curriculum transformation initiatives, with specific reference to the South African context, is increasingly applied in the reflection of societal changes on teaching and learning, content, and pedagogy. However, currently limited research on the presiding narratives of change and their potential impact on practices, policy, and curricula hampers tertiary education stakeholders' ability to fully evaluate and drive effective curriculum transformation. Accordingly, this study aims to provide a comprehensive overview of existing research on narratives of change in South African tertiary education, with objectives that include identifying said narratives, analysing research trends, and highlighting interventions for stakeholders to consider in curricula transformation efforts. The research methodology comprises of a bibliometric and qualitative review. The former utilises “curriculum transformation”, “South Africa”, and “higher”/“tertiary” as source concepts to identify applicable publications on the SCOPUS database, which are subsequently analysed using the VOSviewer (version 1.6.20) software. The qualitative review includes an analysis of the content of the papers in line with the narratives of change identified in the network and overlay visualisations. Through these analyses, four narratives of change are identified in the bibliometric analysis, including decolonisation, e-learning, inclusive curricula, and diversity. Key interventions for curriculum transformation include integrating African perspectives, promoting inclusive teaching practices, and leveraging Information Communication Technology (ICT) for effective e-learning. Additionally, flexible teaching methods, multilingualism, industry partnerships, and the inclusion of African knowledge systems and gender-sensitive content are essential for fostering a diverse and supportive educational environment. The contribution of this paper is centred on enabling more effective and comprehensive evaluation and analysis of existing curricula by education stakeholders and institutions, and to guide successful curriculum transformation initiatives.

Keywords: Curriculum transformation, Narratives of change, Bibliometric review, Decolonisation, e-Learning

1. Introduction

Curriculum transformation in tertiary education has experienced increased importance in the context of societal changes, with reference to social, political, environmental, and economic developments in diverse education contexts (Ashari et al., 2023). This is especially applicable in the post-apartheid South African context in which objectives of socio-economic development, equality, and transformation has catalysed initiatives toward the review of curricula, teaching and learning approaches, and pedagogy (Blignaut, 2020). Said movements are driven by narratives of change – frameworks that delineate a structured account regarding the merits, nature, and required interventions to bring about respective changes within a system (Wittmayer et al., 2019). One example in this regard is the drive for sustainable development as encapsulated in the United Nation’s Sustainable Development Goals (SDGs), which is guided research, policy, and industry in achieving related objectives (UN, 2024).

The potentially wide-ranging impact of narratives of change underlines the need for transformation and renewal in the pedagogies and content inherent to knowledge transfer in tertiary education and institutions. Accordingly, South African tertiary institutions have developed initiatives centred on the continuous analysis of curricula (Mashilo & Govender, 2023), of which the latter is central to ensuring the quality and relevance of related programmes, supports ongoing improvements in educational outcomes, drives innovation and competitiveness (Audunsson et al., 2024) and promotes interdisciplinary approaches to knowledge transfer. However, despite its importance, there is limited research on presiding narratives of change and the inherent shifts in practices, policy, and curricula that these narratives propagate. This inhibits tertiary education stakeholders and institutions to comprehensively evaluate and analyse curricula for effective transformation.

Therefore, the aim of this study is to provide holistic overview of existing research on narratives of change in the context of South African tertiary education. Objectives include the identification of distinct narratives of change, analysing research trends in this regard, and identifying the interventions delineated in existing research to be considered by stakeholders in the process of undertaking curricula transformation initiatives. The contribution of this study is to support and inform the implementation of systematic change and initiatives

toward the improvement of tertiary curricula over time. The research methodology applied in this regard is a bibliometric review of existing research, with focus on determining prominent research themes toward identifying narrative of change, as well as a qualitative research of the selected publications to provide insight on specific descriptions and interventions inherent to respective narratives of change. The structure of the paper is demarcated by the literature review, research methodology, findings and discussion, and conclusion sections.

2. Literature Review

The sections included in the literature review includes an introduction to curriculum and its transformation, the South African education context, and narratives of change.

2.1 'Curriculum' and the South African Education Context

The term 'curriculum' refers to a planned course of study with a clear beginning and end (Hewitt, 2006). Developing a curriculum involves creating, organising, and producing teaching materials, which integrate curriculum with instruction (Abie, 2014; Hewitt, 2006). This process addresses key questions about what should be taught and how, guiding the selection of instructional tools (Hewitt, 2006). There are two main approaches to curriculum: the product-driven model, which focuses on learning outcomes, and the process-driven model, which emphasises experiential learning through work and life experiences (Abie, 2014; O'Neil, 2010). Various curriculum development models, which can be descriptive (explaining a process), prescriptive (outlining steps or principles), practical (specific to certain practices), replicable (usable in different settings), and constructive (developed from particular models), help structure the curriculum by indicating the scope of knowledge and teaching sequence (Hewitt, 2006; Abie, 2014). The incorporation of community-based knowledge into the mentioned models may ensure continued relevance of curricula to students' sociocultural contexts, enabling engagement (Mpuangnan & Ntombela, 2024). This forms part of the broader need for curricula adaptation and evolution to retain their impact and significance (Abidin et al., 2023), highlighting the importance of flexibility and responsiveness (Kilag et al., 2023).

In South Africa, higher education curricula have evolved into well-designed and carefully developed models that support equal education for all, reflecting the country's commitment to addressing diverse educational needs within its specific context. The responsibility for ensuring quality tertiary education lies with the Department of Higher Education and Training (DHET), including, inter alia, through the implementation of the Human Resource Development Strategy for South Africa. This department seeks to provide a comprehensive education system that promotes lifelong learning and aims to improve lives and support a democratic South Africa (DHET, 2020; DBE, 2012). The DHET envisions an inclusive and accessible post-school education system for all South Africans (DHET, 2020). Universities South Africa (USAf), formerly Higher Education South Africa (HESA), is a key governing body representing all public universities in the country. USAf fosters an environment for universities to thrive, ensuring access for students from diverse backgrounds and supporting the role of universities in socio-economic and cultural development. It also addresses issues such as stability, transformation, differentiation, and internationalisation for higher education institutions (USAf, 2021; National Government of South Africa, 2012).

2.2 Curriculum Transformation and Narratives of Change

The primary goal of education is to ensure academic success and prepare students to be active citizens in a democratic society (Mohapi & Netshitangani, 2017). Education is key to social transformation, fostering equality and empowering students to address social injustices (Mohapi & Netshitangani, 2017). In South Africa, education is viewed as a transformative process, with curriculum transformation reflecting broader societal shifts (Mohapi & Netshitangani, 2017; Gumede & Biyase, 2016). Since 1994, South Africa has experienced several significant curriculum changes in line with underlying narratives of change. The introduction of Curriculum 2005 (C2005) aimed to improve education quality with a focus on social justice, human rights, and learner-centered approaches (Woest, 2018). Curricula are grounded in values that align with the goals of the South African constitution, such as social justice, human rights, environmental awareness, and respect for people from diverse cultural, religious, and ethnic backgrounds (Gumede & Biyase, 2016; DBE, 2012). These curriculum changes are necessary in a society where knowledge is shaped through transformative experiences to develop ethical, democratic citizens (Mohapi & Netshitangani, 2017).

3. Research Methodology

This paper applies both a bibliometric and qualitative review of existing research within the parameters of the research objectives. The utilisation of a bibliometric review provides insights into the underlying themes of select publications, their publication trends over time, and thematic clustering (Linglin, 2024), which may be applied to delineate narratives of change. Advantages of this approach include analysis replicability, objectivity, simplicity in the context of large datasets (Pretorius et al., 2022). In applying this approach, specific source concepts are identified to demarcate the publications that are relevant to the research objectives. Accordingly, in this regard, the source concepts are “curriculum transformation”, “South Africa”, and “higher”/“tertiary”. This reflects the institutional and educational context of the research. These source concepts are used as input on the SCOPUS database, where identified publication information (including their titles, abstracts, author information, and keywords) are downloaded in comma-separated values (csv.) format. This database is utilised due to its high volume of multidisciplinary publications, related abstracts, and citations (Patel et al., 2021). The downloaded information is limited to journal and conference proceeding papers, as well as book chapters.

The csv. output is imported in the VOSviewer application (version 1.6.20), which creates various outputs to reflect the nature of the research. Relevant here is the occurrence of the different keywords in the selected publications, which highlight the underlying themes in the research, in addition to the link among keywords, which illustrates the extent to which said keywords occur together within the same publications (Van Eck & Waltman, 2018). The latter enables the identification of research clusters, which informs the delineation of narratives of change. Keyword linkages and clusters are displayed in the network visualisation, while the overlay visualisation indicates the average date of publication of the respective keywords to enable the identification of research and thematic trends over time. The qualitative review, which is the second component of the research methodology, analyses the content of the selected publications in line with the research objectives of the study (Islam et al., 2021). Informed by the narratives of change identified through the bibliometric review, the criteria for the qualitative review of the publications are centred on their description and overview of the narrative of change discussed as part of their content, and interventions suggested applicable to curriculum transformation initiatives. This component of the methodology enables a broader, in-depth analysis of the themes identified in the bibliometric review (Pretorius et al., 2022) and provides a holistic overview of presiding narratives of change in this content for the consideration of institutional stakeholders.

4. Findings and Discussion

The following section delineated the findings of the bibliometric and qualitative reviews, which constitute the two components of the research methodology.

4.1 Bibliometric Review

The structure of the bibliometric review is based on the various VOSviewer outputs, including keyword occurrence, and the network and overlay visualisations. As an introduction, an overview of the delineated research publications is provided.

4.1.1 Overview of research

In total, 28 publications were identified on the SCOPUS databased utilising the source concepts, four of which were journal papers, three book chapters, and 2 conference proceedings papers. The majority of papers (24) were relevant to the social sciences field, followed by art and humanities (two) business, management and accounting (two), and computer science (two). Most of the research (82%) were published between 2018 and 2024, with the earliest published in 2002. The most cited paper in the delineated research is Luckett and Shay (2020) with 60 citations, followed by Wilmot and McKenna (2018) (20), and Bell and Swart (2018) (10).

4.1.2 Keyword occurrence

The first VOSviewer output is centred on identifying the keywords that occur in the delineated research, with the objective of identifying potential narratives of change. Select keyword occurrences are indicated in Table 1.

Table 1: Keyword occurrences

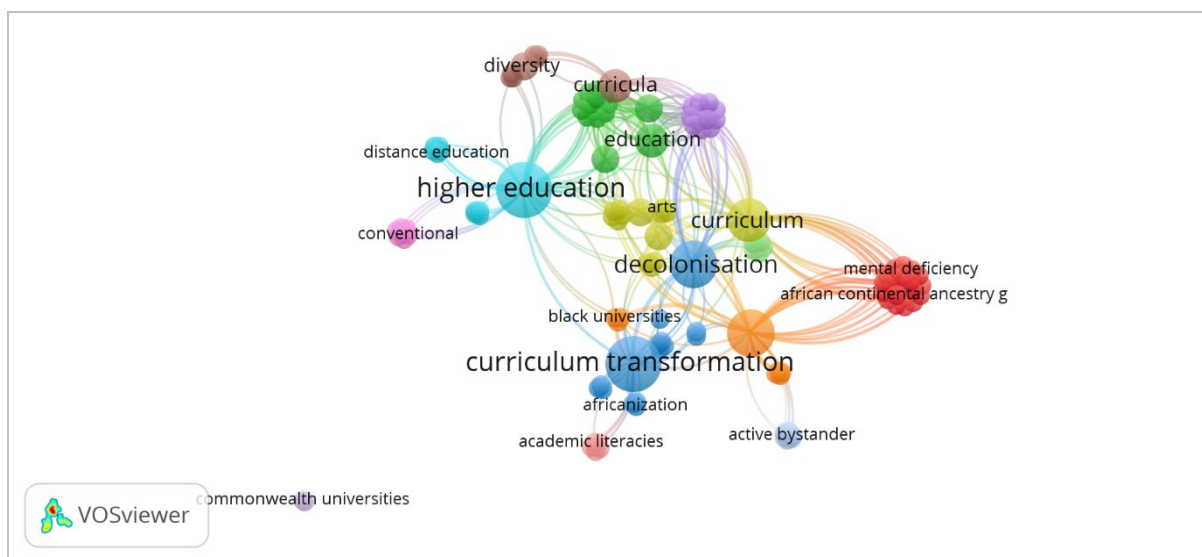
Keyword	Occurrences
Decolonisation	6
e-Learning (Distance e-learning; Open distance e-learning)	4
Deaf (Disability; Hard of hearing; hearing impairment)	4
Diversity	2
Africanisation (and Africanization)	2
Decoloniality (and Coloniality)	2
Inclusive curricula	1
Language of teaching and learning	1
Gender equality	1

Source: Authors (2024).

As per Table 1, there are various keywords that may be associated with narratives of change in this context. This includes *decolonisation*, which occurs six times in the selected research. Keywords potentially associated herewith includes *decoloniality* (and *coloniality*) and *Africanisation* (and *Africanization*), that occur twice, respectively. In addition, the *e-learning* (and *distance e-learning*, *open distance e-learning*) is also a potentially prominent narrative of change, occurring four time among the published papers. Research regarding *disability* (including *deaf*, *hard of hearing*, and *hearing impairment*) also have four occurrences, followed by *diversity* (two). The keywords *inclusive curricula*, *language of teaching and learning*, and *gender equality* all occur once in the delineated research.

4.1.3 Network visualisation

The network visualisation is utilised to the identify relationships between these and other keywords in the research. Said output delineates clusters of keywords based on their co-occurrence in publications and may thus enable improved delineation and categorisation of narratives of change as they emerge in the research. This VOSviewer output is illustrated in Figure 1.



Source: Authors (2024).

Figure 1: Network visualisation

The network visualisation, as illustrated in Figure 1, identifies 14 clusters among the 138 keywords in the research. The criterium for cluster delineation is based on intra-group link strength exceeding linkages with keywords in other clusters – keywords within a cluster occur to a greater degree in the same publications. Informed by Table 1, the network visualisation is also utilised to identify inter-cluster linkages to enable the

selection of keywords to categorise respective narratives of change present in the research. The latter is also based on thematic linkages between potentially related keywords.

Table 2 provides a delineation of said narratives of change, the keywords applied in the categorisation, and the applicable clusters from the network visualisation.

Table 2: Narratives of change

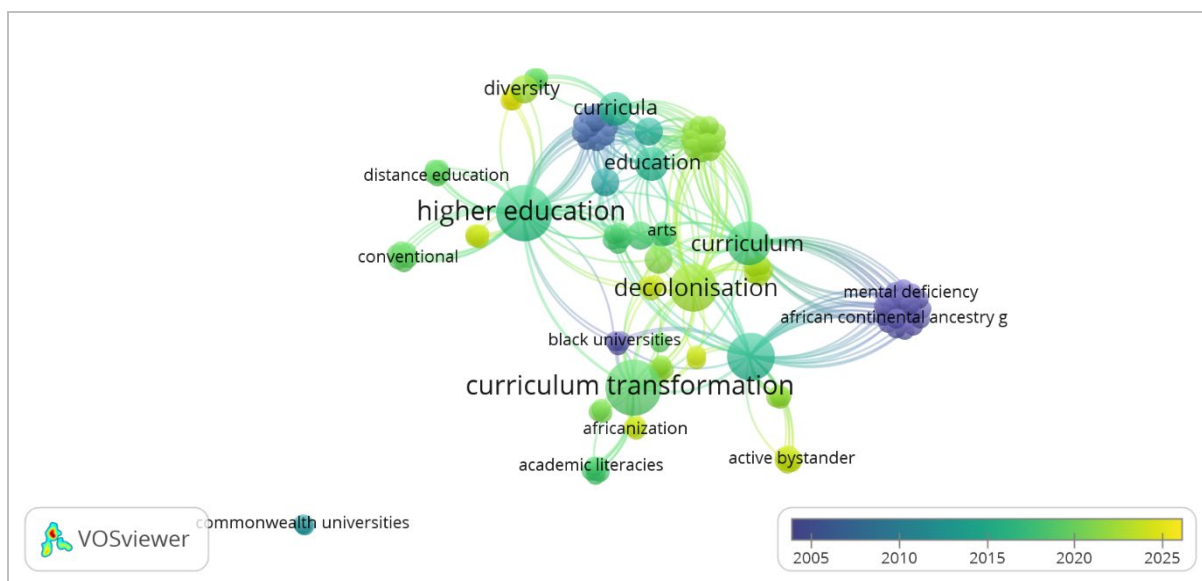
Narratives of change	Keywords	Clusters
Decolonisation	<i>Decolonisation; Africanization; locally relevant curriculum; decoloniality</i>	Cluster 3
e-Learning	<i>e-learning; computer aided instruction; distance e-learning; open distance e-learning</i>	Cluster 2, 5, 6
Inclusive curricula	<i>Inclusive curricula; hearing impairment; disability; deaf; hard of hearing</i>	Cluster 4
Diversity	<i>Diversity; epistemic pluralism; language of teaching and learning; indigenous knowledge; feminist decoloniality; microaggressions; black women faculty; gender equality</i>	Cluster 8, 12, 14

Source: Authors (2024).

Accordingly, the predominant narratives of change present in existing research are decolonisation, e-learning, inclusive curricula, and diversity. These findings inform the qualitative analysis of said publications.

4.1.4 Overlay visualisation

The overlay visualisation, which is the third VOSviewer output, is illustrated in Figure 2. This visualisation illustrates the thematic trends inherent to the publications over time through indicating the average year of publications in which keywords occur. This provides insights on the manner in which the research focus has changed within the indicated period.



Source: Authors (2024).

Figure 2: Overlay visualisation

Based on VOSviewer output, the selected research was published predominantly between 2005 and 2024 (with some due to be published in 2025). As indicated in Figure 2, research on curriculum transformation in the context of tertiary education in South Africa was initially (circa 2005) discipline-specific, with divergent focus on *engineering disciplines* (and *engineering education*), *medical education* (including *medical practice*, *health care quality*, and *medical school*), and *culture studies*. Research in these disciplines constitute respective clusters, with limited keyword linkages. However, focus has shifted toward broader themes that may have transdisciplinary relevance and application, including *teaching* (average publication year being 2013), *e-learning* (2014), and *curriculum transformation* (2019) itself. Research regarding the identified narratives of

change are mostly published during the period in which the latter keyword grows in occurrence. The average year of publication for research associated with the keywords inherent to inclusive curricula is 2018, followed by the collection of keywords related to e-learning (2019), diversity (2021), and decolonisation (2022). The latest research regarding the latter narrative of change is published in 2023 (including *locally relevant curriculum* and *Africanization*).

4.2 Qualitative Review

The following section delineates the findings of the qualitative review of the selected research publications guided by the narratives of change identified through the bibliometric analysis. This review provides an overview of existing research based on their respective descriptions of narratives of change, as well as their potential contribution to curriculum transformation initiatives. Table 3 indicates the prominent sources of decolonisation, e-learning, inclusive curricula, and diversity narratives of change, as well as their description of said change within the parameters of the study.

Table 3: Sources of narratives of change

	Source	Description
1. Decolonisation	Dube (2021)	Deep curriculum transformation beyond content substitution, emphasizing the need to rethink the discipline's being and its pedagogical structures.
	Ebewo & Sirayi (2018)	Decolonisation and the Africanisation of the curriculum, incorporating African cultural content and reducing Eurocentric dominance.
	Luckett & Shay (2017)	Decolonisation through reframing the curriculum to address redistribution, recognition, and representation, based on Fraser's multi-dimensional framework for justice.
	Madhav & Baron (2022)	Decolonisation by addressing the exclusion of African worldviews and proposing a conversation-driven, cybernetic approach to curriculum transformation.
	Maistry & Le Grange (2023)	Decolonisation and challenging neoliberal structures that perpetuate colonial legacies in university governance and curricula.
	Olsson (2023)	Decolonisation, critically assessing how decolonising efforts, like those seen at Nelson Mandela University, intersect with academic freedom.
	Rink et al. (2020)	Decolonisation, emphasizing the need for reflexive pedagogies and border-crossing to dismantle inherited disciplinary and epistemological boundaries.
	Sathorar & Geduld (2019)	Decolonisation, focusing on reshaping the mindset of lecturers to engage with decolonial pedagogy in teacher education.
2. e-Learning	Zawada (2019)	Advocates for e-learning through the development of a high-quality culture in distance education, focusing on both compliance and transformative learning.
	Czerniewicz & Brown (2007)	Advocates for e-learning by examining the complexities of ICT access and usage, challenging the simplistic notion of the "digital divide" in favour of a "usage divide."
3. Inclusive curricula	Bell & Swart (2018)	Inclusive curricula and better support systems.
	De Vos & Riedel (2023)	Decolonizing language curricula by increasing the visibility of African languages and voices.
	Gumbo et al. (2019)	Curriculum pathways that retain practical skills training and work-integrated learning in urban and regional planning education.
	Khoza-Shangase & Kalenga (2024)	Inclusive Curricula by emphasizing the need for Afrocentric approaches and tailored language support in curriculum transformation.
	Wilmot & McKenna (2018)	Inclusive Curricula by using peer-led writing groups to create a safe space for students to develop academic literacy, voice, and identity.
4. Diversity	Denny & Wepener (2021)	Intercultural pluriversity pedagogy that integrates diverse cultural and epistemic perspectives.
	Eybers (2019)	Diversity by proposing the use of Ayittey's Indigenous African Institutions to create epistemic plurality in the curriculum.
	Kepe (2022)	Decolonisation by promoting biliteracy, hybrid literacy, and translingualism in curriculum transformation.
	Moremoholo (2023)	Diversity by emphasizing the need to integrate indigenous cultural knowledge and values into the higher education curriculum.
	Morley (2007)	Diversity by promoting gender mainstreaming to address inequalities in access, curriculum transformation, and staff development.

	Source	Description
	Morley (2012)	Diversity by promoting gender mainstreaming and affirmative action to address gender imbalances in higher education.
	Zerai (2023)	Feminist Decoloniality and Diversity by addressing systemic racism and sexism in higher education through care-based, intersectional responses.

Source: Authors (2024).

As described in Table 3, existing research regarding the decolonisation narrative of change in the South African tertiary education context proposes, inter alia, the integration of diverse (Rink et al., 2020) and African perspectives into curricula (Dube, 2021) and to challenge existing Eurocentric and neoliberal foundation (Maistry & Le Grange, 2023); the incorporation of locally relevant context in curricula, with reference to the integration of African knowledge systems and arts (Ebewo & Sirayi, 2018) and inclusive conversations in technical curricula (Madhav & Baron); the dismantling of colonial power structures through utilising inclusive and pluralistic education practices (Luckett & Shay, 2017); and to enhance lecturer dispositions and promoting critical consciousness (Sathorar & Geduld, 2019). In addition, existing research on the e-learning narrative of change focus on creating strategies for effective ICT use by education participants and addressing socio-economic and disciplinary differences to enhance utilisation and thus learning in this regard (Czerniewicz & Brown, 2007); and suggest shared meaning-making between students and staff to enhance the effectiveness of distance learning, while moving beyond a narrow focus on quality assurance (Zawada, 2019).

With reference to the inclusive curricula narrative of change, as indicated in Table 3, existing research is focused on implementing flexible teaching methods and improved access for hard of hearing students (Bell & Swart, 2018); the integration of multilingualism (De Vos & Riedel, 2023) and indigenous languages (Khoza-Shangase & Kalenga, 2024) in teaching and learning to support English Additional Language (EAL) students; and the incorporation of theoretical and practical training in curricula through project-based learning and partnership with industry stakeholders (Gumbo et al., 2019). With regards to the diversity narrative of change, the selected publications are centred on, inter alia, the incorporation of the African knowledge systems alongside global and Western epistemologies within tertiary curricula (Eybers, 2019); the creation of diverse curriculum models that reflect different cultural perspectives, including African cultural heritage (Moremoholo, 2023); the integration of gender-sensitive content into curricula and gender equality policies at education institutions (Morley, 2007; 2009); and the utilisation of feminist decolonial methodologies and mentoring networks to create supporting environments for Black women with this context (Zerai, 2023).

5. Conclusion

Despite the importance of curriculum transformation, limited research has been undertaken regarding the various narratives of change in the context of tertiary education in South Africa. Accordingly, this paper provides a holistic overview of current publications to inform the decisions of stakeholders engaged with curriculum development and reform as part of broader transformation initiatives. The bibliometric review revealed keyword linkages and thematic clusters that delineate coherent narratives of change. Through the network visualisation, four narratives were identified: decolonisation, e-learning, inclusive curricula, and diversity. Furthermore, the overlay visualisation showed that research themes have evolved from discipline-specific focuses to broader curricula transformation themes with transdisciplinary applications. Notably, research supporting transformation in teaching and the use of e-learning emerged as key trends. Among the papers focused on narratives of change, decolonisation themes were published most recently (average publication year being 2022), while inclusive curricula themes, on average, were published earlier (2018).

The qualitative review component provided a deeper analysis of the identified narratives of change. This analysis of the content of the papers highlighted interventions that can inform curriculum transformation. For instance, in the case of decolonisation, integrating diverse and African perspectives into curricula while challenging Eurocentric foundations is essential to promoting more inclusive and critical teaching practices. Similarly, e-learning can be enhanced by the effective use of ICT and fostering collaboration between students and staff. Inclusive curricula benefit from flexible teaching methods, the promotion of multilingualism, and stronger partnerships with industry to bridge the gap between theoretical knowledge and practical applications. Furthermore, embedding African knowledge systems, diverse cultural perspectives, and gender-sensitive content is crucial for creating a diverse and supportive educational environment. The findings of this paper support the ongoing implementation of systematic change and the improvement of tertiary curricula over time. By providing an overview of narratives of change and potential interventions, this study offers a

framework for more effective and comprehensive evaluations of existing curricula, aiding institutions and education stakeholders in the curriculum transformation process.

Further research is recommended to explore how these narratives can be integrated into specific curricula at South African tertiary institutions and across different programmes. There is also a need to examine methodologies for curriculum reviews, as well as the monitoring and evaluation of transformation initiatives after their implementation. Knowledge-sharing best practices, particularly the role of the DHET and related institutions should also be explored to support sustained curriculum reform in the tertiary education sector. Finally, limitations of this study include the selection of source concepts, which may have affected the scope of the research included in the analyses, as well as the limited consideration of specific disciplinary domains. These limitations will need to be addressed in future research.

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Evaluation of the Obstacles Encountered by South African International Students in Tertiary Educational Institutions

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Abstract: The South African higher education system has seen a gradual rise in the number of international students, mainly from African countries but not exclusively confined to other nations. Although the number of international students has significantly risen in recent decades, there is less knowledge about the obstacles they face and the potential effect of these issues on them. This research aims to comprehensively evaluate the difficulties encountered by international students at higher education institutions, providing insight into the complex obstacles that affect their academic, social, and cultural assimilation. The study utilizes a qualitative approach, incorporating a questionnaire as the research design to collect perspectives from international students. The findings indicate that communication, finances, environment, access to resources, and administration are factors that contribute to the obstacles encountered by international students. This highlights the necessity for specific support mechanisms and policy adjustments to improve the overall educational experience for this expanding demographic. The results of this assessment provide important insights for educational institutions, governments, and stakeholders that want to promote inclusive and supportive settings that facilitate the achievement and well-being of international students in higher education.

Keywords: Higher Education, South Africa, International students

1. Introduction

The phenomenon of global migration and cultural shifts has led to a notable increase in the diversity of students and faculty members at academic institutions worldwide (Altbach, 2013). These emerging patterns have presented novel difficulties for university educators and students. Consequently, a higher proportion of university students come from a range of culturally and linguistically diverse backgrounds (Altbach, et al., 2019). Some of these individuals may be regarded as academically challenged in their potential to achieve success in their studies. According to the study conducted by Zalli, (2024) and Altbach, et al., (2019) higher education for young individuals encompasses several aspects, including the acquisition of knowledge and skills, the cultivation of a scholarly mindset, the establishment of social connections, the nurturing of aspirations, the formulation of professional plans, and the preparation for future life. Clark (2024) asserts that within the realm of higher education institutions, students encounter several challenges and anticipate effective resolutions for these predicaments. The prevalent issues faced by individuals in higher education worldwide include academic, cultural, emotional, and economic challenges. Many nations develop and enforce many policies to tackle the problems in higher education and facilitate students' adjustment to the higher education milieu, enhancing their chances of success (Sam, 2024). When examining the challenges encountered by individuals pursuing higher education, particularly those who come to study in an international nation, it seems that these difficulties vary in magnitude.

In South African perspective, presence of language hurdles is a notable challenge, especially for students who come from non-English-speaking backgrounds, given that English serves as the main mode of teaching (Gukurume, 2024). This may have a detrimental impact on their capacity to actively participate in lectures, contribute to debates, and achieve high performance in examinations. International students often encounter challenges in cultural adaptation, struggling to acclimatize to the local traditions, social conventions, and the rich cultural milieu of South Africa (Woldegiorgis and Chiramba, 2024). Furthermore, the process of social integration might be arduous because of disparities in social customs and the possibility of encountering xenophobic sentiments, both of which can contribute to sensations of seclusion and marginalization (Aberra, 2024). Financial limits are a significant obstacle for international students, who often encounter elevated tuition prices and living expenses (Woldegiorgis and Chiramba, 2024; Namuwonge, 2024). These challenges are further exacerbated by the restricted availability of financial assistance and part-time employment alternatives (Gukurume, 2024).

Additionally, bureaucratic obstacles, such as the acquisition and upkeep of student visas, further complicate their experience, contributing to the anxiety and lack of assurance (Sivapalan, and Khan, 2024). The complex problems underscore the need for South African higher education institutions to establish strong support mechanisms to improve the academic and social welfare of international students. The results of this study are

crucial for guiding the creation of specific initiatives and policies designed to enhance the support systems inside higher education institutions. The primary objective of the research is to enhance the development of educational settings that are more inclusive and equitable, so enabling them to effectively cater to the different requirements of international students.

2. Literature Review

International students at higher education institutions often encounter a range of obstacles that can significantly impact their academic success and overall satisfaction (Zalli, 2024; Altbach et al., 2019). One of the most prominent challenges is the language barrier. Students from non-English-speaking countries may struggle with understanding lectures, writing academic papers, and participating in classroom discussions (Xiao, 2024). This difficulty often leads to feelings of isolation and frustration as students find it challenging to communicate effectively with peers and professors. Andrade (2006) highlights that language proficiency is a key factor in the academic success of international students, as it directly influences their ability to comprehend course material and engage in academic conversations. Furthermore, language barriers can hinder social integration, making it difficult for international students to form personal relationships and participate in extracurricular activities—important elements of a well-rounded educational experience (Poyrazli, and Grahame, 2007).

Another significant challenge faced by international students is cultural adaptation and homesickness. Moving to a foreign country requires adjusting to a new cultural environment, which can be overwhelming and anxiety-inducing. Many international students experience culture shock when exposed to unfamiliar customs, social norms, and academic practices. This transition can be particularly difficult for those with limited prior experience abroad. Research by Ward, et al., (2001) suggests that cultural differences can lead to misunderstandings, which in turn impede students' ability to interact effectively with local peers and faculty. Additionally, the absence of familiar support networks, such as family and friends, can intensify feelings of loneliness and homesickness, negatively impacting mental health and academic performance (Sawir et al., 2008).

Financial difficulties are another major challenge for international students in higher education. These students often face higher tuition fees compared to local students and have limited access to financial aid or scholarships. Chen (2017) argues that the financial strain of studying abroad can create significant psychological stress, which may interfere with students' ability to focus on their studies. Moreover, restrictions on work permits often limit international students' opportunities for part-time employment, further exacerbating their financial difficulties. This financial burden may force students to cut back on essential expenses such as healthcare and nutrition, adversely affecting both their academic performance and overall well-being (Beine, et al., 2014). The combination of financial pressure and academic demands creates a challenging environment that can hinder international students' success in higher education.

Communication difficulties also arise during both pre-registration and post-registration stages, as international students often struggle to understand complex university procedures and requirements. These challenges are frequently intensified by language barriers (Watson et al., 2024). International students may find it difficult to navigate registration processes and academic regulations due to differences in educational systems and language proficiency, which can lead to misunderstandings and delays in enrolment (Spencer-Oatey, and Xiong, 2006). Additionally, environmental challenges such as adjusting to new climates, cultural practices, and social norms can further complicate their ability to focus on their studies (Ward, et al., 2001).

Access to university resources, such as libraries, technology, and support services, is another hurdle for international students. These resources are essential for academic success, yet students may face difficulties in utilizing them due to unfamiliarity or lack of information (Poyrazli, and Grahame, 2007). Finally, international students must navigate administrative challenges such as immigration regulations, securing housing, and understanding financial obligations, which add to the complexity of their experience. The need to quickly adapt to and learn about unfamiliar systems can be both demanding and time-consuming (Andrade, 2006).

3. Research Methodology

Research methodology is the systematic framework and set of procedures employed to collect, analyze, and interpret data to address specific research questions or objectives (Creswell, 2024). Qualitative research is an exploratory research method focused on understanding the underlying reasons, opinions, and motivations behind human behavior and experiences (Verma, et al., 2024; Ang, 2024). It involves collecting non-numerical data, such as interviews, observations, and textual analysis, to gain in-depth insights into the subject matter and identify patterns and themes (Shen, and Smith, 2024). Thus, the study adopted a qualitative research

methodology. This research collected qualitative data using the open-ended questionnaire research design, which included delivering questionnaires over the mail as a kind of remote contact, instead of conducting in-person group talks. This enhanced the capacity of all participants to provide individual solutions. The questionnaire was sent to all international students at the Central University of Technology, Free State, South Africa, using the total population as the sampling technique. The questionnaire was sent to 60 international students, and only 36 of the students responded to the questionnaire. The gathered data was then analyzed using thematic analysis. Thematic analysis is a method used in qualitative data analysis to identify, analyze, and report patterns or themes within the data (Mirza, et al., 2024). It involves coding the data, grouping similar codes into broader themes, and interpreting these themes to understand the underlying meanings and insights relevant to the research questions (Braun, and Clarke, 2024).

4. Research Findings and Discussions

Theme 1: Country background of the participants

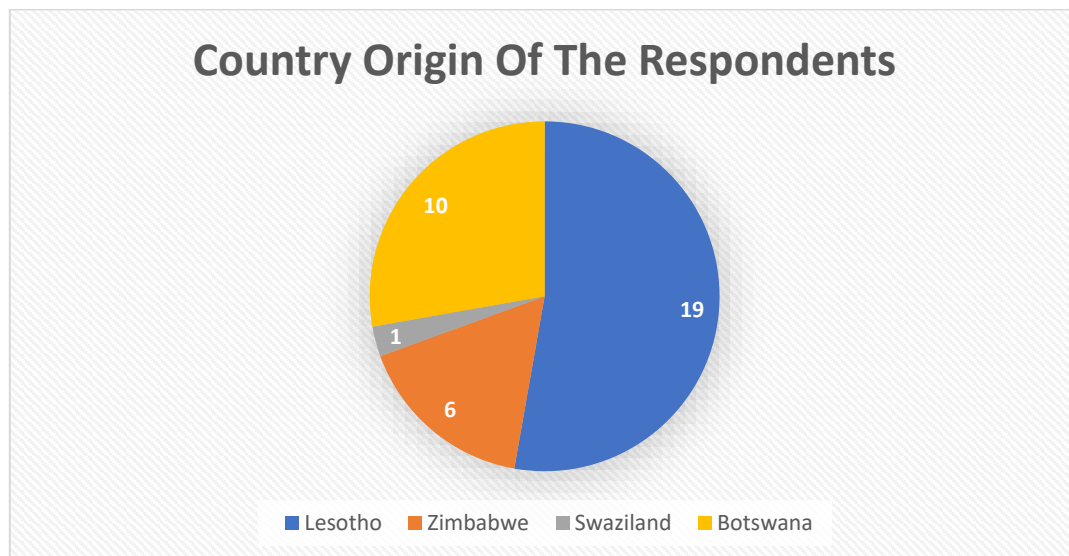


Figure 1: Country background of the participants

As illustrated in Figure 1, the research participants consisted of a heterogeneous cohort of international students originating from Lesotho, Zimbabwe, Eswatini(Eswatini), and Botswana, each contributing distinct cultural and educational experiences. Lesotho had the highest number of respondents, with 19 students, followed by Botswana with 10 respondents. Zimbabwe is represented by 6 respondents, while Swaziland has the least number of respondents with only 1. This suggests that most international students in this dataset come from Lesotho and Botswana, indicating a strong presence from these neighboring countries in the survey. The representation from Swaziland is significantly smaller compared to the other countries.

Theme 2: Communication obstacles encountered during pre-registration and post-registration at the university

The data on communication obstacles encountered during pre-registration and post-registration at the university reveals several significant issues faced by students. A recurring theme is the inefficiency of the university's systems and administrative processes concerning communication with the students and providing answers to the submitted queries. Students reported frequent errors with the registration system, making it difficult to submit necessary documents on time. One student highlighted the impact of visa renewal delays, and mentioning that "I could not submit all the required documents before registration because renewing my study visa took longer than I expected." Additionally, changes in fees and administrative requirements each year, particularly for postgraduate students, caused confusion and frustration. For example, one student noted, "It still doesn't make sense why the finance office includes early fees, yet they know Masters and PhD students pay fees once during their residency period if study received university postgrad funding."

Moreover, communication from the university administration often lacked timeliness and clarity, exacerbating these issues. Students expressed frustration with the delayed responses from finance officers and other departments, which hindered their ability to complete registration processes efficiently. A student mentioned, "We were told to send our documents, but it takes ages for them to give us feedback," highlighting the slow feedback loop. Additionally, network challenges and data shortages were mentioned as barriers to completing

online registration. Some students faced difficulties in understanding administrative procedures, even when language was not a barrier, due to the lack of clear guidance. The negative environment in the international office was another significant concern, with one student describing the atmosphere as draining due to "negative energy," and alleging favoritism and inconsistent assistance. These varied experiences underline the need for improved communication strategies, more responsive administrative support, and a more supportive and professional environment within the university's international office.

Language barriers are another significant challenge, especially for students from non-native English-speaking backgrounds. One student from Eswatini mentioned, "It could be the language barrier since I'm from Eswatini I'm only familiar with Siswati and English, I understand a bit of Zulu since it's similar to one of my home languages." This highlights the struggle of adapting to lectures and social interactions in a multilingual environment. Social anxiety and homesickness were also cited as personal obstacles, affecting students' ability to integrate and feel comfortable in their new surroundings.

To substantiate these findings, several studies have emphasized the presence of communication problems at institutions of higher education. One major issue is the difficulty in understanding the complex terminology and procedural instructions often provided in English or the local language, which can lead to confusion and delays in completing necessary paperwork (Andrade, 2006). Additionally, international students may struggle with accessing support services due to unclear or insufficient information about whom to contact for assistance, resulting in prolonged registration processes and missed deadlines (Kuo, 2011). Moreover, cultural differences in communication styles can lead to misunderstandings between students and university staff, further complicating interactions and creating barriers to effective communication during critical registration phases (Spencer-Oatey, and Xiong, 2006).

Theme 3: Financial difficulties encountered at university

The analysis of financial difficulties encountered by students at the university reveals several significant themes and challenges. A recurring issue is the lack of bursaries and scholarships for international students, which forces them to rely heavily on personal or family funds. As one student poignantly noted, "I do not have a bursary, so I have to pay for my medical aid, registration fee, and also pay for my studies. Apart from that, there is rent, food and cosmetics. To pay for all this my mother must apply for a loan, sometimes she doesn't qualify for it and sometimes she gets a small amount that does not cover what I've mentioned above. It is so frustrating, especially at the beginning of the year." This highlights the significant financial burden placed on students and their families, leading to considerable stress and frustration, particularly at the start of the academic year.

Additionally, the rising costs of medical aid and registration fees present substantial obstacles. Students reported that the annual increase in medical aid fees, coupled with compulsory registration fees, places an additional financial strain. For instance, one student stated, "Medical aid fees are so expensive, and the registration fee is to be paid the same time as medical aid it makes it difficult for students." Moreover, the limited availability of scholarships exacerbates these difficulties, forcing students to cover higher tuition costs out-of-pocket. Issues with financial communication from the university, such as late notifications about fees, further complicate the situation. Some students also mentioned specific financial challenges related to accommodation, food, and necessary academic equipment, underlining the multifaceted nature of their financial struggles. The analysis underscores the need for more robust financial support systems, timely communication regarding financial obligations, and expanded scholarship opportunities to alleviate these burdens.

To substantiate these findings, Zia, et al., (2024) opines that financial difficulties are a common challenge faced by international students at universities, significantly impacting their academic and personal lives. Additionally, they typically have limited access to scholarships, grants, or financial aid, exacerbating their financial strain (Beine, et al., 2014). Restrictions on work permits further limit their ability to earn money while studying, forcing many to rely solely on personal or family funds, which may not always be sufficient. This financial pressure can lead to stress and anxiety, affecting their academic performance and overall well-being (Chen, 2017). Moreover, the high cost of living in many university towns, including expenses for accommodation, food, and transportation, adds to their financial challenges (Zia, et al., 2024). Consequently, some international students may have to make difficult choices, such as cutting back on essential needs or reducing their academic workload to take up part-time jobs, thereby impacting their educational experience and success (Smith, and Khawaja, 2011).

Theme 4: Environmental challenges

The analysis of challenges related to the university's surroundings and atmosphere highlights several key issues faced by students as they adapt to their new environment. One prominent theme is the difficulty in navigating the campus, particularly for new students or those who registered late. A student noted, "It was not easy to find lecture rooms around campus," underscoring the disorientation experienced in a new and large campus setting. This issue is compounded by the lack of maps or guides, as mentioned by another student, "Not having a map on certain buildings to navigate where classes are." Additionally, logistical problems such as inadequate transport from downtown and malfunctioning library plugs add to the daily hassles students face". Furthermore, the physical environment of the campus presents issues such as the poor condition of cafeteria toilets, which a student described as "appalling," reflecting the need for improved facilities. Overall, these responses indicate a blend of logistical, and personal adaptation challenges that need to be addressed to enhance the university experience for all students.

Many international students struggle to find affordable housing close to campus, leading to longer commutes and increased transportation costs, which can be both time-consuming and stressful (Smith, and Khawaja, 2011). Additionally, international students may face difficulties with inadequate facilities, such as outdated libraries, crowded study spaces, and limited access to technology, which can hinder their academic performance (Forbes-Mewett, and Nyland, 2013). Another significant challenge is the lack of cultural and dietary accommodations in university dining facilities, which can affect students' health and comfort. Students from diverse cultural backgrounds may find it challenging to adjust to unfamiliar food options, potentially impacting their nutritional well-being (Brown, and Edwards, 2011). Lastly, international students often face difficulties in navigating unfamiliar urban environments, such as understanding public transportation systems or finding suitable accommodation, which can add to their stress and anxiety (Forbes-Mewett, and Nyland, 2013).

Theme 5: Accessibility challenges to university resources

The analysis of the data on challenges related to the accessibility of university resources reveals a few key issues with most students reporting no difficulties. A notable concern is the lack of alternative power sources during load shedding, which forces students to leave study premises like the library and student support centres. One student specifically mentioned, "Lack of alternative power sources at university. Being escorted out of university study premises (student support and library) during load shedding." This highlights the disruption of academic activities due to power outages, underscoring the need for the university to invest in backup power solutions to ensure continuous access to critical resources.

Another significant challenge pertains to delays and issues in accessing essential academic resources. For instance, a student reported difficulty in obtaining necessary materials for practical, stating, "The university does not give us resources on time, especially for practical's." Additionally, problems with digital resources were highlighted, such as being unable to download books from the e-library and issues with accessing the university portal due to not having a South African Identity number. These issues point to gaps in the digital infrastructure and resource management at the university. Moreover, the need for better communication and accessibility of career information was noted, suggesting a lack of visibility and availability of career services. Overall, while many students reported no issues, these highlighted problems indicate areas where the university can improve resource accessibility and support to enhance the academic experience.

Moreover, unfamiliarity with the university's systems and technology, such as online portals for course registration, resource access, and communication platforms, can lead to confusion and delays in obtaining essential information (Sawir, et al., 2012). Another critical challenge is the lack of cultural competence and sensitivity among university staff, which can result in international students feeling misunderstood or overlooked when seeking assistance, thus discouraging them from utilizing available resources (Andrade, 2006). Additionally, differences in educational practices and expectations can create misunderstandings about how to access academic support, such as tutoring services or writing centers, which may be structured differently from those in their home countries (Smith, and Khawaja, 2011).

Theme 6: Administrative obstacles encountered at the university

The analysis of administrative obstacles encountered by students at the university reveals a mix of positive and negative experiences. A significant number of students reported no administrative obstacles, praising the support provided by the international office. For instance, one student mentioned, "The International Office is very helpful, and I have nothing but good things to say." However, several students highlighted specific issues that impeded their academic progress. One notable problem was the delay in unblocking students for

registration and the late release of the list of continuing postgraduate students cleared for registration. A student expressed frustration, saying, "The list of continuing postgraduates cleared for registration is out late and with some students not on the list. This is inconvenient."

Additionally, some postgraduate students reported dissatisfaction with their study supervisors, mentioning delays in fulfilling the requirements necessary for their eligibility to register and graduate. One student noted, "For postgraduates, study supervisors sleep on their job. Delay in fulfilling the requirements of Exam office-submission of progress reports and other documents required for our eligibility to register and graduate." There were also issues with the finance office, such as delays in accessing I Enabler due to pending sponsorship approvals and slow responses to email inquiries. Another student highlighted a significant administrative error that impacted their academic journey, stating, "The issue of taking off and putting again my results cost me +3 years trying to fix them but never happened only until last semester." These responses indicate areas where the university's administrative processes can be improved to ensure timely and effective support for all students.

Firstly, universities lack administrative competencies in addressing international students' administrative needs (Arthur, 2017). Another obstacle is dealing with unfamiliar academic regulations and administrative procedures, such as course registration, credit transfers, and meeting graduation requirements, which may differ significantly from those in their home countries (Beine, Noël, and Ragot, 2014). Additionally, international students may face challenges in accessing academic support services, such as counseling and career advice, due to a lack of awareness or understanding of how to navigate these services effectively (Choudaha, and Schulmann, 2014). This situation can lead to missed opportunities for academic and professional development. Furthermore, inadequate cultural competence among university staff can result in misunderstandings or inadequate support for international students, as administrative procedures may not be tailored to address their specific needs and cultural differences (Glass et al., 2015).

5. Conclusion

The research reveals that international students encounter a diverse range of problems that have a substantial influence on their academic achievement and personal welfare. The main problems faced by international students in a new educational setting mostly revolve around language limitations, cultural differences, financial limits, and administrative impediments. Each of these factors significantly influences the entire experience of international students. Language problems impede efficient communication, resulting in academic challenges and social seclusion (Andrade, 2006). Cultural disparities often lead to sensations of estrangement and culture shock, hence exacerbating students' capacity to acclimatize and assimilate (Ward, et al., 2001). The presence of elevated tuition rates and restricted availability of financial assistance intensifies financial limitations, leading to increased stress and perhaps impeding academic achievement (Chen, 2017). Overcoming administrative obstacles, such as dealing with intricate immigration procedures and new educational structures, may be challenging without adequate assistance (Arthur, 2017). The study recommends that South African tertiary institutions should provide enhanced support services, such as cultural orientation programs and counseling, to help international students adjust to the academic and social environment. Additionally, study recommends creating of streamlined administrative processes for visas and academic registration to reduce bureaucratic challenges faced by international students. Future research could explore strategies for overcoming the identified obstacles faced by South African international students, comparative studies across different countries, or the impact of institutional support services on student success and well-being.

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HEI Educators' Views on Traditional and Online Teaching and Learning: Post Pandemic

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Abstract: Every aspect of society, especially education, has been profoundly impacted by the COVID-19 pandemic. Nearly all institutions and universities have transitioned from traditional learning to online teaching and learning during the outbreak in order to maintain academic continuity. The goal of the present research is to evaluate how traditional teaching and learning in HEIs, particularly during the post-pandemic period, were affected by online learning. Technology has been used for many years to enhance the teaching and learning process. Therefore, the introduction of technology into many educational contexts was hastened by the COVID-19 pandemic. However, educators confronted a variety of difficulties they had never faced before as a result of the abrupt change to distance learning. Following a qualitative mode of inquiry, the current study sought to discover how a group of 20 South African educators handle their post-pandemic teaching. The researchers conducted in-depth, semi-structured questionnaires with HEI educators to accomplish their goal. Educators were tasked with detailing their journey from in-person to fully online teaching, and later adjusting to a blended format of face-to-face and online instruction. The research aimed to enhance post-COVID-19 teaching by employing various technological, pedagogical, and administrative strategies for both online and traditional learning. In the long run, this was intended to enhance the integration of technology into the pedagogical setting even further. The study's findings laid the groundwork for developing accessible online tools to support academic instructors in effectively utilizing widely adopted online pedagogical techniques.

Keywords: Online teaching and learning, Traditional teaching and learning, HEIs educators, Post pandemic

1. Introduction

Long before the COVID-19 epidemic, many higher education institutions (HEIs) offered blended or mixed-mode delivery through the incorporation of technology into classroom teaching. However, the availability of online teaching and learning (OTL) was an add-on rather than a complete substitute for the course. As a result, given that online educational delivery has become the new normal in many HEI contexts around the world and given the power-coercive and unplanned nature of the transformation, a comprehensive study is required to explore the change brought about by this OTL in HEI contexts. In this manner, future directions for effective online courses would be discovered. Additionally, since professional development for educators takes place in situated contexts of practice, a better understanding of the unique difficulties that online educators faced would help higher education institutions (HEIs) enhance the standard of traditional and OTL programs in the regional contexts of practice. Numerous research conducted over the past few decades have demonstrated the increasing trend of using digital technology in a variety of learning scenarios (Ghanbari & Nowroozi, 2021; Fauzi, 2022 & Turnbull, Chugh & Luck, 2021). Although technology is widely used in a variety of learning contexts, educators have identified a number of barriers to its effective usage in these contexts, including online assessments that require the marking and processing of marks online. This global shift from face-to-face to fully online education occurred at a time when there was no prior advice, insight, or explicit models of good practice for such a large change. The sudden shift to remote teaching and learning via various digital teaching and learning methods posed numerous issues for students and teachers (Turnbull et al., 2021). Furthermore, quality research on the lived experiences of South African educators in the setting of HEIs on traditional and blended learning is lacking. The interest in COVID-19 research has expanded considerably, with thousands of documents provided in a relatively short period of time (Fauzi, 2022). With so much information available, it is delightful to delve into the trending topic in OTL adoption publications that may result in better knowledge of adapting digital learning in the context of HEIs. The approach to cope with the pandemic in HEI settings from these publications with suitable mitigation and intervention plans could provide an insightful understanding to HEIs in designing their strategy based on best practices for the continuum of education. The interest in COVID-19 research has expanded considerably, with thousands of documents provided in a relatively short period of time (Fauzi, 2022). With so much information available, it is delightful to delve into the trending topics in OTL adoption publications that may result in better knowledge of adapting digital learning in the context of HEIs. The approach to coping with the pandemic in HEI settings from these publications with suitable mitigation and

intervention plans could provide an insightful understanding to HEIs in designing their strategy based on best practices for the continuum of education.

- What are the barriers faced by South African educators involved in traditional and online teaching and learning in the post COVID-19 pandemic?
- What are the solutions of South African educators involved in traditional and online teaching and learning in the post COVID-19 pandemic?

2. Online Teaching and Learning Post Pandemic

Prior to COVID-19, online learning was a supplemental option to conventional, in-person instruction, often targeted at working adults, international students, or those geographically separated (Allen & Seaman, 2017). The pandemic forced HEIs to swiftly adapt, leading to varied experiences due to inadequate preparation. Teachers had to quickly modify lesson plans for virtual platforms, often without sufficient training, as seen in organizations like Peking University, which faced early difficulties but eventually streamlined their online education systems (Bao, 2020). COVID-19 necessitated a global shift from traditional in-person methods to online teaching/learning (Bao, 2020; Dilucca & Souli, 2020; Wang, Horby, Hayden & Gao, 2020), presenting significant challenges, especially for public institutions. While many institutions successfully transitioned online, attracting 90% of their student body, others struggled with connectivity and adapting teaching methods. South African HEIs faced additional challenges due to limited internet access, requiring teachers to use social media platforms for educational resources (Naik, Deshpande, Shivananda, Ajey, & Manjunath, 2021). Live classes necessitated robust infrastructure, software, and high-speed internet. Online education involves more than passive listening; it demands active engagement, planning, and support, presenting numerous challenges (Wang et al., 2020; Naik et al., 2021). Post-pandemic, online education components have cemented their place in the educational landscape. Educators, now more familiar with digital tools, recognize the importance of both synchronous and asynchronous learning, which provide flexibility and maintain student engagement and community (Aguilera-Hermida, 2020; Raes, Detienne, Windey & Depaepe, 2020). Hybrid learning, combining online and in-person methods, is gaining popularity, blending social interaction with the flexibility of online formats (Alammary, Sheard & Carbone, 2014). Despite increased accessibility, online education raises equity issues, disadvantaging students lacking reliable internet or quiet study spaces.

3. Traditional Teaching and Learning Post Pandemic

The Covid-19 pandemic has profoundly impacted traditional teaching and learning systems worldwide, serving as a catalyst for the rapid transition to digital platforms. Prior to the pandemic, traditional in-person classroom instruction was predominant, with only 15% of lecturers having taught online (Pedro & Kumar, 2020). In South Africa, historical educational inequalities had already caused significant disparities in traditional education quality across institutions (Spaull & Jansen, 2019). The pandemic's onset led to widespread school and campus closures, affecting over 1.5 billion students globally (Tadesse & Muluye, 2020), and necessitated a swift pivot to online learning. South African higher education institutions (HEIs) faced unique challenges, such as unequal access to digital infrastructure, making the transition to online learning particularly difficult and exacerbating existing inequalities (Mayisela, Govender & Hodgkinson-Williams, 2022). Although some institutions have resumed in-person classes, the landscape of higher education has permanently shifted. There is a growing acceptance of blended learning models, which combine online and in-person elements, as a way to address access and equity issues thoughtfully (Power, Kay & Craig, 2023; Bozkurt et al., 2022). South African educators, however, face unique obstacles, including load shedding and data access issues, while adapting to new teaching modes. Despite the flexibility offered by online platforms, educators lament the loss of real-time engagement with students (DeCoito & Estaiteyeh, 2022). Ultimately, the pandemic has indelibly altered traditional teaching and learning, ensuring that while in-person methods will persist, they will continue to evolve in conjunction with online and hybrid models.

The post-pandemic period has brought about a fundamental shift in educational landscapes worldwide, particularly in higher education institutions (HEIs). The rapid transition to online teaching during the COVID-19 pandemic highlighted significant gaps in digital infrastructure, pedagogical preparedness, and equitable access to education. As a result, institutions and educators have had to adapt to hybrid and blended learning models, combining the benefits of traditional face-to-face engagement with the flexibility of online learning. While technology has played a pivotal role in maintaining academic continuity, challenges such as digital equity, engagement, and the digital divide have persisted, particularly in regions with limited internet access. Post-pandemic literature underscores the importance of refining these hybrid models to ensure inclusivity, enhance

digital literacy among educators and students, and improve the accessibility of online platforms. In addition, the pandemic has prompted a re-evaluation of teaching methods, compelling educators to embrace innovative approaches that cater to diverse learning needs while addressing the systemic inequalities exacerbated by the pandemic.

4. Methodology

The methodology section of this study followed a qualitative approach, employing semi-structured interviews with 18 South African higher education institution (HEI) educators. The quotes used in the paper were derived directly from these interviews, which were guided by a set of open-ended questions. These questions aimed to explore the educators' experiences with traditional and online teaching during and after the COVID-19 pandemic. A thematic analysis was conducted to identify patterns and themes within the responses, highlighting both commonalities and dissonance between participants' views. Rather than selectively presenting quotes, the analysis aimed to reflect an accurate representation of the data, grounded in the educators' shared experiences and distinct challenges. The quotes were categorised into specific themes related to the research questions, ensuring a comprehensive analysis of the educators' perspectives. The study used purposive sampling to select 18 educators from various disciplines, ensuring a diverse and representative sample. Data collection involved semi-structured interviews, lasting approximately 60 minutes, conducted either face-to-face or via secure online platforms. An interview guide with open-ended questions facilitated the interviews, allowing deep engagement with participants. Ethical considerations included informing participants about the study's aims, voluntary participation, confidentiality, and obtaining written informed consent. The interviews were transcribed and analysed using thematic analysis to identify key themes related to HEI educators' views on traditional and online teaching. The analysis focused on three main themes: "Online Teaching and Learning," "Traditional Teaching and Learning," and "HEI Educators Post-Pandemic," highlighting educators' perceptions, difficulties, and experiences. The findings provided valuable insights into how the epidemic has transformed HEI educators' instructional strategies, informing educational policy and practice. The purpose of this research paper was to evaluate the views of Higher Education Institution (HEI) educators on traditional and online teaching and learning methods, especially in the context of the ongoing epidemic. Understanding educators' perspectives on these teaching approaches was crucial for educational planning, policymaking, and enhancing student outcomes. Given the nuanced and context-dependent nature of educators' experiences and perspectives, a qualitative approach was deemed most appropriate for this study. This approach allowed for an in-depth exploration of educators' views and provided richer insights into the complexities involved in traditional and online teaching in HEIs.

4.1 Results

Incorporating biography data, as detailed in Table 1, provides essential context for understanding the perspectives and experiences of educators regarding traditional teaching and learning before and after the pandemic. Factors such as gender, age, educational background, and teaching experience influence attitudes, approaches, and challenges in education. Experienced educators favoured traditional methods due to familiarity, while those with tech backgrounds are more open to innovative approaches. Gender and age can also impact perceptions of technology adoption and adaptability. This study's diverse participant pool, including various genders, age groups, home languages, educational levels, and professional experiences, enriches the analysis by reflecting a wide range of views and experiences. The demographic and professional diversity captured in the biography data ensures a comprehensive understanding of the evolving educational landscape and the intersecting factors influencing traditional and online teaching post-pandemic.

Table:1: Biography data

Participants	Gender	Age	Home language	Educational Level	Occupation	Number of Experience at HEIs
Participant 1	Male	35-44	Setswana	Postgraduate	Lecturer	6-10 years
Participant 2	Male	35-44	Sesotho	Postgraduate	Lecturer	16-20 years
Participant 3	Female	>55	IsiZulu	Postgraduate	Senior Lecturer	11-15 years
Participant 4	Female	25-34	Setswana	Postgraduate	Junior Lecturer	2-5 Years
Participant 5	Female	35-44	Sesotho	University Degree	Junior Lecturer	6-10 years

Participants	Gender	Age	Home language	Educational Level	Occupation	Number of Experience at HEIs
Participant 6	Female	35-44	Sesotho	Postgraduate	Lecturer	6-10 years
Participant 7	Female	25-34	IsiZulu	Postgraduate	Lecturer	6-10 years
Participant 8	Female	45-54	Afrikaans	Postgraduate	Junior Lecturer	Over 20 years
Participant 9	Female	35-44	Sesotho	University Degree/Diploma	Part-time Lecturer	6-10 years
Participant 10	Female	35-44	Sesotho	Postgraduate	Lecturer	16-20 years
Participant 11	Female	45-54	Afrikaans	Postgraduate	Lecturer	Over 20 years
Participant 12	Female	25-34	Sesotho	Postgraduate	Lecturer	6-10 years
Participant 13	Male	25-34	Sesotho	Postgraduate	Junior Lecturer	2-5 years
Participant 14	Female	25-34	Sesotho	Postgraduate	Lecturer	2-5 years
Participant 15	Male	45-54	IsiZulu	Postgraduate	Senior Lecturer	Over 20 years
Participant 16	Female	35-44	Afrikaans	University Degree/Diploma	Lecturer	11-15 years
Participant 17	Female	55and above	Sesotho	Postgraduate	Senior Lecturer	16-20 years
Participant 18	Male	25-34	English	Postgraduate	Junior Lecturer	2-5 years

Table 2, outlining key interview themes, enhances understanding of post-pandemic traditional teaching. It organizes diverse perspectives, highlighting resistance to change, technological challenges, the value of face-to-face interaction, and flexible teaching needs, enriching qualitative data analysis.

Table 2: Interview responses

Participants	Theme:1 Online Teaching and Learning Before Pandemic	Theme: 2 Traditional Teaching and Learning-Before Pandemic	Theme: 2 Traditional Teaching and Learning-Post Pandemic	Theme: 3 HEI Educators Post-Pandemic
Participant 1	"Pre-pandemic, online teaching was rare; COVID-19 prompted a substantial surge in its use, driving increased awareness and adoption among educators."	"Educational settings confront challenges such as student absenteeism impacting performance, while educators keenly discern students' comprehension struggles."	"Students' habitual attendance online may diminish their desire for traditional classroom attendance."	"Teachers must adapt, innovate, and ensure flexibility in traditional teaching for post-COVID education."
Participant 2	"The tool's potential remained untapped, possibly perceived as bothersome as learning predominantly occurred in physical classrooms."	"Physical interaction in group settings fosters engagement, focus, and discussion, making it the preferred method over virtual learning."	"Resource constraints impede online learning, causing students to lag in accessing information and completing assessments due to limited access to mobile phones, laptops, and data."	"Maximize online teaching with eThuto integrated with WhatsApp, incentivizing attendance with surprise quizzes."
Participant 3	"Online teaching compelled both lecturers and students to acquire essential technological skills while fostering independent learning and time management outside traditional office settings."	"Traditional teaching's reliance on paper is costly, fostering technophobia and hindering global networking opportunities among peers."	"Traditional teaching confines both lecturers and students to one environment, using limited tools."	"HEI must ensure internet access while the South African government tackles load shedding and provides tech training for lecturers."

Participants	Theme:1 Online Teaching and Learning Before Pandemic	Theme: 2 Traditional Teaching and Learning-Before Pandemic	Theme: 2 Traditional Teaching and Learning-Post Pandemic	Theme: 3 HEI Educators Post-Pandemic
Participant 4	"Assisting a friend with a University assignment, I found online teaching intriguing, realizing its potential for my own lectures, fostering a passion for continuous learning in this domain."	"Traditional teaching allows for direct observation of students' comprehension and engagement, but the shift prompted by COVID-19 revealed a technological lag in education."	"Traditional teaching barriers: attendance, lateness, participation, lecture repetition, crowded venues, mobile phone distractions, and inadequate technology."	"Online teaching solutions encompass prerecorded lectures, interactive Q&A sessions, lecturer rating systems, seamless sessions, topic discussions for student engagement, and camera participation mandates."
Participant 5	"Online learning offers flexibility and accessibility, enabling personalized learning from anywhere for a diverse student body."	"Pre-pandemic, traditional teaching involved face-to-face interactions in physical classrooms, fostering direct communication, immediate feedback, and real-time engagement for lectures and discussions."	"Post-pandemic, persistent health concerns may prompt increased tech integration in education, necessitating a blend of in-person and online formats to accommodate diverse learning styles amid resource constraints and the challenge of sustaining student engagement".	"Ensure classroom safety and health with proper ventilation, cleanliness, and adherence to health protocols while gradually integrating technology for enhanced teaching experiences."
Participant 6	"Managing online classes for over 800 students posed challenges due to limited interaction, assignment-based assessments, and difficulties catering to special needs amidst distancing issues."	"I cherish teaching for its deep student connections, discerning attendance, robust assessments, and the tradition of approachability fostering understanding."	"Honestly, in my traditional teaching and learning, everything is fine, and my students understand the rules of our class, no late coming, we all participant"	"I wish the institution emphasized the importance of online learning for students, ensuring no one misses out, and provided one-on-one consultations, particularly for those with special needs during COVID-19."
Participant 7	"Online teaching was a myth, something strange that I never thought I would one day be forced to do."	"Teaching was very simple and rudimentary, one had to just come in the class and deliver the expected curriculum without really paying attention to student engagement."	"Regulating student engagement in the classroom Monitoring and evaluation in the class in terms of progress Theres no time to focus on hidden curriculum."	"Leverage interactive online platforms like Zoom, Microsoft Teams, or Google Meet for engaging virtual classes, enabling real-time interaction and collaborative activities, mirroring the classroom experience online."
Participant 8	"Poorly structured courses cause student disinterest; well-structured material and regular contact benefit students."	"Students and lecturers prefer face-to-face interactions to build relationships and ease communication."	"Challenges include practical demonstrations online, time-intensive setups, and disengagement among slower learners."	"Encourages attendance to prevent information loss."
Participant 9	"Appreciation for online education pre-COVID, despite its challenges."	"In-person interactions in classrooms facilitated direct communication and real-time engagement."	"Barriers included digital literacy, technology access, and maintaining engagement and assessment integrity online."	"Advocates for professional development in online teaching to enhance educators' confidence and skills."
Participant 10	"Limited exposure to online tools; primarily used for content uploads."	"Reliance on traditional methods due to unresponsive students despite various teaching attempts."	"Recorded lessons had low engagement and did not improve learning outcomes."	"Plans to continue traditional methods and focus on content necessary for assessments."

Participants	Theme:1 Online Teaching and Learning Before Pandemic	Theme: 2 Traditional Teaching and Learning-Before Pandemic	Theme: 2 Traditional Teaching and Learning-Post Pandemic	Theme: 3 HEI Educators Post-Pandemic
Participant 11	"Did not engage with online teaching pre-COVID, preferring in-person lessons."	"Traditional methods were preferred and effective pre-COVID."	"Common excuses for non-attendance include lack of data and tech resources."	"Suggests improving class appeal to ensure attendance, pending resource provision."
Participant 12	"Valued online teaching during COVID but preferred in-person methods."	"Traditional teaching allowed for active learning and social skills development."	"Found adapting to online methods post-COVID challenging due to reduced interaction."	"Needs more support and resources to blend traditional and online teaching effectively."
Participant 13	"Noted a pre-pandemic rise in online instruction enhancing traditional methods with interactive tools."	"Traditional in-person methods dominated, using textbooks and discussions for effective learning."	"Challenges included maintaining engagement online and technical issues disrupting learning."	"Recommends professional development for educators, flexible course designs, and active learning tactics online."
Participant 14	"Thought online teaching and learning required strong self-discipline and was not reliable."	"Promotes active engagement and a coordinated learning environment."	"Challenges included lack of learning devices, data, and clear communication."	<u>"Solution is to train staff and students on the use of online platforms and provide adequate facilities and equipment."</u>
Participant 15	"Offered a promising avenue for reaching more students despite some reservations."	"Valued for facilitating irreplaceable face-to-face engagement and immediate feedback."	"Hybrid models posed challenges but offered a creative space for blending methods."	"Invest in mixed learning and online ways to enhance education."
Participant 16	"Marked by caution due to concerns about effectiveness and equity."	"Valued for direct interaction but needed to blend with new strategies."	"Blended approach supports a balanced and effective learning environment."	"Adopt interactive online materials and integrate technology in classrooms."
Participant 17	"Viewed as a groundbreaking avenue for educational innovation."	"Valued for fostering interpersonal connections and engagement."	"Hybrid model essential for safety but challenging for interaction quality."	"Use online platforms and game-like elements to enhance online classes."
Participant 18	"Viewed with scepticism due to lack of depth in interaction."	"Preferred for cultivating personal connections and understanding."	"Pandemic forced a shift towards hybrid teaching models."	"Adapt methodologies for real-time discussions in online classes"

5. Discussion

5.1 Online Teaching and Learning before Pandemic

The theme of "Online Teaching and Learning before Pandemic" underscores a period of underutilisation and scepticism towards digital education within the higher education sector. Before the COVID-19 pandemic, online learning was often perceived as a supplementary or secondary mode of education, lacking the engagement and effectiveness of traditional classroom settings. The responses indicate a general lack of preparedness and investment in online learning infrastructure and pedagogical strategies tailored for digital environments (Bao 2020). Furthermore, educators' testimonies reflect a limited recognition of the potential for online platforms to expand access to education and to foster independent learning among students. The pandemic, however, acted as a catalyst for a significant paradigm shift, compelling educators and institutions to rapidly adapt to and embrace online teaching and learning out of necessity (Lederman 2020). This unexpected transition highlighted the importance of digital literacy, the need for robust online learning platforms, and the potential benefits of flexible, student-centered learning approaches that could reach beyond the constraints of traditional classrooms (Hodges, Moore, Lockee, Trust & Bond, 2020).

5.2 Traditional Teaching and Learning

The sentiments expressed regarding traditional teaching and learning methods highlight both the strengths and limitations of this approach. While traditional methods offer in-person interaction, immediate feedback, and a sense of connection between educators and students, they also face challenges such as student absenteeism, reliance on paper materials, and limited opportunities for networking with peers globally (Anero,

& Tamayo, 2023). The COVID-19 pandemic forced a re-evaluation of these methods, revealing both the necessity and potential of integrating technology into education. This shift underscored the importance of adapting to new teaching and learning approaches while recognizing the value of traditional methods in fostering direct engagement and facilitating deeper understanding (Sato, Condes Moreno, Rubio-Zarapuz, Dalamitros, Yañez-Sepulveda, Tornero-Aguilera & Clemente-Suárez, 2023). Moving forward, a blended approach that combines the best aspects of traditional and modern techniques may offer the most comprehensive and effective educational experience, catering to diverse learning styles and needs.

The post-pandemic landscape of traditional teaching and learning reveals a complex interplay between the desire to return to familiar methods and the necessity of adapting to a rapidly evolving educational environment. While educators express a longing for the pre-pandemic era of face-to-face interaction, the shift towards online and hybrid models has exposed numerous barriers, including technological challenges, disparities in access to resources, and difficulties in maintaining engagement and motivation (Elhawa, Alexander & Krajka, 2024). The hybridisation of teaching methods emerges as a pragmatic response, blending traditional approaches with online tools to accommodate varying learning styles while prioritizing safety (Adi Badiozaman, Ling, & Ng, 2024). This transition underscores the need for flexibility and innovation in education, challenging educators to reassess their pedagogical practices and embrace a dynamic blend of old and new techniques to ensure effective learning outcomes in an ever-changing world.

5.3 HEI Educators Post-Pandemic

The discussion on the theme of "HEI Educators Post-Pandemic" suggests a transformative shift in teaching methodologies driven by the exigencies of the COVID-19 pandemic. This transition is characterised by an embrace of digital platforms and a re-evaluation of pedagogical approaches to enhance student engagement and learning outcomes. For instance, educators now recognise the importance of integrating technology into traditional teaching environments, not just as a temporary solution but as a long-term educational strategy. This adaptation includes the innovative use of applications like WhatsApp alongside traditional learning management systems (LMS) to maintain student engagement (Martin & Bolliger 2018). Additionally, the emphasis on flexibility in teaching methods and the provision of resources such as internet access reflect an understanding of the need to mitigate the digital divide and support diverse student populations (Bond, Bedenlier, Marín & Händel, 2021). The pandemic has accelerated the adoption of blended learning models, compelling educators to refine their approaches to ensure that both in-person and online learning environments are effective and responsive to students' needs (Raes, Detienne, Windey & Depaeppe 2019). The shift towards more dynamic and interactive online learning environments underscores a broader movement within higher education towards inclusivity, accessibility, and the leveraging of technology to foster educational resilience and innovation in the face of future challenges.

6. Recommendation for Future Research

The paper advocates for a strategic shift in higher education post-pandemic towards hybrid learning models, blending online and traditional teaching to cater to diverse learning preferences and ensure educational resilience. Emphasis is placed on significant investments in digital literacy and robust online platforms to enhance accessibility and effectiveness for all students, alongside continuous professional development for educators and students to bridge the digital divide and foster inclusivity. Collaboration among stakeholders is urged to embrace technological advancements and pedagogical innovations for a future-proof and equitable educational landscape. Future research should prioritize investigating the long-term impact of hybrid pedagogies on student outcomes, retention, and engagement, while addressing equity and access to ensure all students have equitable learning opportunities. This comprehensive approach aims to promote social justice and optimize educational practices for inclusivity and effectiveness.

7. Conclusion

In conclusion, the upheaval brought about by the COVID-19 pandemic has fundamentally reshaped the landscape of teaching and learning within higher education. What was once perceived as a secondary mode of education, online learning, has now become an integral component of educational strategies, complementing traditional methods. The pandemic served as a catalyst for change, forcing educators and institutions to rapidly adapt and embrace digital platforms, leading to a re-evaluation of pedagogical approaches and the integration of technology into teaching practices. As we move forward, the hybridization of teaching methods, blending the strengths of traditional and online approaches, emerges as a pragmatic response to the challenges posed by the pandemic. This transformative shift underscores the need for flexibility, innovation,

and inclusivity in education, ensuring that students are equipped with the skills and resources necessary to thrive in an ever-evolving world.

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Insights into Building VR Solutions in the Police Domain

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Abstract: Advanced technologies such as Virtual Reality (VR) hold immense significance for society, particularly in the law enforcement domain. VR offers a unique platform for immersive, experiential learning, allowing Police Officers (POs) to engage with dynamic scenarios that mirror real-world situations, incidents, and challenges. In the Police domain, the integration of VR solutions provides valuable insights into enhancing POs' training, situational awareness, and community relations. Learning objectives in VR-based Police training encompass a spectrum of skills, including decision-making under pressure, effective communication and collaboration, and de-escalation techniques. Furthermore, evaluation perspectives span both quantitative and qualitative measures, assessing training efficacy, officer performance, and societal impact. This research adopts a systematic literature review approach where it becomes evident that the future of VR-enabled policing lies in interdisciplinary collaboration, technological innovation, and ethical considerations. Future directions entail refining VR solutions to reflect evolving societal dynamics, integrating Artificial Intelligence (AI) for adaptive scenario generation and analytics, and addressing concerns related to algorithmic transparency, fairness, security, and privacy. By leveraging VR technologies, law enforcement agencies can enhance operational effectiveness and foster trust, accountability, and responsibility within the communities they serve.

Keywords: Police, Law enforcement, Police conflict, Police bystander, Virtual Reality

1. Introduction

"Why shouldn't people be able to teleport wherever they want?" (Palmer Luckey)

In recent years, law enforcement agencies witnessed a significant surge in the number of conflicts and crises that POs need to address. This trend can be attributed to a multitude of factors, including socio-economic disparities and the erosion of trust between communities and law enforcement. Furthermore, the rise of social media and the widespread availability of video-recording devices brought increased scrutiny to police actions, amplifying tensions, and fueling public distrust. This erosion of trust made it more difficult for POs to effectively communicate and establish rapport with the communities they serve, potentially exacerbating conflicts. Additionally, socio-economic factors like poverty, unemployment, and lack of access to education and healthcare contributed to an environment ripe for civil unrest and criminal activity. POs are frequently called upon to address such issues and deal with their implications and consequences. This requires training programs that emphasize communication skills, emotional intelligence, and scenario-based simulations. By equipping POs with the tools to deal with or defuse tense situations, law enforcement agencies can reduce injuries, legal liabilities, and negative publicity, while fostering stronger relationships with the relevant communities. Hence, the development and deployment of VR solutions for training and support of POs in a responsible and trustworthy manner is imperative as this approach offers a unique opportunity to create immersive, scenario-based simulations that closely mimic real-world situations, allowing officers to practice and refine their skills in a safe and controlled environment (Giessing, 2021). In this digital environment, POs are exposed to various situations, from de-escalation to crisis intervention, thus their decision-making abilities, communication skills, and emotional intelligence can improve allowing them to deal with high-stress events effectively (Zechner et al., 2023). Moreover, using VR in police training can foster a culture of responsibility and trustworthiness by supporting accountability and transparency in a human-centered approach that integrates individual needs, include input from diverse community stakeholders, and prioritize ethical considerations while ensuring their adherence to established law enforcement protocols and practices (Xie et al., 2021; Maathuis, 2023). This calls for a systematic development of VR solutions in the Police domain and directly implies a comprehensive analysis of the underlying dimensions, methods, and techniques considered. To the best of our knowledge, such an approach is lacking in the existing body of knowledge. To address this gap, this research reflects on existing learning objectives and evaluation mechanisms considered, and further gathers lessons learned and prospective avenues for building responsible VR solutions within the Police domain. The overarching aim is to both garner valuable insights into prevailing research methodologies and solutions, and further also to foster a deeper understanding of how responsible and trustworthy VR solutions can be developed in the Police domain to bolster security and safety endeavors. To this end, the following research questions are formulated:

- **RQ 1:** What are the learning objectives of existing VR solutions in the Police domain?
- **RQ2:** What are the evaluation mechanisms considered to assess the effectiveness of the VR solutions proposed?

- **RQ 2:** What are the lessons learned and future perspectives for building responsible VR solutions?

To this end, this research conducts a systematic literature review following the principles of the PRISMA methodology as outlined by Page et al. (2021). This approach enables the extraction of valuable insights and future perspectives essential for informing the development of VR solutions finely tuned to meet the unique needs of law enforcement agencies while assuring their development and deployment in a responsible and trustworthy manner.

The outline of the article is structure as follows. In Section 2, the research approach considered is addressed. In Section 3, the learning objectives of existing VR gaming solutions in the Police domain are presented. In Section 4, a comprehensive analysis is adopted to discuss existing evaluation mechanisms used when developing and deploying such solutions. In Section 5 are captured lessons learned that could be of use when building future VR solutions in the Police domain in a responsible manner. Concluding remarks and future perspectives are outlined in Section 6.

2. Research Methodology

The aim of this research is to capture learning objectives, lessons learned, and future perspectives in relation to building responsible VR solutions in the Police domain. It does that to provide insights into existing research approaches and solutions, and to further contribute to efforts that aim at building responsible and trustworthy digital technologies and solutions for security and safety purposes. Accordingly, the following research questions are formulated:

- **RQ 1:** What are the learning objectives of existing VR solutions in the Police domain?
- **RQ2:** What are the evaluation mechanisms considered to assess the effectiveness of the VR solutions proposed?
- **RQ 2:** What are the lessons learned and future perspectives for building responsible VR solutions?

To capture valuable insights and future perspectives when developing VR solutions in the Police domain, a systematic literature review approach is undertaken, following the structured methodology outlined by Denyer and Tranfield (2009). This approach starts with the delineation of objectives, followed by the identification of research studies, in-depth analysis of relevant literature, and ultimately, the presentation of the results gathered. By adhering to the guidelines outlined in the PRISMA methodology, robust data collection is ensured, utilizing the PRISMA 2020's stage flow diagram for meticulous data collection, screening, and analysis (Page et al., 2021). Then valuable insights and future perspectives are extracted to guide the development of VR solutions tailored to the specific requirements of law enforcement agencies. Hence, the following research steps are considered and are depicted in Figure 1 below:

Step 1: Identification: In this step, studies were chosen using various combinations of keywords such as *VR*, *virtual reality*, *law enforcement*, *police*, *policing*, *criminal justice*, *police conflict*, and *police bystander*. Only articles in English were included in the search, conducted across the ACM, IEEE Digital Library, Web of Science, Wiley, and the first ten pages of Google Scholar scientific databases. The search timeframe was restricted to the period between January 1, 2015, and December 31, 2023. As a result, the initial findings yielded 1887 articles, of which 76 duplicates were identified and promptly eliminated.

Step 2: Screening: In this step, the studies were screened based on their abstract, title, and keywords, applying criteria such as relevance to the topic and direct relevance to VR and Police domains for exclusion. Consequently, a final set of 20 studies was selected for further in-depth review.

Step 3: Inclusion: During this step, the final selected 20 research studies are in-depth examined and summarized in Table 1 below:

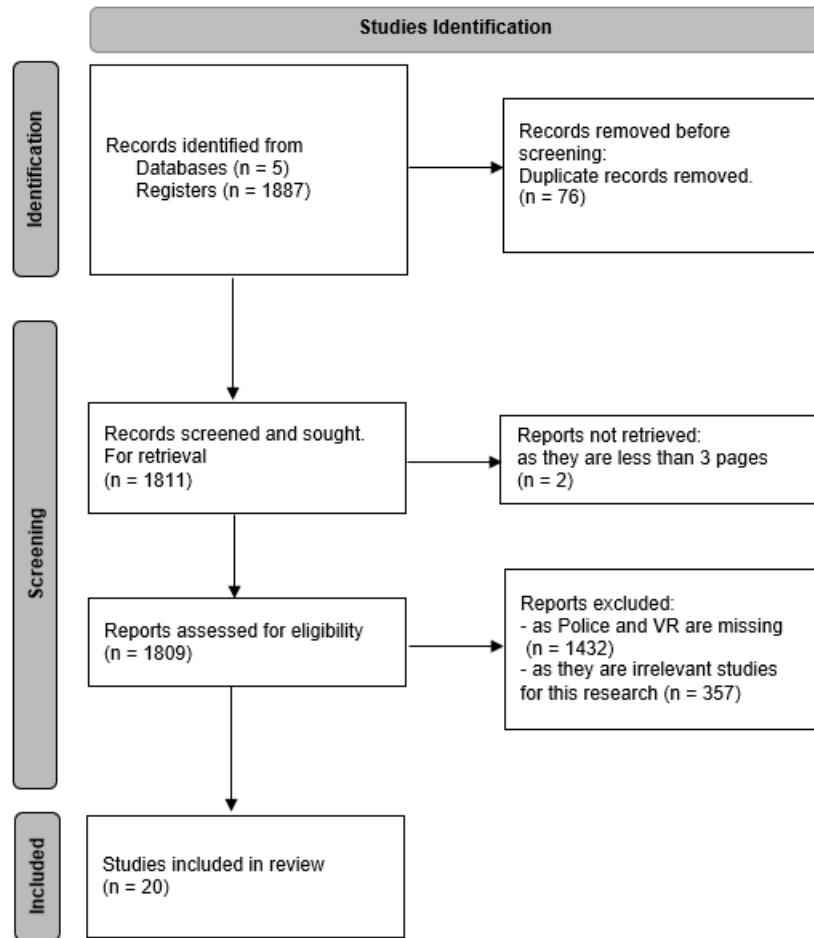


Figure 1: Research approach

Table 1: Information about the studies selected

No	Title Study	Year	Research Aim	Research Type	Reference
1	Virtual Reality Training of Law Enforcement Officers in Predicting Terroristic Attacks Indicators	2022	To design a VR-based serious game for Police training for the identification of suspicious terrorist activities.	Application	Soldatos et al., (2022)
2	Validating Virtual Reality as an Effective Training Medium in the Security Domain	2019	To assess the effectivity of a VR training for LEAs (Law Enforcement Agencies) and first responders, and compare the results in relation to conducting the same exercises without VR in live settings.	Application	Saunders et al., (2019)
3	Trusted Virtual Reality Environment for Training Security Officers	2023	To build a VR-game for training LEAs and security professionals in the analysis and prediction of potentially terroristic activities.	Application	Pantazidis et al., (2023)
4	Exploring VR Training for First Responders	2020	To explore VR training challenges and review four public safety VR scenarios.	Position/Review	Haskins et al., (2020)

No	Title Study	Year	Research Aim	Research Type	Reference
5	The Impact of Virtual Reality in the Social Presence of a Virtual Agent	2020	To assess the impact that a social interaction with an Intelligent Virtual Agent has on subjects across different mediums with different immersion levels.	Application	Guimarães et al., (2020)
6	Virtual reality for law enforcement training: a demonstration and implication for dispatch priming	2022	To assess the impact of a VR-intervention in a case of dispatch priming.	Application	Potts et al., (2022)
7	Virtual reality training for police officers: a comparison of training responses in VR and real-life training	2024	To assess VR SBT in VRT training of POs.	Application	Kleygrewe et al., (2024)
8	Can a Virtual Reality Training Scenario Elicit Similar Stress Response as a Realistic Scenario-Based Training Scenario?	2024	To assess if a VR training scenarios would elicit a similar stress response as a realistic scenario-based training scenario.	Application	Martaindale et al., (2024)
9	Deep-Breathing Biofeedback Trainability in a Virtual-Reality Action Game: A Single-Case Design Study with Police Trainers	2022	To assess response inhibition in police-decision making contexts.	Position/Review	Michela et al., (2022)
10	A Virtual Reality Embodiment Technique to Enhance Helping Behaviour of Police Toward a Victim of Police Racial Aggression	2019	To explore the effectiveness of VR embodiment techniques in reducing implicit racial bias among POs.	Application	Kishore et al., (2019)
11	The Cycle of Violence: Understanding Individual Participation in Collective Violence	2015	To explore the role of group identity in individual participation in collective violence and the impact of such behaviour on group identification.	Position/Review	Litman & Paluck (2015)
12	Measuring presence and performance in a virtual reality police use of force training simulation prototype.	2019	To develop a VR training simulation designed to help police officers learn and apply use of force policies effectively.	Application	Garcia, Ware & Baker (2019)
13	Stress out: translating real-world stressors into audio-visual stress cues in VR for police training	2021	To develop and validate a VR training simulation for police officers, focusing on improving decision-making in use of force scenarios.	Application	Nguyen et al., (2021)
14	A concept of a training environment for police using VR game technology.	2018	To design a police training VR-tool for traffic control.	Application	Caserman et al., (2018)
15	The potential of virtual reality for police training under stress: a SWOT analysis. In Interventions, training, and technologies for improved police well-being and performance	2021	To explore the potential of VR in enhancing police training, particularly in stress management, decision-making, and situational awareness under stress.	Position/Review	Voigt (2021)
16	Virtual training: Making reality work?	2015	To develop a Virtual Training Environment (VTE) for training police personnel in complex collaborative tasks, with a focus on interactions between police ground forces and helicopter crews.	Position/Review	Bertram, Moskaliuk & Cress (2015)

No	Title Study	Year	Research Aim	Research Type	Reference
17	The desert of the unreal: Inequality in virtual and augmented reality.	2017	To investigate the potential of VR and AR technologies to enhance equality and reduce bias in various societal contexts, including job interviews, law enforcement training, and public privacy concerns.	Position/Review	Franks (2017)
18	An Integrated emotional and psychological assessment for VR-based active shooter incident experiments	2021	To test the effectiveness of an active shooter VR experiment on emotional and physiological responses to evaluate the realism of the active shooter scenario for research or training purposes.	Application	Awada et al., (2021)
19	A meta-analysis of virtual reality training programs	2021	To explore the effectiveness of VR training programs compared to traditional training methods across various professions, including police and military personnel.	Position/Review	Howard, Gutworth & Jacobs (2021)
20	A review on virtual reality skill training applications	2021	To evaluate the effectiveness of VR training platforms in enhancing high-level motor skills and ensuring accurate task performance in complex environments.	Position/Review	Xie et al., (2021)

3. Learning Objectives

Based on the analysis conducted in this research, a comprehensive set of learning objectives emerged. These objectives are rooted in the synthesis of both position studies and practical applications developed, aimed at addressing multifaceted challenges encountered in the Police domain. From understanding the intricate psychological and social dynamics driving collective violence to delving into the intricacies of terroristic attack cycles, VR gaming solutions have provided a unique platform for immersive learning experiences. Moreover, by creating realistic social training environments and simulating stressful scenarios, VR facilitates a more in-depth understanding of decision-making processes and stress responses among law enforcement personnel. Importantly, the potential of VR extends to mitigating biases, enhancing equality, and preparing officers for real-life critical incidents. These learning objectives represent an important step forward in building responsible VR solutions to optimize training methodologies and foster a safer, more informed law enforcement community:

- Understand the psychological and social mechanisms driving individuals to participate in collective violence, including the role of group identity, intergroup conflict, and how violent groups reduce psychological obstacles to violence among their members. Nevertheless, this is directly related to the context of the situation and the agents involved.
- Explore the structure and interrelationships of activities leading to the preparation and execution of terroristic attacks, as described by the Terroristic Attack Cycle (TAC), including understanding the categories of activities within the TAC and utilizing the TAC to develop game scenarios involving combinations of actions.
- Create a realistic Social Training Environment (STE) focusing on dyadic interaction with virtual agents.
- Investigate the effect of priming messages and VR technology on responses of POs and civilians in simulated scenarios and determine whether police officers perform differently from untrained civilians in response to VR-simulated scenarios.
- Conduct training scenarios in both VR and real life settings for POs, focusing on protection tasks.
- Assess the stress response of participants exposed to VR scenarios compared to those exposed to traditional scenario-based training.
- Understand the impact of VR on reducing implicit racial bias among POs, evaluate the effectiveness of VR embodiment experiences in fostering empathy and reducing racial biases in policing, assess the potential of VR training simulations in improving police responses and behaviors towards African Americans, explore innovative technological solutions for addressing systemic racial bias within law

enforcement agencies, and contribute to the development of effective training programs that incorporate VR technology to enhance police understanding and empathy towards the experiences of racial aggression victims. At the same time, the need for understanding the underlying goals and perspectives that conduct to incidents is necessary and a way that contributes to this understanding is considering engagement with all roles involved.

- Assess the potential of VR and AR technologies to mitigate biases and enhance equality in various societal sectors, investigate the role of VR and AR in addressing or reinforcing biases in law enforcement training and practices, and examine the implications of VR and AR technologies on privacy, consent, and the exacerbation of social inequalities. Using the informed consent mechanism, the participants are made aware of how their data will be used and which defensive strategies and methods are used in order to assure that the VR solutions are designed with a focus on minimizing or avoiding any inherent biases so that fairness, diversity, and inclusivity are respected.
- Assess the impact of repeated simulation sessions on participants' performance and understanding of use of force policies and investigate how different control types (VR vs. screen and keyboard) affect participants' ability to learn and apply use of force decisions.
- Enhance POs' decision-making skills in use of force scenarios through VR training simulations and validate the effectiveness and realism of the training simulations with expert feedback, ensuring they are a reliable training tool.
- Evaluate the potential of VR training in inducing realistic emotional and physiological responses in active shooter scenarios and assess the role of VR training in preparing both civilians and law enforcement personnel for real-life active shooter incidents.

4. Evaluation Mechanisms

The development of VR solutions for training and skill enhancement in the Police domain necessitates a nuanced understanding of evaluation methodologies to ensure their effectiveness and make sure that they are built and used in a responsible way. Hence, a multi-layered trans/multidisciplinary evaluation approach is adopted by capturing technical, educational, and ethical evaluation methods (Fard & Maathuis, 2021). Technical evaluation methods play a crucial role in assessing the seamless integration of VR technologies into existing training frameworks, including considerations such as hardware reliability, software performance, and system compatibility. Moreover, educational evaluation methods are indispensable for gauging the efficacy of VR solutions in achieving learning objectives, measuring knowledge retention, and assessing skill acquisition among law enforcement personnel. Equally vital are ethically oriented evaluation methods, which scrutinize the ethical implications, legal considerations, and societal impacts of VR training interventions. This approach assures the holistic effectiveness of VR solutions, thereby maximizing their utility in enhancing operational readiness, promoting professional development, and fostering ethical conduct within the law enforcement community.

In the technical category, the following performance and quantitative evaluation methods are defined (Pantazidis et al., 2023; Garcia, Ware & Baker, 2019; Voigt, 2021; Kishore et al., 2019); Xie et al., 2021):

- Scoring Mechanisms: Evaluate the effectiveness of scoring mechanisms in incentivizing user engagement and understanding of police protocols.
- Physiological Monitoring: Monitor physiological responses such as heart rate, skin conductivity, and temperature to gauge presence and stress levels during VR scenarios.
- Behavioral Data Analysis: Analyze participant actions during scenarios to assess performance and decision-making skills.
- After-Action Reviews: Utilize enriched feedback through scenario replays to enhance reflection and learning.
- Physiological Measures: Use physiological responses for quantitative analysis of stress levels and engagement, while when possible considering the relationships between the agents involved in an incident.
- Questionnaire-Based Assessments: Utilize questionnaires for quantitative data collection on user experience and presence.

In the education category, the following user experience and engagement, as well as qualitative evaluation methods are defined (Michela et al., 2022; Nguyen et al., 2021; Awada et al., 2021; Howard, Gutworth & Jacobs, 2021; Garcia, Ware & Baker, 2019; Awada et al., 2021):

- Knowledge Assessment: Conduct pre- and post-tests to evaluate knowledge retention and transfer.

- Subjective Assessments: Measure user presence, immersion, and emotional responses using PANAS (Positive and Negative Affect Scale) emotion scale and subjective evaluations.
- Meta-Analysis: Perform meta-analysis to assess the overall efficacy of VR training programs using Kirkpatrick's Model.
- Comparative Analysis: Compare locomotion techniques and control methods to understand their impact on user experience.
- Expert Evaluation: Gather input from experts to evaluate the training content and its alignment with police protocols.
- Biometric Evaluation: Utilize biometric data (GSR, HRV, eye-tracking) to predict affective states and assess real-time engagement.
- Self-Reported Reflection: Gather qualitative insights from participants on their training experiences and effects.
- Expert Interviews: Conduct interviews with experts for qualitative feedback on training content and effectiveness.

In the ethical category, the following learning, social interaction, equality, and bias assessment methods are considered (Guimarães et al., 2020; Potts et al., 2022; Nguyen et al., 2021; Franks, 2017):

- Hypothesis Testing: Test hypotheses regarding the impact of social interaction and believability levels in VR settings compared to traditional computer settings.
- User Feedback: Collect user feedback on social presence and believability of virtual characters.
- Equality Product Testing: Assess VR technologies for their impact on gender, race, and class equality.
- Bias Activation and Mitigation: Study the effects of VR on user biases and attitudes towards others.
- Iterative Improvement: Continuously iterate and improve VR solutions based on evaluation results and feedback from users, experts, and quantitative analysis.
- Adherence to Protocols: Ensure VR scenarios align with police protocols and training objectives to maximize effectiveness and real-world applicability.

5. Lessons Learned

This study aims to draw insights from these scientific studies to contribute to the responsible evolution of VR solutions and to the further development and deployment of responsible VR solutions. In this way, researchers and developers can grasp the technical intricacies, ethical nuances, and societal implications of deploying VR in policing contexts. By assimilating insights like the significance of human-centered design, strategies to mitigate biases, and the imperative of ethical adherence, future VR solutions can be crafted with heightened responsibility.

Continual iteration based on co-creation and feedback (Haskins et al., 2020)) serves as a foundational principle for ensuring that VR solutions evolve iteratively to address user needs and optimize training outcomes. Expanding content and scenarios, Garcia, Ware & Baker (2019) widens the scope of training, enabling POs to confront diverse and evolving challenges in simulated environments. Furthermore, by integrating advanced technologies such as high-fidelity avatar simulations, remote VR training possibilities, and real-time psychophysiological data integration, enhances the immersive experience and efficacy of VR training. Moreover, Awada et al. (2021) uses emotional and physiological measurement techniques, elevating user engagement and replicating real-world scenarios with greater fidelity. Concurrently, robust evaluation and validation mechanisms are imperative. To this end, evaluation with POs ensures that VR solutions align with operational needs and standards (Soldatos et al., 2022), while longitudinal studies on VR's impact provide valuable insights into the long-term efficacy and transferability of VR training to real-life policing scenarios (Kishore et al., 2019). Through the strategic integration of these approaches, VR solutions developed in the Police domain can evolve responsively, delivering impactful and sustainable simulation and training solutions for the modern faced challenges.

Furthermore, for ethical, safety, security, and privacy considerations, Franks (2017) stresses the importance of safeguarding individual rights and ethical principles amidst technological advancements. At the same time, data collected and analysed from VR sessions should be managed with strict privacy protocols to prevent unauthorized access and priority should be given to defensive mechanisms that address potential risks associated with data breaches. Investigating organizational outcomes, Bertram, Moskaliuk & Cress (2015) delve into the broader impact of VR training on organizational performance and operational costs, emphasizing its efficacy in optimizing resources and enhancing outcomes. Moreover, Xie et al., (2021) addresses the importance

of physical characteristics like headset resolution, field of view, and haptic technologies to deepen immersion and realism. The authors explore collaborative and social VR experiences, offering specialized skills and communication training opportunities in interactive virtual environments. In the realm of research methodology and empirical studies, empirical research, and methodological development, Litman & Paluck (2015) calls for enhanced lab and field-based evidence to elucidate the cycle of violence and group dynamics, informing the development of targeted interventions. At the same time, Howard, Gutworth & Jacobs (2021) consider that the effectivity and ethical assessment of VR solutions needs to be done aligned with the organizational goals, ethical standards, and societal expectations. These lessons learned provide a valuable outlook on how VR solutions in the Police domain can be developed in a responsible manner and further support and/or enhance various decision-making and action skills of POs in diverse contexts and settings.

6. Conclusions

In recent years, the landscape of conflict and crime has expanded significantly, encompassing both physical and cyberspace domains. This proliferation of incidents calls for law enforcement agencies and POs to be adequately prepared, trained, and skilled to address a diverse array of challenges across various contexts and potential incidents. Whether responding to traditional crimes or navigating the complexities of cyber threats, officers must possess the requisite expertise and readiness to safeguard communities and uphold the rule of law. In this evolving environment, advanced technologies like VR present invaluable opportunities for enhancing training effectiveness and readiness (Marler et al., 2020). By immersing officers in realistic and dynamic scenarios, VR enables them to build and/or enhance their decision-making abilities, practice de-escalation techniques, and cultivate situational awareness in a safe and controlled environment. Moreover, VR facilitates training across a wide spectrum of scenarios, ranging from routine patrols to high-stakes crisis interventions, thereby equipping POs with the versatility and adaptability required to effectively navigate the complexities of modern law enforcement. As incidents continue to evolve and diversify, the integration of VR solutions plays an important role in empowering law enforcement personnel with the skills, knowledge, and resilience needed to uphold public safety and security in an ever-changing landscape.

It is then the aim of this research to delve into existing VR solutions built within the Police domain aiming to capture key insights regarding learning objectives, lessons learned, and future perspectives. In this way, this research seeks to contribute to the ongoing efforts directed to building responsible and trustworthy VR solutions for security and safety purposes in the Police domain. Integrating lessons learned from previous scientific studies serves as a cornerstone for developing responsible VR solutions that not only bolster Police capabilities, but also uphold ethical standards and societal welfare (All, Castellar & Van Looy, 2021). This research continues by developing VR and AI conflict simulations in the presence of various agents in order to understand the dynamics, influence, and the role of de-escalation mechanisms, and from there to be able to propose effective conflict resolution and community policing strategies and solutions. Other future perspectives could consider a joint multidisciplinary effort that relies on both field expertise of POs and available incident data in order to build cross-domain solutions that tackle existing legal and socio-ethical challenges (e.g., fairness and safety) existing in this domain considering a co-design and co-participation approach. Conclusively, this research aims to contribute to building/g digital responsible solutions that enhance responsibility and trust (Moreno et al., 2024; Maathuis, 2022), and further prioritize safety, justice, and accountability of all stakeholders involved.

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Interventions to Mitigate Attrition Rates in a Developing Country, South Africa

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Abstract: Education is regarded as a tool that is used to change the world. Institutions such as the United Nations Education Science Culture Organisation (UNESCO) were established on the premise of how important education is for individuals, organisations, societies, and the world. UNESCO is a specialised agency of the United Nations (UN) for promoting world peace and security through international cooperation in education, arts, sciences, and culture. The high attrition rate from higher education institutions is still a challenge and concern, especially in South Africa as one of the developing countries. Various factors for high attrition rates were identified, namely lack of motivation or desire to complete the qualification or a course, lack of time, insufficient prior knowledge, lack of support, and feelings of isolation among others. Despite the challenges, education is a huge investment, and the initial investment in education represents above a quarter (25%) of the eventual total educational cost. The high attrition rates suggest that the initial investment made in education is not fully realised as should be. Some of the consequences of high attrition rates are poor achievements of world peace and security aspirations. Various interventions for mitigating attrition rates do not necessarily achieve the desired results. Governments and other agencies committed a lot of resources to mitigate some of the challenges associated with attrition rates. Despite the commitments, attrition is high in many countries, especially in developing countries such as South Africa. The number of people not in education, employment, or training (NEET) is at a constant increase. Students who complete tertiary education are concerningly below targets and do not commensurate with the investment made in education. The aim and objectives of the study were to reignite the discussion about attrition rates in education given its huge investment. The study analysed the available literature, current reports, and some of the policy interventions that were developed and implemented to mitigate attrition rates. The study concluded that all parties to education must be committed to the available interventions, especially students.

Keywords: Attrition rates, Entrepreneurship education, Open distance and e-learning, Sustainable development goals (SDGs)

1. Introduction and Background of the Study

Education is one of the most important tools that is used to change the world by ensuring progress on the sustainability development goals (SDGs) in both developed and developing countries. It is at the center of the provision of much needed knowledge and skills that promote the achievements of the 2030 SDGs aspirations such as sustainable education development and lifestyles, human rights, gender equality, promotion of a culture of peace, and non-violence, global citizenship and appreciation of cultural diversity (UNESCO, 2023). Education is a process of building a complete human being, and one of the factors that lead people to a better standard of life. The height of human civilisation, social changes, and modern society begin with and are achieved through education (Muchlisin *et al.*, 2020). In the absence of or with poor education, all these are not possible to achieve. The importance of education has a far-reaching effect on both individuals and the rapid economic development of communities. It is a basic human right with a tremendous instrumental value which is central to unlocking human capabilities and a basis for a fair and equitable society (Moriña, 2019). It is at the center of raising human capital, productivity, income, employability, and economic growth/entrepreneurship. The benefits of education transcend beyond monetary gains by making people experience better health and autonomy over their lives. It also generates trust and creates institutions that promote inclusion and shared prosperity (Moriña, 2019; World Bank, 2018). When educational improvements are expedited among disadvantaged communities, the additional growth reduces poverty, and inequality, and promotes social mobility and parity (Sarker *et al.*, 2019). Muchlisin *et al.* (2020) describe education as a core for conscientisation, which is a process of consciousness for people to know and understand the substantial development of their abilities. Education also fosters the appreciation for diversity, including differences in capabilities, gender, social and cultural origin (Moriña, 2019). In the main, education serves as a linkage between psychological and sociological perspectives, and individual development and social structure (Blossfeld & Von Maurice, 2019). It is a top investment priority for all nations (Sarker *et al.*, 2019).

Despite the good prospects that education provides, it suffers a rapid increase in attrition rates (Kim & Kim, 2018). Attrition at tertiary education is a problematic phenomenon worldwide, with 20% of students affected in Organization of Economic Co-Operation and Development (OECD) countries (Guzmán *et al.*, 2021). Policymakers, administrators, and related authorities pay proper attention to the consequences of attrition rates, mitigating attrition rates and improving the quality of education (Sarker *et al.*, 2019), especially in

developing countries like South Africa. The attrition rate has been an extensively studied phenomenon in three disciplines, namely sociology, psychology, and economics (Aina *et al.*, 2022). The high attrition rate in the e-learning environment is one of the main problems that has been experienced for years (Nicoletti, 2019). Despite the remarkable expansion in e-learning in open distance education in recent years in terms of enrolment and graduation, statistics from the OECD member countries show that, on average, one third of students who enroll at university leave their studies without obtaining or completing a degree (Aina *et al.*, 2022). The consequences of attrition rate related problems are demonstrated by many studies, focusing on different aspects for comprehensive understanding (Nicoletti, 2019). This is an indication of how serious attrition is, to both policymakers and educational institutions.

Cabus and De Witte (2016) affirm that the problem of attrition, which is described as the early leaving of educational institutions does not have only one origin, but multiple factors are in play when such a decision is taken. As a result, different models were proposed and developed to mitigate challenges associated with attrition rates, these include Tinto's model; Spady's Model; Pascarella's Model; and Bean's Model among others (Nicoletti, 2019). The modeling of the attrition rates problems should take into account highly dependent on various factors that are interwoven, including geographical, social, cultural, temporal, economic, course/qualification, institutional, as well as personal factors (Nicoletti, 2019). Student attrition has various underlying factors and is more likely for students who have one or more years of retention in a grade; or due to teenage pregnancy; or shocks resulting from bad health; or reduction of interest in schooling, gradually resulting in truancy behavior; the influence of the lack student's commitment to the education institution, peers and teachers; and a poor learner's motivation; and the economic cycle influence attrition (Cabus & De Witte, 2016). Millions of learners around the globe leave education institutions early, with increasing attrition rates on the rise in tertiary education (UNESCO, 2024). The UNESCO global happy education institution framework proposes four pillars, namely people, process, place, and principles, offering happiness into education policies and cultivating it in the institution through system change (UNESCO, 2024). All these factors were somehow put together to model theoretical frameworks for attrition. The frameworks were designed to model the attrition decision by students to time preferences, motivation, aspirations, opportunity costs, and policy measures (Cabus & De Witte, 2016). The stronger the integration of the learner in all the academic and social spheres, the greater the commitment to the institution and the goal of persistence and completion of the course/qualification (Nicoletti, 2019).

In South Africa, the percentage of individuals who attended educational institutions shows high attendance in the age group between 7 and 14 years, after which attrition increases sharply. By the age of 24 years, approximately 10% were still attending, showing some noticeable representation of learners who are older than the ideal grade age. Individuals without any formal education were most common in Limpopo (7,1%) and Mpumalanga (6,3%), and least common in Western Cape (0,7%) and Gauteng (1,0%) (StatsSA, 2022). A major global challenge is the phenomenon of young people who are not in education, employment, or training (NEET). Globally, 30% of young women and 13% of young men were classified as NEET in 2018. The unemployment rate for women (5.4%) is slightly higher than for men (4.7%). The gender gap in unemployment rates is widest in lower-middle-income countries (StatsSA, 2022). Critical educational programs are affected by attrition rates, this also includes among others entrepreneurial education (Nurmalitasari *et al.*, 2023). Other reasons for high attrition rates are that both students believe that educational institutions insufficiently stimulate learners (Arend, 2019). The study focused on the available literature, some of the common policy interventions, and reports/statistics on attrition rates.

2. Factors for Attrition Rate From Education Institutions

Similarly, high attrition rates in Sub-Saharan Africa are attributable to multiple factors (Yakubu & Salisu, 2018). Factors that predict high attrition rates are categorised into three major themes, namely sociocultural, environmental, and economic factors (Cabus & De Witte, 2016; Gubbels *et al.*, 2019; Guzmán *et al.*, 2021; Kim & Kim, 2018; Mishra, 2020; Muchlisin *et al.*, 2020; Yakubu & Salisu, 2018). Other factors are lack of or poor parental counseling and guidance, parental neglect, the absence of affordable or free education, lack of comprehensive sexuality education, renegade and misconceptions of some fundamental responsibilities, and inappropriate forms of recreation. Individual factors (with variables such as excessive use of alcohol, substance abuse, educational status, low self-esteem, inability to resist sexual temptation, curiosity, and cell phone usage) (Cabus & De Witte, 2016; Gubbels *et al.*, 2019; Guzmán *et al.*, 2021; Kim & Kim, 2018; Mishra, 2020; Muchlisin *et al.*, 2020; Yakubu & Salisu, 2018). Health service-related factors also influence adolescent pregnancies (Cabus & De Witte, 2016; Gubbels *et al.*, 2019; Guzmán *et al.*, 2021; Kim & Kim, 2018; Mishra, 2020; Muchlisin *et al.*, 2020; Yakubu & Salisu, 2018). Seemingly unique to sub-Saharan Africa, religious factors, early marriages, low

level of education, poverty, the cost of contraceptives, lack of adolescent-friendly health service provision, inadequate and unskilled health workers, and lack of comprehensive sexuality education. Policymakers and opinion leaders should focus on community sensitisation, comprehensive sexuality education, and ensure girls enroll and stay in an education institution (Cabus & De Witte, 2016; Gubbels *et al.*, 2019; Guzmán *et al.*, 2021; Kim & Kim, 2018; Mishra, 2020; Muchlisin *et al.*, 2020; Yakubu & Salisu, 2018). Various other factors at the individual, national, and global levels also influence high attrition rates, but in the main, these are adequately grouped into sociocultural, environmental, and economic factors.

3. Consequences of Attrition in Society

Attrition is defined as the share of learners or students who do not complete their educational programs at a specific time (Aina *et al.*, 2022). Attrition is also defined as anyone leaving an education institution at which one is registered for without completing the course or qualification, or a certificate or equivalent credential, or a specific grade one was studying/pursuing has not been completed (Nicoletti, 2019; Sarker *et al.*, 2019). Attrition is a premature departure of the student from the program/course or institution without fulfilling the requirements of the program. Attrition is also associated with a loss of investment in education. According to Guzmán *et al.*, (2021), investment in education ceases to be profitable when the attrition rate is high. The achievement of all the aspirations of the SDGs is also affected when the attrition rate is high (UNESCO, 2024). A high attrition rate compromises the achievement of the SDGs' aspirations. For example, SDG#4, namely 'ensuring inclusive and equitable quality education and promotion of lifelong learning opportunities for all'; SDG#9 'industry, innovation and infrastructure'; SDG#3 'ensure good health and well-being for all ages' (Kim & Kim, 2018; OECD, 2023; UNESCO, 2024). Due to high attrition rates, the period for redressing the imbalances of the past is affected (White & Van Dyk, 2019). The attrition rate negatively impacts on objectives of the quality, equitable, and democratic education system, which is central to South Africa's transformation and redressing of the inequitable system of apartheid past (Sayed & Motala, 2012). The attrition rate continues to widen the country's economic disparity and unequal educational opportunities due to different socioeconomic backgrounds (Ogbonnaya & Awuah, 2019). A high attrition rate is a serious harmful factor that affects the human capital development of nations (Sarker *et al.*, 2019). In developing countries, one-third of learners/students suffer from the challenges associated with the attrition rate (Sarker *et al.*, 2019). The attrition rate poses a disaster in the education system; and it mainly happens due to social, economic, political, and environmental factors. Economically poor societies are the most affected by the challenges of attrition rate, where some students do not attend classes or eventually cancel enrolment.

Attrition rates may lead to economic deprivation and different mental social, occupational, and marital challenges in adulthood (Gubbels *et al.*, 2019). The absence of learners/students from these contexts has the potential to create or compound deviations in normal development (Heyne *et al.*, 2019). The attrition rate is also associated with many different life-course problems (Gubbels *et al.*, 2019). An attrition rate is one of the challenges that must be declared as an educational pandemic, as it continues to haunt societies. South Africa is investing much in entrepreneurship education as entrepreneurship is believed to be an appropriate approach that enables people to provide for themselves and eradicate poverty (Bux & Van Vuuren, 2019). While South Africa provides several programs to empower and enable people to engage in entrepreneurship, among other factors, the high attrition rates from entrepreneurship programs remain a serious concern affecting its meaningful contribution to the question of poverty eradication and achievement of SDG aspirations (Bux & Van Vuuren, 2019).

4. Interventions for Mitigating Attrition Rates and Improving Educational Completion

In South Africa, various policies are implemented, which are related to improving access and affordability to education. These include the quintile education system, the provisions of feeding schemes programs, the provisions of scholar transport, the programs that look at infrastructure, and the financial aid schemes for tertiary education students. Each of these is briefly discussed in this section. The quintile education policy categorises schools according to the communities the schools serve. The Amended National Norms and Standards for School Funding (ANNSSF) ranks all schools into one of five quintiles, with Quintile 1 representing the poorest, and Quintile 5 representing the most affluent schools (White & Van Dyk, 2019). The policy addresses the funding system of schools and some challenges in the education system. For example, Quintile 1 schools are regarded as no-fee paying schools, receiving the bulk of financial support from the Department of Education (White & Van Dyk, 2019). It is an intervention that allows learners to receive education without any form of financial exclusion. Parents can choose which school to take their children depending on their economic status and factors such as which school is closer to the learner's place of residence. Quintile 5 schools are fee-paying

schools, meaning that the financial support for the school is mainly raised by parents of learners attending the school and less financial support is provided by the government. The no-fee paying schools supporting policy is one among other interventions that seeks to improve access, equity, and the quality of education (Sayed & Motala, 2012). It is also one of the factors leading to high enrolment rates between the ages of 7 to 14 (StatsSA, 2022).

The quintile ranking system was to ensure equity in the financial status of schools (White & Van Dyk, 2019). Literature reveals that students from lower quintile schools experience a higher attrition rate tendencies when in tertiary education institutions, taking them more time to adjust and complete their programs compared to students from higher quintile schools (Ogbonnaya & Awuah, 2019). The quintile system also redresses the impulse of the widening gap between the haves and have-nots. Interventions such as no-fee paying schools, provisions of feeding schemes, and scholar transport reduce the attrition rates and adjustment-related challenges of students at tertiary institutions (Sayed & Motala, 2012). The National Student Financial Aid Scheme (NSFAS) was introduced to make higher education accessible to poor students in South Africa. It undoubtedly contributed positively to making higher education more accessible to the poor. A larger proportion of NSFAS students perform better than non-NSFAS students and obtain qualifications while a smaller share of them dropped out without qualifications, compared to the non-NSFAS students (de Villiers, 2023). A full understanding of the attrition rate patterns was needed for the complexities of the various interventions impacting outcomes in education systems (Sayed & Motala, 2012).

Some policies and programs are implemented to make education an attractive commodity and improve access, equity, and quality of education, and arrest the high attrition rate in South Africa (Munje & Jita, 2019). These include social and economic supports that are provided to students. The provided support attempts to make the education environment a happy place to learn. When both learners/students and instructors are happy, there is a feeling of friendship and the presence of fresh air and safety, these variables stimulate happiness and improve the learning experiences, learning outcomes, and well-being of learners (UNESCO, 2024). Hunger is one of the factors considered a major barrier between impoverished learners and the learning process, always leading to absenteeism and ultimately attrition (Munje & Jita, 2019). Nutrition influences the efficiency of the education program, and it is vital for learners' cognitive development (Nhlapo *et al.*, 2015). Some improvements should be made in the nutrition programs, storage, and handling of food at some educational institutions (Munje & Jita, 2019).

Another intervention that has a remarkable impact in reducing attrition rates is the provision of scholar transport. Most scholars in rural areas face serious challenges in commuting to and from educational institutions, including walking long distances, weather conditions, and personal safety, resulting in worse academic performance due to fatigue, and/or damage to textbooks (Joseph & Carpenter, 2017). The national and provincial transport policies contain limited helpful sections, sometimes putting learners in difficult or dangerous situations. It is recommended that South Africa must provide learners with adequate transport due to the dangers and traveled distances. The provision of scholar transport is an important right for every learner. The policies put in place by government departments provide a starting point for the creation of an effective transport strategy, but there are still many difficulties to overcome to ensure that transport is available for every learner who has trouble getting to and from school (Joseph & Carpenter, 2017). Some of these learners do not have the economic means to afford scholar transport to and from schools. Insufficient scholar transport places some difficulties on learners, making it impossible for some learners to attend classes regularly, and/or eventually drop out (Joseph & Carpenter, 2017; Rammuki, 2018). The provision of scholar transport addresses the obstacles learners face while walking to schools, such as walking in dangerous terrains (Joseph & Carpenter, 2017). In provinces such as Gauteng, the policy covers learners who live at least 4 kilometers (km) to a maximum of 15 km of schools of choice. These are most prevalent in rural areas as most learners in urban areas live within 4 km of schools of choice (Mngaza *et al.*, 2001). A study by Mabasa (2023), reflected on the attrition rates from the course, where students could not write their examinations. Despite the factors advanced for attrition, the fact remains that at first, the student had the intention to complete the module/qualification, but could not due to attrition.

Other forms of support for students include among others social networks, social capital, and social support. A social network is defined as a structure composed of a set of actors where some members are connected by a set of one or more relations. Individuals access a variety of resources through membership in social networks (Liu *et al.*, 2018; Mishra, 2020). Social networks provide access to various forms of social capital such as information, social support, values, and aspirations along with economic resources (Liu *et al.*, 2018; Mishra, 2020). Social capital is defined as the aggregate of the actual resources that are linked to the possession of a

durable network of more or less institutionalised relationships of mutual recognition (Mishra, 2020). The mechanisms through which different forms of social capital are accessed and mobilised are complex and dependent on the composition and characteristics of social networks (Liu *et al.*, 2018; Mishra, 2020). The social support literature distinguishes between perceived and received support (Liu *et al.*, 2018). Perceived support measures the general availability of support or global satisfaction with the amount of support that is available (Liu *et al.*, 2018). In a study by Mabasa (2023), conflicting results were reported about the role of discussion forums (which platform provides interactive support between students and learning content, students and fellow students, students and institutions) in predicting education performance. There are some noticeable improvements in the percentage distribution of educational attainment for individuals aged 20 years and older between 2002 and 2021 as shown in Table 1 below:

Table 1: Percentage distribution of educational attainment for individuals ages 20 years and older between 2002 and 2021

Period	None	Completed Primary school	Completed Grade 12	Completed Post school
	%	%	%	%
2002	11.4	7	21.3	9.2
2003	10.6	6.6	21.7	9.4
2004	10.2	6.7	23.5	9.6
2005	9.8	6.4	22.7	9.8
2006	9.8	6.3	24.3	9.2
2007	8.7	6.4	23.8	10
2008	8.7	6	24.6	11
2009	7.3	5.7	26.3	11
2010	6.8	5.7	26.6	11.3
2011	6.3	5.5	27.7	11.7
2012	5.7	5.2	27.5	12.5
2013	5.5	5.1	28	12.8
2014	5.2	4.8	29	13.5
2015	5	4.7	28.3	14.1
2016	4.7	4.6	28.8	14.1
2017	4.7	4.4	29.2	13.9
2018	4.5	4.3	30.9	14.3
2019	3.7	4.2	30.8	15.4
2020	2.9	3.8	36	14.1
2021	3.2	3.7	35.9	14.6

Source: (StatsSA, 2022)

It is shown in the table that the number of learners who have not completed any education level is on the decline, from 11.4% in 2002 to 3.2% in 2021. There is also a decline in the number of learners who have completed some primary education, which is a positive outcome from the 7% high in 2002 to 3.7% in 2021. The number of learners who complete grade 12/matric is on the increase, from 21.3% in 2002 to 35.9% in 2021. The number of students who completed their post-matric qualifications, from 9.2% in 2002 to 14.6% in 2021. The marginal changes are low for those who have completed either grade 12 or post-grade 12 education.

A portion of the educational budget is related to ancillary services, including welfare services offered to students (student meals, housing, and transport). Public funding is heavily scrutinised and in an economic downturn, even core sectors like education are subjected to budget cuts by governments. Government funding for education is generally spent on public institutions but some countries spend a large part of the public budget on private educational institutions. Staff expenditure encompasses the salaries, pensions, and other benefits earned by teaching and support staff, representing the largest expenditure in educational budgets across all OECD

countries (OECD, 2023), and South Africa is one of the OECD member countries. In the Gauteng Department of Education, for example, 55% of the school budget is for learners' support materials; 33% for services, and 12% for maintenance (Sayed & Motala, 2012). The available budget for attrition prevention in some other countries has been on the increase (Cabus & De Witte, 2016). However, the budget must be used economically and efficiently for the good of the educational institutions and students. It is argued that entrepreneurial education (EE) has many benefits and should be central in any nation's educational policies and financial support. One of the objectives of entrepreneurship education is to build knowledge and skills for entrepreneurship, a viable tool for poverty alleviation and survival during periods of high unemployment rate and economic downturn (Vegard Johansen, 2014).

5. Results, Findings, Discussions and Conclusions

The benefits of education are evident in society at both individual and societal levels. Education is a tool for capacity development and to redress the imbalances of the past, such as the alleviation of poverty and inequality. It increases the prospects for employment, manageable marriage, and improved self-esteem for individuals. It is at the center of the achievements of all the SDGs' aspirations. There are various interventions at individual and institutional levels to promote access and affordable education, grouped as economic and social support interventions. These include the provisions of learning, accommodation, feeding/nutrition schemes, transport, and financial support. These interventions ensure that the learning environment is a happy place for all learners/students to complete their studies. Despite all these forms of support, the attrition rate is still a concern. The educational completion rates are still far below targets for primary, secondary, and tertiary education. The budget committed for education by countries is huge with high hopes for better educational outcomes. However, the educational outcomes are not commensurate with the committed budget due to factors such as attrition rate. The success of critical programs such as entrepreneurship education, which is believed to capacitate individuals with needed survival skills for alleviating poverty, is also affected by attrition rates. The study concluded that all parties, and not the government alone, must be committed to the available interventions for better attrition mitigation outcomes.

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Building a Postgraduate Supervision Model for Student Success in South Africa: How Masters and Doctoral Students' Experiences can Assist?

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Abstract: A critical gap exists in South African higher education research on postgraduate supervision models. Research emphasis is placed in administrative aspects over the supervision praxis for student throughput. This paper investigates an effective postgraduate supervision model in South Africa to enhance student success. The literature underscores the need for an approach that balances the teaching and the supervising of research. Supervision is a supportive and collaborative journey between the student and the supervisor. However, there are complexities of postgraduate supervision pedagogy that are hardly explored in South Africa - the quality of supervision, time-to-degree, throughput rates, and perceived organisational support. Therefore, inadequate understanding of the elements constitutes supervision relationships issues for masters and doctoral students. Current practice falls short of addressing supervision praxis which necessitated this study to explore a tailored model of supervision. Therefore, how can experiences of masters, doctoral candidates and graduates assist to explain and propose an optimal postgraduate research supervision model that best supports the student success rates in South African universities? As a constructivist designed study, a quantitative digital survey and a snowball sampling method were used targeting masters and doctoral candidates and graduates across private and public universities in South Africa. An online survey was designed and administered using Microsoft Forms to over 500 participants. Descriptive statistical analysis was conducted measuring position in percentile rankings. Results elucidate the nature and main feature of postgraduate supervisory relationships in South Africa. We found that a postgraduate research supervision model can be tailored to the South African context, and we contribute to the development of postgraduate supervision model as pedagogical tool related to metacognitive strategies and humanising pedagogy for research supervisors and students.

Keywords: Cohort model, Humanising education, Humanising pedagogy, Postgraduate supervision model, South Africa, Student success

1. Introduction

Postgraduate supervision faces diverse challenges and strategies, varying between masters and doctoral levels. Evolving supervisory roles and administrative challenges impact supervision practices in postgraduate education. This paper investigates supervision models to enhance postgraduate success rates in South Africa. It examines the dynamics between supervisors and students using empirical evidence to develop a conducive supervision model for South Africa. Our findings aim to improve strategies for academic supervisors guiding postgraduate students. The paper includes a background on postgraduate supervision, contextual analysis, literature review, theoretical framework, methodology, results, findings discussion, and conclusion. The next section is the background.

2. Background to the Study

Goolam Mohamedbhai (2022) indicates that South Africa aimed to increase PhD graduates to 100 per million by 2030 from 28. By 2017, progress was evident with 54 PhD graduates per million and 3,057 annually. Research on postgraduate supervision in South Africa highlights the lingering effects of apartheid's "legacy of disempowerment and dehumanisation" (Zinn & Rodgers, 2012) experienced by postgraduate students. However, the quality assessment of supervision remains unclear, and there is no effective supervision model. Madondo (2021) explores the use of pedagogical knowledge in postgraduate supervision within South African business management education, concluding that teaching research methodology and supervising research are interconnected yet distinct, forming opposite ends of a continuum. This divide hinders postgraduate research success. Madondo (2021) proposes a balanced supervision strategy incorporating both teaching research methodology and supervising research to achieve the goal of 100 PhD graduates per million by 2030. McCallin and Nayar (2012) identified changes in postgraduate research programme funding and delivery that influence university supervision practices in New Zealand. They emphasise the importance of faculty development, supervision pedagogy, supervision models, and supervisor education in establishing a knowledge economy. A comprehensive supervision model can thus enhance postgraduate education. Additionally, Chugh, Macht, and Harreveld (2022) examined supervisors' feedback to postgraduate students. In the context of online supervision,

feedback processes often involve diverse professional, cultural, and linguistic backgrounds. Therefore, ongoing research into improving supervision feedback practices is crucial in the globalised and technologically mediated research education landscape. In South African universities, various supervision challenges impact postgraduate students' experiences, including supervision quality, time-to-degree, throughput rates, supervisor effectiveness, and organisational support (Chireshe, 2012; Holtman & Mukwada, 2014; Cekiso et al., 2019; Wadesango & Machingambi, 2011; Wanyama & Eyamu, 2021). Wadesango and Machingambi (2011) emphasise the importance of effective communication, mutual respect, and guidance in fostering productive supervision relationships. Supervisors need the necessary skills and knowledge to support students effectively. Chireshe (2012) highlights that successful supervision involves communication, guidance, and mentorship. Holtman and Mukwada (2014) discuss the impact of supervision quality on time-to-degree and throughput rates, emphasising the need for improved practices. Cekiso et al. (2019) explore students' perceptions of supervisor support, noting the benefits of strong supervisor-student relationships. Wanyama and Eyamu (2021) examine the role of institutional support in influencing student experiences and completion rates, advocating for a supportive environment to enhance the research journey.

Postgraduate supervision is vital for creating knowledge, fostering a knowledgeable society, and supporting knowledge-based economies. Postgraduate students and their supervisors are central to this process. Master's and doctoral students rely heavily on supportive supervision for their success. However, there are few theoretical models explaining postgraduate supervision as a pedagogic tool in South Africa. Existing theories are rarely applied to real supervision challenges faced by students and supervisors. This study examines postgraduate students' experiences with their supervisors in the South African context addressing both theoretical and practical knowledge gaps. It proposes a tailored postgraduate supervision model for South African universities and provides theoretical insights and practical evidence to support future postgraduate education and supervision as a humanising pedagogy in South African higher education. The next section analyses the context in which postgraduate supervision is practised.

3. Contextual Analysis

Zinn and Rodger (2012) argue that South Africa's legacy of disempowerment and dehumanisation, especially in education, urgently needs repair. Despite progress towards democracy, higher education remains a battleground for building voices, agency, and community. Traditional one-on-one supervision perpetuates power imbalances and disempowerment in postgraduate education. South Africa's low annual PhD graduation rates reflect this ongoing struggle (Zinn & Rodger, 2012; Goolam Mohamedbhai, 2022). The CHE's Briefly Speaking No.25 (September 2023) highlights the need for a research-rich culture in postgraduate education. Traditional one-on-one supervision is insufficient for fostering this culture. The National Development Plan 2030 calls for innovative strategies to enhance doctoral production amid higher education transformation (Motshoane & McKenna, 2021). High student-to-supervisor ratios and uneven workload distribution strain academic responsibilities and achieving expected doctoral production (CHE, 2023). The Higher Education Qualifications Sub-Framework recognises the specialised and demanding nature of postgraduate supervision (Motshoane & McKenna, 2021; Connell & Manathunga, 2012; McAlpine & Amundsen, 2011). Current supervision frameworks focus on monitoring progress and timely completion but lack flexible supportive workload models (CHE, 2023). Despite institutional reforms, apartheid's legacy continues to create disparities in resource allocation and support across universities (Zinn & Rodger, 2012; Motshoane & McKenna, 2021; Bunting, 2002; CHE, 2000). This legacy affects supervision development initiatives, highlighting the need for institutional support to empower emerging supervisors (Motshoane & McKenna, 2021; CHE, 2023). The CHE (2023) recognises that there are innovative supervision models such as cohort approaches and interdisciplinary teams. These models support diverse research and reduce power imbalances between supervisors and students. They provide varied expertise and comprehensive guidance addressing historical inequities and fostering a vibrant postgraduate research environment in line with global standards. The next section is a review of literature on postgraduate supervision.

4. Literature Review

This reviewing of literature draws from a thematic analysis approach leading to sufficient explanation of the reality in postgraduate supervision.

4.1 Relationships, Barriers and Cultural Dynamics

Postgraduate supervision demands intensive academic relationships. Adedokun and Oyetunde-Joshua (2024) emphasise the importance of one-on-one relationships between the role of supervisors and the students. Thus,

while the supervisors' roles are vital in supporting students, they must be examined from the students' perspectives (Adedokun & Oyetunde-Joshua, 2024). Understanding students' experiences is essential for improving supervisory practices. The intensive supervision relationship can offer tailored support and mentorship, yet it also requires significant personal and academic investment from both parties. Mncina, Letsie, Nkhi, and Mofana (2024) highlight how cultural, ethnic, and educational backgrounds complicate effective communication in South Africa and Lesotho. This insight shows that postgraduate supervision relationships face communication barriers and cultural dynamics impacting on students' academic success (Mncina et al., 2024). Adedokun and Oyetunde-Joshua (2024) emphasise the need for supervisory styles tailored to students' needs, while Mncina et al. (2024) stress the importance of cultural competence in overcoming these communication challenges. Effective supervision requires supervisors to have cultural competences to manage cultural differences and to create supportive academic environments. However, the scalability of such personalised supervision models is problematic in resource-limited contexts or where student-to-supervisor ratios are high. This is a common issue in South African higher education. This challenge suggests that institutions need for alternative supervisory models and professional development with intercultural communication competencies. Adopt more flexible strategies to effectively address supervisory challenges.

4.2 Institutional Concerns and Growth Mindsets

Ferreira-Meyers (2022) examines how the COVID-19 pandemic influenced the shifts to online supervision affect postgraduate students' progress. A concern is about research quality and completion delays. Gausdal and Svendsen (2023) advocate for fostering a growth mindset among doctoral supervisors. Scholars suggest that institutional support can improve supervisors' ability to support student development and adapt to supervisory challenges (Gausdal & Svendsen, 2023). According to Ferreira-Meyers (2022) the shift to online supervision reveals gaps in engagement and research quality. This calls for research and reassessment supervisory practices. Therefore, institutions should invest in robust online tools and supervisor training to address supervisory issues (Ferreira-Meyers, 2022; Gausdal & Svendsen, 2023). Developing flexible supervisory frameworks and promoting a growth mindset among supervisors in the evolving academic contexts can enhance adaptability and continuous learning (Gausdal & Svendsen, 2023). Overall, there are approaches that can empower supervisors to better handle the changing contexts and diverse supervisory challenges in postgraduate supervision.

4.3 Mentorship, Shared Wisdom, Team

Maguire, Anderson, and Chavez (2024) highlight the value of mentorship among women in academia for navigating challenges. This aligns with Muda et al. (2020) on developmental supervision and Johansen et al. (2019) and Robertson (2017) on team supervision dynamics. Largely, multiple supervisors contribute to the doctoral journey and enhance credibility. According to Maguire et al. (2024) the role of mentorship in supporting women in academia it is overcoming systemic barriers. This insight aligns with developmental supervision which focuses on personal growth. The team supervision model offers diverse expertise and distributing responsibilities and serves as an alternative to traditional one-on-one approaches (Johansen et al., 2019; Robertson, 2017). However, successful implementation of mentorship and team model is found to require clearly defined roles and coordination among academic members to avoid conflicts and ensure cohesive support for the students.

4.4 Research Pedagogical Concerns

Muthanna and Alduais (2021) highlight the vital role supervisors play in upholding research integrity. Scholars emphasise supervisors' responsibility in guiding students through ethical dilemmas and ensuring adherence to research standards. Zeegers and Barron (2012) argue that effective postgraduate supervision should involve active teaching and learning engagement. Thus, it is vital to integrate research integrity with pedagogical focus to foster an environment of mutual growth and adherence to standards in the postgraduate students (Zeegers & Barron, 2012; Muthanna & Alduais, 2021). However, implementing this approach remains an academic challenge and a site of struggle in postgraduate education.

4.5 Summary of Literature

The review of literature on postgraduate supervision in South Africa reveals a multifaceted landscape of postgraduate education challenges and strategies. Effective postgraduate supervision models need to be adaptable, culturally sensitive, and capable of leveraging both individual and team-based approaches. Higher education institutions in South Africa must invest in resources, training and development to support supervisors and students alike, and to foster environments conducive to student success and ethical research practices. The evolving nature of postgraduate education demands continuous reflection and adaptation of postgraduate

supervisory practices to meet the diverse and changing needs of masters and doctoral students in South Africa. The next section is the theoretical framework analysis.

5. Theoretical Framework

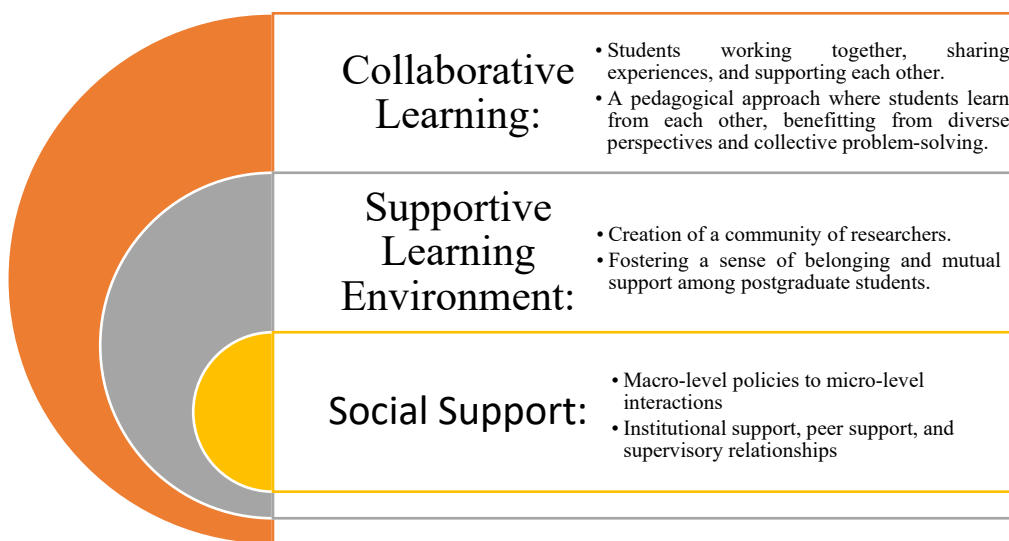
The landscape of postgraduate supervision, particularly knowledge and theoretical gaps within the South African context, is underpinned by various theoretical perspectives in fostering student success. Table 1 below presents unique lenses through which to understand the dynamics of postgraduate supervision.

Table 1: Theoretical Framing

Theorist (s)	Theory	Explanation
Boud and Lee (2005)	Peer learning theory	The potential of collaborative learning among students is a pivotal element of the pedagogic discourse.
De Lange, Pillay, and Chikoko (2011)	Cohort model of supervision	Creating a supportive learning environment for doctoral students involves developing a community of researchers who can share experiences, resources, and support throughout their doctoral studies.
Carter-Veale et al. (2016)	Dissertation House model	Creating a collaborative environment where doctoral students can work together to cope with the demands of writing their dissertations.
Cornér (2020)	Socially-Embedded Support System	There are various levels and forms of social support integral to macro-level policies, institutional practices, and micro-level interactions within research communities and supervisory relationships in doctoral education.

Source: Authors

The theories and models presented in Table 1 above offer valuable insights for enhancing postgraduate supervision and student success in South Africa. According to Boud and Lee (2005) peer learning creates opportunities for collaborative learning among the doctoral students. Cornér (2020) believe that socially embedded support system is aligning support with student needs which then suggests the need to develop comprehensive support structures that address the informational, instrumental, and emotional needs of postgraduate students. As De Lange et al.'s (2011) explain cohort model underscores the value of building a community of scholars. Theorists believe this model is essential for fostering a supportive learning environment. Carter-Veale et al. (2016) view the Dissertation House model as providing a practical framework for helping postgraduate students and helpful in navigating the final stages of their studies. The central theoretical lens drawn from these theorists shows interrelated information on peer, social support and collaborative learning in postgraduate education. Figure 1 presents this theoretical lens:



Source: Authors

Figure 1: Theoretical Framework

This model presented in Figure underpins the envisioning of postgraduate supervision system which can help address the unique challenges faced by postgraduate students in South Africa. By fostering a more supportive and collaborative research environment, this lens contributes to explaining an alternative postgraduate supervision model for achieving higher completion rates and a more vibrant academic research community. Overall, the central theoretical lens encompasses the concepts of peer, social support and collaborative learning as key components in enhancing the postgraduate supervision practice in South Africa.

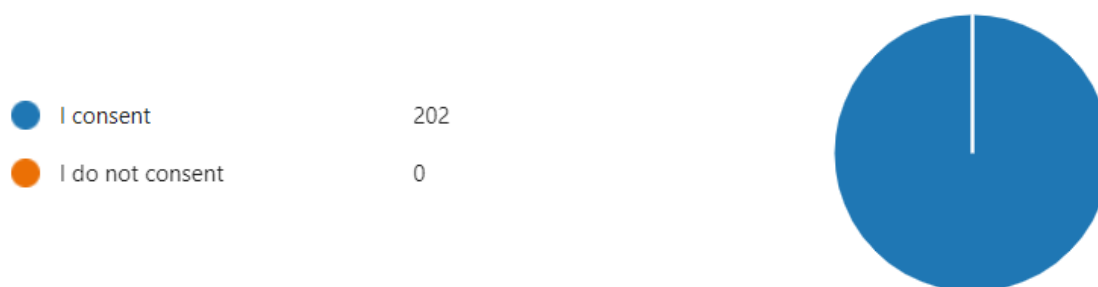
6. Methodology

This is a quantitative study which adopted the digital (online) survey design. The targeted research participants were masters and doctoral student population currently affiliated with 26 South African public universities and some private higher institutions with masters and doctoral programmes. A snowball purposeful and sampling techniques were used to recruit the participants to reach over 500 masters and doctoral students. The methodology for collecting data employed the Online-based survey including popular social media platforms in South Africa. Facebook; WhatsApp; and LinkedIn were used to administer the research digital survey questionnaire. In this research, the researchers designed an Online-based survey questionnaire with variables of the postgraduate supervision model. We deployed This digital survey questionnaire was created using Microsoft Form. The instrument was then deployed and distributed as link via the social media platforms in particular Facebook; WhatsApp; and LinkedIn to over 500 masters and doctoral students. This research strategy enabled the researchers to retain the integrity of the data collection and the actual data from the online survey. This study received approval from the University of KwaZulu-Natal's Ethics Committee (Approval No.: HSSREC000064722023) because the methods and techniques to collect and collate data assured anonymity, informed consent, confidentiality, and voluntary online participation with no rewards, or risks. Completing the data collection instrument required e-consent for anonymous data use. Descriptive data analysis was based on a Microsoft Form which analysed and explored up-to-date results in Excel as the descriptive data analysis process. This technique generated descriptive statistical results presented in the section below in this paper.

7. Results

7.1 Response Rate

The participants were given a description of the study and informed consent. They were freely available to consent or not consent to proceed participating in this study. The digital survey was distributed to over 500 participants and the response is presented in Figure 2:

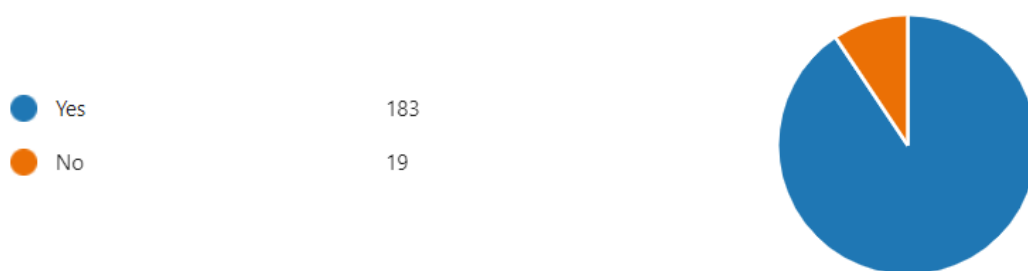


Source: Author

Figure 2: Participants who consented and responded

Figure 2 shows a 40.4% response rate from 202 of over 500 targeted master's and PhD students.

Then, the study target the participants enrolled and graduated in Master's or PhD programmes at public or private universities in South Africa between 2020 and 2024, and the result is presented in Figure 3 below:



Source: Author

Figure 3: South African public or private Institution

Figure 3 shows 91% of 202 respondents studied in South Africa, with a 9% response not studied in South Africa. The participants were asked to indicate the level of study in the last 5 years (2020-2024). The following result in Figure 4:

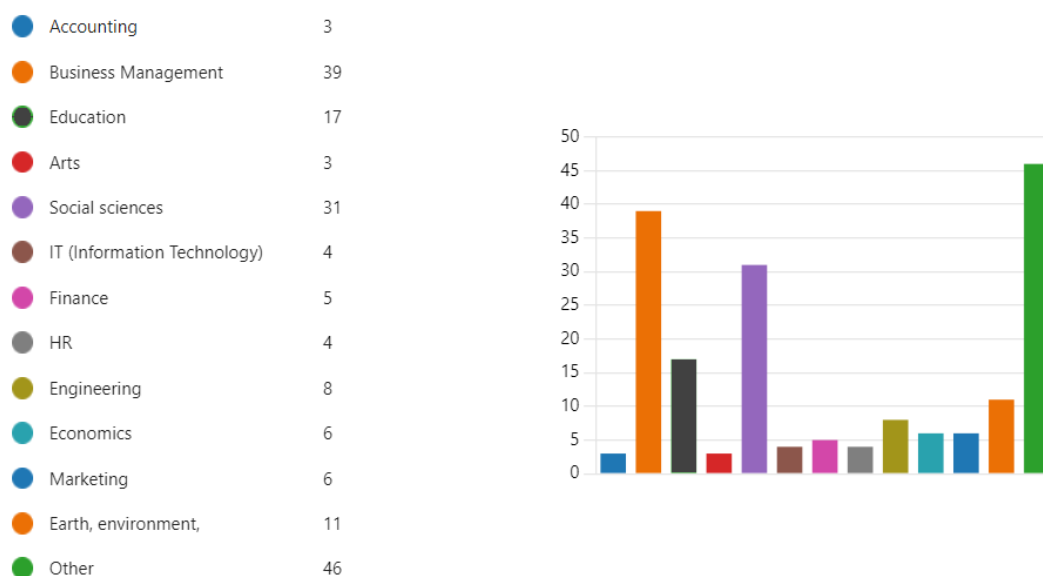


Source: Author

Figure 4: Level of study in the last 5 years

Figure 4 shows respondent distribution of 23% in progress with master's, 24% completed, 25% working on doctoral, and 28% completed. These results reflect ongoing transformation efforts and challenges in South Africa's postgraduate education sector and the need for enhanced postgraduate production (Zinn & Rodger, 2012; Motshoane & McKenna, 2021).

The participants were asked to indicate area of study specialisation for general representativeness. The result are as follows.



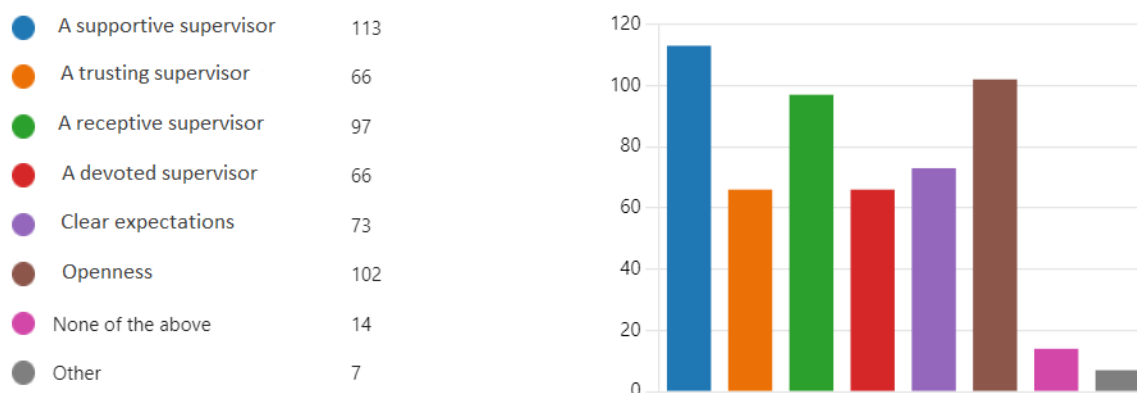
Source: Author

Figure 5: Area of study specialisation

Figure 5 shows the generalisation of field of study respondents are in.

7.2 Discussion of Descriptive Statistical Results

The participants were asked to select the best description of supervisory relationship they have experienced. The result is as follows in Figure 6 below:



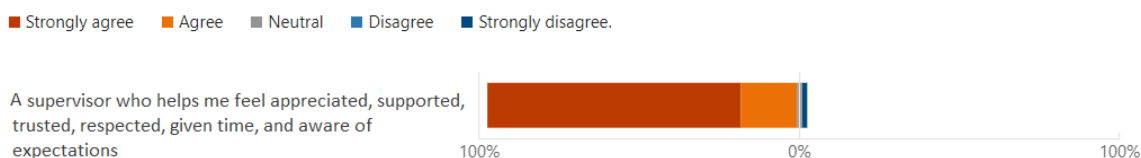
Source: Author

Figure 6: Supervisory Relationship experienced

Figure 6 shows respondents' supervisory relationship descriptions: 113 supportive, 66 trusting, 97 constructive, 66 time-focused, 73 with clear expectations, 102 approachable, 14 with no positives, and 7 other. These results highlight the importance of relational qualities in supervision and support Zinn and Rodgers' (2012) view of the learner-teacher relationship as crucial to humanising pedagogy and mentorship.

7.3 Finding 1

Supervisory relationship is perceived as positive relational qualities influenced from effective and humanising pedagogy. The participants were asked to indicate their degree of agreeance regarding the supervisory relationship they need.



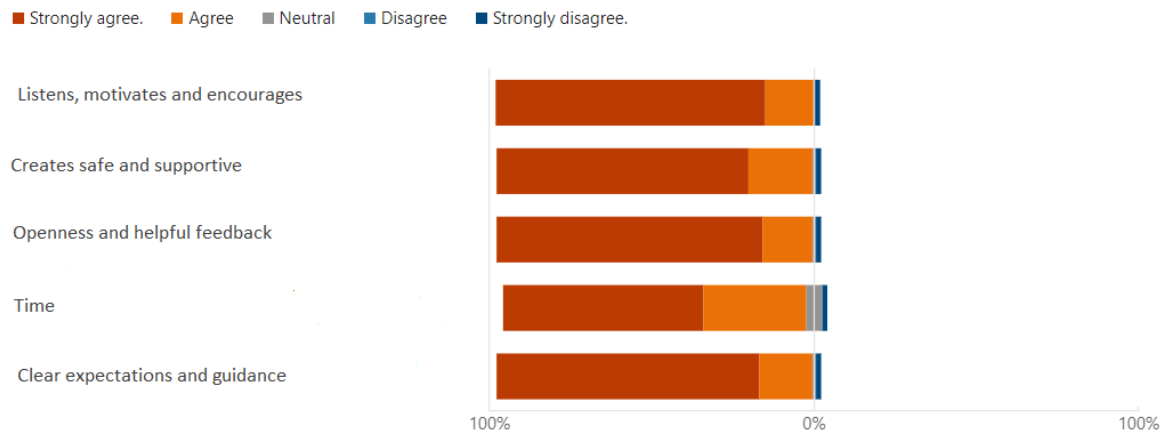
Source: Author

Figure 7: Supervisory Relationship needed

Figure 7 shows 79.2% of respondents strongly agree and 17.5% agree on needing a supportive, respectful, and communicative supervisor. Only 2.12% disagree. These findings align with the relational aspects and mentorship within the humanising pedagogy (Zinn and Rodgers, 2012).

7.4 Finding 2

The quality of supervisory relationships postgraduate students need are when a supervisor is accommodating, supportive, trusting, respectful, give time, and well informed. The participants were asked to indicate their degree of agreeance regarding the supervisory relationship needed to help them to succeed in their study. The result is presented in Figure 8 as follows:



Source: Author

Figure 8: Supervisory Relationship for success in studies

Figure 9 reveals that 83% of participants strongly agree that effective supervision involves a supervisor who listens, motivates, and encourages, aligning with Chugh et al. (2022) on the importance of open communication and mutual trust. Additionally, 78% agree that a supportive environment is crucial, consistent with Andriopoulou and Prowse's (2020) view on the balance between structure and support. Furthermore, 82% believe beneficial supervision requires open feedback, and 62% value supervisors who dedicate time to skill development. Finally, 81% stress the need for clear expectations and guidance, echoing Lee (2008) and Andriopoulou and Prowse (2020) on critical thinking and independence in supervision.

7.5 Finding 3

A supervisor-supervisee relationship is perceived beneficial in postgraduate research supervision journey when it is supportive and structured based on:

- Listening, Motivating, and Encouraging.
- Open and Constructive Feedback.
- Clear Expectations and Guidance.
- Safe and Supportive Environment.
- Time for Teaching and Training.

8. Discussion of Findings

8.1 Positive Supervisory Relationships

The findings reveal that positive supervisory relationships, as experienced by master's and doctoral students, are characterised by relational qualities that foster human connections in the postgraduate supervision process. Zinn and Rodger (2012:76) argue that higher education in South Africa is still grappling with a "societal legacy of disempowerment and dehumanisation". The continuing legacy leads to institutional and inhumane methods of postgraduate supervision which necessitates a shift towards a more humanised approach to education focusing on building the voices, agency, and community among researchers (Zinn and Rodger, 2012). The concept of "humanisation education" (Zinn & Rodger, 2012) is central to creating positive postgraduate supervisory relationships. The concept explains the importance of human aspects of students over the institutional administrative processes as emphasised in traditional supervisory models. Humanisation of supervisory relationship then ensures that the supervisors are supportive, empathetic, and student-centred, and enhance the postgraduate experience by addressing the emotional and psychological needs of students. Wanyama and Eyamu (2021) emphasise the importance of institutions in creating a supportive environment that enhances students' research journeys. A supportive institutional environment is crucial for fostering positive supervisory relationships and providing the necessary resources and infrastructure to facilitate effective postgraduate supervision. Institutions must therefore adopt supervision practices that promote a supportive and nurturing environment for postgraduate students. Moreover, the emphasis on peer learning by Boud and Lee (2005) suggests the need for creating opportunities for collaborative learning among the doctoral students. Collaborative peer learning environments enable students to share experiences, mutual support, and learn from

each other's research journeys. Peer interaction complements the supervisory relationship by providing additional layers of support and knowledge sharing which enrich the overall postgraduate experience.

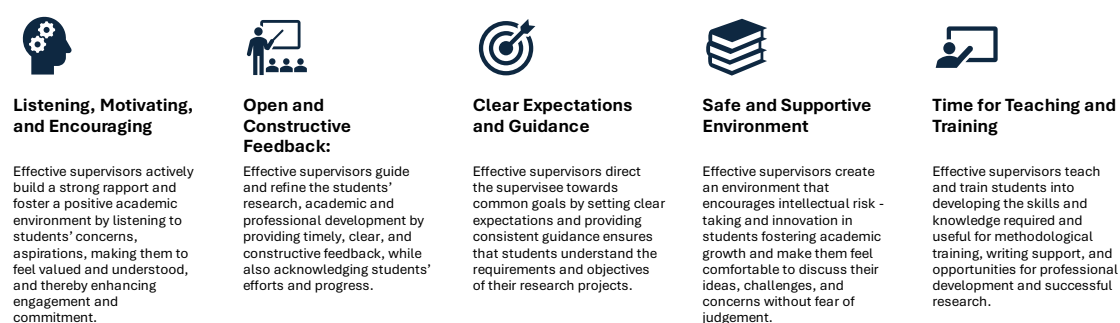
8.2 Quality Supervisory Relationships

The current study's second finding underscores the critical need for supervisors who make students feel appreciated, supported, trusted, respected, and well-informed. These qualities are fundamental to forming quality supervisory relationships that significantly impact students' academic journeys. Cekiso et al. (2019) highlight the importance of supervisor-student relationships and the provision of adequate support systems, which are crucial for enhancing students' experiences and research productivity. This indicates that the nature of the supervisory relationship is pivotal in shaping the postgraduate experience. Supervisors who embody these relational qualities contribute to a supportive and nurturing environment. Such an environment fosters student confidence and motivation, which are essential for academic success. The feeling of being appreciated and respected can enhance a student's sense of belonging and commitment to their research, while trust and support from a supervisor can mitigate feelings of isolation and anxiety that are often associated with postgraduate studies.

Corn r (2020) introduces the concept of a socially embedded support system, which aligns with the idea of comprehensive support structures tailored to meet the diverse needs of postgraduate students. This approach emphasises the importance of addressing the informational, instrumental, and emotional needs of students. By aligning support with student needs, supervisors and institutions can create an environment where students are not only academically supported but also emotionally and socially nurtured. The development of comprehensive support structures is essential. Informational support involves providing clear and consistent guidance on academic and administrative processes, ensuring students are well-informed about their responsibilities and opportunities. Instrumental support includes providing resources such as funding, access to research materials, and opportunities for professional development. Emotional support entails creating a supportive atmosphere where students feel valued and understood, which can significantly reduce stress and enhance overall well-being.

8.3 Supervisory Model

The third finding in this study indicates that master's and doctoral students perceive a beneficial research supervision journey as one that develops a supportive and structured supervisor-supervisee relationship. According to Holtman and Mukwada (2014), the quality of postgraduate research supervision significantly impacts time-to-degree and throughput rates at South African universities. This insight suggests that effective supervision is not merely a matter of academic guidance but a comprehensive support system that fosters timely and successful completion of postgraduate studies. Holtman and Mukwada (2014) is confirmed by the findings that a beneficial supervision journey and practice should be modelled as in Figure 9:



Source: Author

Figure 9 Supervision Model

Figure 9 shows as supervisory model with five theoretical principles as explained by Holtman and Mukwada (2014) that improved quality supervision practices enhance student progression and completion rates. In addition to Holtman and Mukwada (2014), De Lange et al.'s (2011) cohort model underscores the value of building a community of scholars by bringing together students and supervisors. A collaborative and supportive network promoting peer learning and mutual support a practice fostering a safe and supportive learning environment, listening, motivation and encouragement. Further, Carter-Veale et al. (2016) explain Dissertation House model supporting the above practical framework for helping postgraduate students navigate the final

stages of their studies. Thus, supervision model shown in Figure 9 can be demonstrated by structured workshops, individual consultations, and peer support. Collectively, students assist each other to experience clear expectations, guidance, teaching, open and constructive feedback leading to complete their theses efficiently.

8.4 Integration: Building a Postgraduate Supervision Model

Building a postgraduate supervision model for student success in South Africa requires moving away from institutional-focused traditional one-on-one models to humane-oriented models and practices. Such a multifaceted approach demonstrated in Figure 9 above in this paper integrates humanisation education, institutional support, and peer learning fitting Zinn and Rodger's (2012) theory of "humanising pedagogy" in South Africa. In this theory, Zinn and Rodger (2012), premise humanisation education as building the voice, agency, and community embodying belonging and the essence of citizenship. The postgraduate supervision model as a crucial to humanising pedagogy embodies supervisory relational qualities fostering supportive institutional environments and promoting collaborative learning among students (Zinn & Rodger, 2012). Thus, postgraduate education in South Africa can adopt this supervision model for more humane and effective in support for students' personal and professional development leading to quality dissertations and theses, completion and throughput. According to the findings in this study, along with scholarly insights from Zinn and Rodger (2012), Cekiso et al. (2019) and Cornér (2020), it is necessary for supervisors to possess relational qualities that make students feel appreciated, supported, trusted, respected, well-informed and embracing them as human. Furthermore, the qualities align with socially and humane embedded approach to give postgraduate student the social support and collaborative learning experience. Higher education institutions in South Africa can adopt and develop humane-oriented supervision models that promotes student success, well-being, research productivity, completion and throughput. Thus, building a postgraduate supervision model for postgraduate student successful completion and throughput in South Africa should be routed in humanising pedagogy. Supervision models embracing humanising pedagogy are characterised by listening, motivating, and encouraging students. Supervisors provide open and constructive feedback, setting clear expectations and guidance, create a safe and supportive environment, and allocate time for teaching and training students. Institutions can significantly develop their postgraduate research supervision framework by learning from humanising pedagogy praxis, cohort model, dissertation house model, and socially-embedded support system to enhance student success, timely completion rates, and overall research productivity.

9. Conclusion

The aim of this study was to explore the experiences of masters and doctoral candidates and graduates to develop and recommend an optimal postgraduate research supervision model that ensures student success rates in South African universities. The central research question posed was: How can the experiences of masters and doctoral candidates and graduates be used to explain and propose an optimal postgraduate research supervision model that best supports student success rates in South African universities? Examining postgraduate supervision models in South Africa through existing theoretical frameworks reveals various approaches and potential supervision strategies for enhancing student success. Each model offers unique advantages and challenges that need to be carefully assessed and tailored to the local context. This paper established that integrating elements from these different perspectives, a more comprehensive and effective postgraduate supervisory framework can be developed, promoting academic excellence and higher completion rates among South African doctoral students. Humanising supervision practices are particularly supportive and foster strong supervisor-student relationships. As a practical approach, this is crucial for enhancing students' experiences, improving time-to-degree completion, and increasing research output. We found that a postgraduate supervision model grounded in the theory of humanising pedagogy can improve successful student completion and throughput in South Africa. This model is characterised by active listening, motivation and encouragement of students, providing open and constructive feedback, setting clear expectations and guidance, creating a safe and supportive environment, and allocating time for teaching and training. It is a futuristic model. A futuristic supervision model taps into innovative postgraduate education. A postgraduate supervision models this study proposes encompasses the future roles of students and supervisors, and future supervision spaces. The models should use humanising pedagogical criteria with pastoral care to address individual students' competencies, strengths, weaknesses, and interests. Therefore, futuristic supervisor cultivates agility, critical thinking, and problem-solving skills in students for real-time scenarios by listening, motivating, encouraging, providing open and constructive feedback, setting clear expectations and guidance, creating a safe and supportive environment, and allocating time for teaching and training. This includes using new technological tools for research and evaluating research competencies to ensure students are well-

prepared for an authentic research culture. Additionally, postgraduate supervision pedagogical tools must equip student researchers for a rapidly evolving job market characterised by new communication technologies, globalisation, and fostering human-machine collaboration. A suggested postgraduate supervision model in this paper embraces futuristic humanising postgraduate education contributing to the overall success and productivity of masters and doctoral students in South African universities. This model supports the humane awareness raising and emancipatory approach to supervising student researchers within South African postgraduate education.

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The 'Law and Language Friction': Overcoming the Barriers of Discourse in Supervision

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Abstract: The relationship between law and language requires continuous attention in legal education, specifically supervision. In the journey of every law student, the discipline will demand that they interpret legal texts, write legal opinions, and prepare research reports and theses, which require the use of language. Clear and practical legal language makes a legal argument whole, compelling, and persuasive. However, the language challenges law students because the discourse in legal terminology creates a law and language friction. This friction presents a double-edged sword when students attempt to express themselves using legal language in their research projects, depending on whether they know the limitations and opportunities that the language presents in legal reasoning. The main argument of this paper is that we need to acknowledge the friction in the relationship between the law and language and seek opportunities to confront and overcome this friction through our supervision models and approaches. The research focus of this paper addresses the academic literacy obstacles in the context of postgraduate supervision in legal education. It presents the law and language friction as a positive and a negative factor that law students should confront to communicate effectively in legal writing and for their supervisors to teach effective legal writing.

Keywords: Legal terminology, Supervision approaches, Writing, Legal education, Discourse, Models of supervision

1. Introduction

Legal language is exclusive and peculiar. On the one hand, the law prescribes legal language that deviates from ordinary language, which denotes exclusivity. On the other hand, law adopts ordinary language to determine the scope of legal rules, which is peculiar. It is no wonder why we have textbooks with titles such as 'English for Law Students' (Van der Walt & Nienaber, 2009). The meaning of words shifts in legal language depending on context, field and time. Stierer's (2008) explanation of the daunting experiences of navigating a particular discipline's complex jargon and terminology comes to mind when I think about the role of language in law. Stierer (2008) accurately describes my supervision candidates' predicament. Law students struggle to navigate, adapt and use legal discourse. When a student writes inaccurately, it skews their argument because of a lack of awareness and intentionality to construct legal meaning. It often results in an incorrect statement of the law, even though the language used may be grammatically correct in ordinary English. I refer to this challenge as the law and language friction. In this paper, I explain how I conceptualise the writing challenge experienced by law students as friction. I provide examples of how I address the friction in postgraduate supervision using educational theory on supervision pedagogies and approaches.

2. The law and Language Friction at Crossroads but not at Odds

I first observed the students' challenges with legal terminology and the subtlety of the problem in my undergraduate classes. Students would learn obscure principles, such as that the law regards a company as a 'person' (s1 of the Companies Act 71 of 2008) but does not apply the term 'person' to an unborn baby (*Christian Lawyers Association of South Africa and Others v Minister of Health and Others* [1998] JOL 3617 (T) pp. 17). I call this an obscure principle because of how students react to learning this notion, which seems harsh and contrary to social, cultural, and religious views. This obscurity influences the way students construct knowledge and write about the law during their undergraduate and postgraduate studies. These reactions are not a bad outcome. Instead, the students highlight the beauty and significance of discourse while also showing why academics must grapple academically with discourse from a scholarship of teaching and learning perspective.

Friction occurs when two objects cannot merge and perform smoothly simultaneously. This is particularly true when the two objects rub against each other while moving in opposite directions. Friction causes the two objects to wear each other out, which deteriorates their quality and substance. I imagine the same process happens in students' minds with the law and the language in legal discourse. Language and legal terminology must work together to construct and convey the acceptable correct meaning in law. However, the language and the law conflict and diminish what the student intends to communicate. The students' challenges lie in the lack of awareness and understanding of this friction when they attempt to communicate in academic legal language. Students are susceptible to conflating meaning when legal interpretation is required. For students to confront the friction, they require what Biggs (2012) calls conceptual change to be more strategic about writing law.

Moreover, their supervisors must consider how supervision models and approaches influence how much they can provide support in confronting the friction.

I use conceptual change opportunities to demonstrate how the friction is tackled. I provide access by guiding students to sources and making the friction explicit, but without using discourse (as in this paper) to describe the friction, and I make it explicit that the ways of arguing or producing knowledge are determined by the legal community's way of speaking and conducting legal enquiry. This requires a particular style of writing characterised by the use of authority and critical terms that signify signposts for a specific legal phenomenon. Yet, depending on the supervision model in a supervisory relationship, there may be limited or extensive opportunities for the supervisor and student to address the friction.

2.1 Models of Supervision – a Dyadic Group Response to the Friction

The dyadic supervision model is conducive to students' ability to manage law and language friction. The dyadic model requires a master apprenticeship approach where one student has one supervisor (Guerin, et al., 2015). Since the friction presents an academic literacy and discourse challenge, the master apprenticeship method of supervision is needed. A single supervisor has sufficient opportunity to demonstrate and model how to know and be in the legal discipline without a clash of ideologies between supervisors.

Models of supervision include panel or team supervision and group models of supervision. Group supervision involves multiple students under one supervisor who runs a project that pulls from each student's research problem (Guerin, et al., 2015). Panel supervision is often called team supervision, which requires one student to receive feedback from multiple academics (Guerin, et al., 2015). Team supervision usually comprises two supervisors in a co-supervision context (Guerin, et al., 2015), which most legal researchers can adopt if they want to deviate from the dyadic model. However, complete deviation is not advisable for teaching supervision candidates how to confront the law and language friction. The best solution may be to begin and end the process with the dyadic supervision model for each supervision candidate and combine it with group supervision approaches through seminars and workshops throughout the students' journeys. Student groups can assist each other in confronting the academic literacy challenge at the core of the law and language friction.

2.2 The Academic Literacy Obstacle

The law and language friction is not an English language problem, nor is it about a misunderstanding of the law. I hold an ideological view of literacy in the higher education context (Boughey & McKenna, 2016). The ideological perspective of academic literacy is that reading and writing are shaped by the social contexts within which they arise, and the ways of arguing or producing knowledge are determined by the legal community, which is different from how a group of scientists or sociologists would construct knowledge (Boughey & McKenna, 2016).

Boughey and McKenna's views confirm that what constitutes a valuable argument or a contribution to the field is determined by the disciplinary context of the law and the specific legal field within which the research of the students exists (Boughey & McKenna, 2016). The postgraduate studies environment also has a socialisation process characterised by the roles and expectations placed on postgraduate students (Carter, et al., 2013). In law, this is seen in the increased expectations of reading more and searching old authorities to trace historical origins in specific subjects to contribute meaningfully to the field. Therefore, it is not the mere difficulty of expressing oneself in English that presents a hurdle for the students' success and contribution to the field. The obstacles are the ways of being that the supervisor ought to model.

2.3 Legal Academic Literacy – is it Unique?

In a legal context, the student should construct arguments using the appropriate interpretation methods considering which primary and secondary sources are acceptable in the field. For instance, an argument not based on court cases or developed in consultation with them will be deemed unfounded. The law and language friction present a legal terminology and social identity obstacle that affects students' writing and construction of knowledge because of the disciplinary context and, sometimes, historical context of the law. This problem can exist in any other discipline. For instance, some concepts and threshold concepts become bottlenecks in undergraduate courses because they prevent the students from understanding scientific and academic meanings simply because the latter is irreconcilable with the ordinary meaning of the words.

In law, knowledge exists within a boundary of principles that restrict ways of creating and constructing arguments, especially in statutorily regulated fields, which prescribe a restricted meaning of terms. Here, the lawmaker ringfences the conversation by ensuring that the interpreter of the law remains within defined boundaries. No other meaning is allowed except that which appears in the context of the legislation. Therefore,

in law, discourse is not developed by the community of practice, but the law is discourse. This detracts from the notion that the community of practice informs the discourse because, in law, discourse is imposed by the lawmaker, particularly, parliament and the judiciary.

Legal writing is embedded in the discipline because the law only accepts objective ways of writing and constructing knowledge. This reminds me of how academic literacy affects a student's proficiency due to cultural, social, and racial backgrounds (Boughey & McKenna, 2016). For instance, an African student may be uncomfortable expressing an argument requiring one to view a company as capable of holding rights and duties. In indigenous law, the notion of a company is non-existent. This explains why a student might struggle to express legally acceptable arguments in an undergraduate dissertation on companies. However, the same candidate can later develop to think critically in a master's thesis that requires her to build arguments about people's identities considering our Constitution, which is rooted in dignity and Ubuntu, an African concept (Le Grange, 2012).

For students to use certain language correctly, they must learn new meanings for ordinary terms that they have used for their whole lives. Students must demonstrate their learning by looking at the world with different eyes (Biggs, 2012; Boughey & McKenna, 2016). The law and language friction is not a problem that is inherent in the individual student (Boughey & McKenna, 2016). It is apparent in all the students' writing at various degrees and stages of development. All the students I have supervised have had to confront the friction between law and language.

3. Manifestations of the law and Language Friction

The supervisor is responsible for raising the importance of avoiding ordinary language and adopting academic language and legal discourse. As a supervisor, I must remind students that language use is shaped by the specific terminology used by the writer due to their awareness of the context within which they speak (Boughey & McKenna, 2016). The context of law determines the intention, language, and scope, which creates a tight space for students to navigate when expressing a legal argument that overlaps with a personal view.

Students tend to use emotive language instead of legal discourse to express themselves. It is difficult for students to separate personal opinions from legal arguments because the law affects society and human behaviour. In postgraduate supervision, the subject matter of the students' theses is often a touchy one for them. Thus, friction is inevitable in students' legal writing and research. There may be several ways in which this problem arises. I only discuss two forms in which the law and language friction manifests in my observations.

3.1 Positive Friction

A positive manifestation of friction is where the clash between the law and the language is visible and detectable in the student's writing. The term 'positive' is used in its dictionary sense in the latter statement, which refers to a presence rather than an absence of friction. Due to a lack of awareness of the strategic word choices required for law, students end up with what seems like an ignorant explanation or conclusion about the law or what law ought to be. Despite the presence of friction appearing as an obstacle, it is also positive. Now, I use the term positive in its ordinary sense to refer to a good outcome. Therefore, the visible presence of friction is good because it allows students to grow in knowledge production and helps them identify that there is a way of constructing knowledge in law. Supervisors and their students should not be discouraged by the appearance of friction.

Some of the legal terms we use have ordinary meanings. For instance, the word 'doubt' refers to a state of uncertainty. When used as legal terminology, 'doubt' distinguishes a criminal law burden of proof standard from the burden of proof in civil cases. When a student writes about civil laws and refers to a principle requiring 'no doubt' about the facts, the student unintentionally engages in a criminal law discourse. The outcome is that the language distorts the legal meaning of the written text and, technically, results in an 'incorrect' statement of law. This is a classic case of language and law having to move together in the same direction to create a crisp argument, but instead, the language went in the opposite direction than the law when the student constructed meaning.

3.2 Negative Friction: The Flight Instead of Fight Response

The second form of the law and language friction is negative, where a student is afraid to enter the 'friction zone' and instead opts to regurgitate the law as is, without any criticality. The avoidance reduces the value of the knowledge that the student advances because it omits critical thinking. Criticality requires a student to analyse and pick out ideas and theories that emerge from the works they have read (Stierer, 2008) to present them in a way that gives insight into the development and practice of law. However, with negative friction, the

student ends up with rudimentary content, often taking the legal text out of context, resulting in incorrect legal arguments.

The student's approach is caused by the fear that they will encounter the law and language friction and fail to construct an appropriate argument based on the law. The negative form manifests in students who have previously tried to evaluate the law in past experiences critically and had their ideas turned down as purely 'wrong' instead of being told that their construction should engage legal discourse with precision.

The law and language friction is inevitable and sometimes necessary to develop the law and the student's ability to produce legal knowledge through evaluation, critiquing and interpreting legal texts. Decided court cases frequently illustrate how this issue can be resolved when the court dissects the legal interpretation of a rule, word or phrase. The courts usually choose between an ordinary literal meaning or flexible contextual and purposive meaning. The courts must find a socially responsive solution and method of interpretation to construct the legal meaning of the language used in a particular statute. A conceptual change is required for students to demonstrate this 'way of knowing'. (Biggs, 2012) Students must intentionally consider how they use language to express their meaning in law. The strategic language choices influence the argument to determine the appropriate application of the law (Boughey & McKenna, 2016).

Part of my role as a supervisor is to help the student reach the desired level of writing in legal discourse. This requires a supervision approach that allows the student to manage the law and language friction to resolve the challenging transition from the primary discourse that is shaped by socio-economic realities to the academic discourse shaped and determined by the law and its community of practice (Boughey & McKenna, 2016).

4. Supervision Framework: From old Ways to Scholarly Ways

When academics begin supervising for the first time, they often draw from our own experiences as supervision candidates (Guerin, et al., 2015). I have been through the master-apprentice model of supervision three times as a postgraduate student. Each of these supervision experiences was linear and functional, which Lee and Murray (2015) describe as "brainstorming, drafting, redrafting, editing, release" through a series of tasks with which the student complies. I would pitch my research topic to the supervisor, we would brainstorm the focus of the paper, and I would draft and submit my work for feedback until the final product was ready for examination. In law, postgraduate supervision comprises dyadic, one-on-one relationships by default (Guerin, et al., 2015), which often lend themselves to linear-functional supervision approaches. Consequently, when supervising students, I use a similar linear-functional approach.

Throughout the supervision process, I advise students on areas where the law and language friction adversely affect the student's argument. I show students how to read the legislation definitions through the lens of judicial precedent, where our courts have demonstrated the methods of interpreting words defined in and not defined in legislation. This equips students to practice law as our courts interpret it because there are instances where our discourse is informed by legal rules. The next stage is a criticality exercise that requires the student to judge the outcomes of their legal interpretations. At this stage, the student should use discourse to contribute to the field and suggest new ways of thinking about legal problems. These ways can be facilitated by the positive law and language friction as it reveals the inconsistencies between law, legal reasoning and societal realities affected by laws.

I started reflecting on the effectiveness of this approach when I first read about Lee's (2007) supervision framework. It helped me move beyond an apprenticeship perspective of teaching in the context of supervision to reimagine supervision from a developmental perspective. Pratt (2002) describes the apprenticeship perspective as using performative learning as students adopt the language and practices of a specific social group, which in this case is that of legal researchers, and how they approach legal research. The distinguishing factor of the developmental perspective is that it focuses on what the student knows and how the student changes their mind about what they understand through the learning process. As a result, the developmental approach uses a series of questions to develop student thinking and writing processes. Questioning has proven to be a valuable tool to develop student writing. The more questions I pose to the student, the more the layers of their arguments are revealed. This style ensures appropriate legal discourse. However, it can only be effective through a combination of supervision approaches and not just the functional approach.

4.1 Soothing Friction Through a Supervision Framework

Lee's (2007) supervision framework outlines various approaches supervisors can adopt to guide students through their research projects effectively. A good framework pairs effective approaches with effective

supervision models. Central to Lee's perspective is the idea that supervisors should navigate between different supervisory modes depending on each student's specific needs and circumstances. This adaptability is crucial in addressing the friction that arises from the complex interplay of law and language during the writing process. The friction in law and language necessitates shifts in supervisory approaches and an appropriate supervision model.

4.1.1 First, the functional approach

Initially, a functional approach is employed in supervision. It involves setting clear tasks and objectives to start the supervision process, particularly during the research proposal phase (Lee, 2007; Lee & Murray, 2015). In this stage, supervisors provide structure through tasks such as drafting the proposal, suggesting readings, and handling administrative matters. The focus is on helping students define their project, develop research goals, and select appropriate methods. This structured guidance ensures that student gains a clear understanding of their research intentions.

As students progress, the supervision approach must evolve. In the advanced stages of the proposal phase, and after the proposal has been accepted, a shift towards critical thinking is essential (Lee, 2007; Lee & Murray, 2015). At this point, students are encouraged to go beyond the current legal standards and consider how the law ought to be to contribute meaningfully to their field. This involves engaging with statutory interpretation methods and critically assessing the implications of legal texts. The aim is to challenge students to think deeply about the law's theoretical underpinnings and practical application.

4.1.2 Critical thinking approach as a central stage

Recognising nuanced legal issues through critical thinking is crucial to addressing the law and language friction. Supervisors need to scrutinise the terminology and language that students use as legal research requires precise and deductive reasoning. Students may adopt common meanings of legal terms that could distort their arguments at this stage, which results in positive law and language friction. However, if the supervisor does not detect the positive friction at this stage, they might have to enquire whether it is manifesting negatively. If the latter is found, the supervisor must alert the student to shift the friction from negative—absent on paper but present in the mind and triggering avoidance—to positive, which is present and confronted through critical thinking. Therefore, a critical thinking approach should be employed to prompt students to examine the rationale behind their choices and engage with the theoretical frameworks underpinning their research (Lee, 2007). This approach is intended to lead to knowledge production that aligns with legal discourse.

4.1.3 Enter the enculturation approach

In addition to critical thinking, an enculturation approach is crucial during this phase (Lee & Murray, 2015). Enculturation involves providing feedback that encourages students to view their work from the perspective of external reviewers or peers. This approach helps students understand how the disciplinary community might judge their arguments and how to present their research within the established legal discourse. Effective enculturation requires supervisors to guide students in articulating their arguments in legal terms, balancing technical legal language with more accessible language as needed. This approach fosters the development of sophisticated legal discourse skills essential for academic writing in law.

The critical and enculturation approaches help students manage the friction inherent in legal writing. As Lee and Murray (2015) highlight, a critical thinking approach encourages students to engage in inquiry-based learning, which is pivotal for constructing and understanding knowledge. Students can move from merely replicating existing knowledge to making original contributions by identifying and addressing gaps in their arguments. This process is iterative, as students may encounter and address friction at various stages of their research.

4.1.4 Using the dyadic model to facilitate adequate supervision to emancipate students

A dyadic supervision model, where the supervisor and student engage directly, can effectively manage this friction. In such a model, supervisors can provide individualised feedback and support, which helps students confront and overcome challenges related to law and language (Guerin, Kerr, & Green, 2015). This model allows a more nuanced understanding of the student's difficulties and facilitates targeted interventions to address specific issues. The supervisor can begin with the functional approach, then move into critical thinking as a central approach. They can also incorporate enculturation while repeating the process throughout different stages of the supervision journey.

Conversely, group or panel supervision structures might not always be conducive to effectively managing the law and language friction. In group settings, students may feel isolated or judged, which can exacerbate anxiety and hinder their ability to engage with critical feedback (Watts, 2010). Team supervision involving multiple supervisors can also present challenges, such as conflicting approaches or intellectual divisions, which might affect the student's morale and sense of direction. Given the complex nature of legal research and the need for precise and critical analysis, a one-on-one supervisory relationship often provides a more supportive environment for addressing friction.

Detecting and addressing friction in postgraduate supervision requires a careful and inclusive approach. Supervisors need to make the writing and language challenges explicit and provide clear guidance on managing and overcoming these challenges. The dyadic supervision model allows for modelling effective strategies for addressing friction and fostering conceptual change in students (Guerin, Kerr, & Green, 2015). This approach facilitates the transition from a functional to a critical and emancipatory mode of supervision, helping students develop the skills necessary for advanced legal academic writing.

As students become more proficient in managing the law and language friction, they often exhibit responses characteristic of an emancipatory approach. This stage involves students becoming more confident in their ability to engage with and critique legal discourse, leading to a more sophisticated understanding of their research field (Lee & Murray, 2015). The emancipatory approach supports students in integrating their learning and applying it to their research, fostering their growth as independent scholars.

5. Conclusion

Soothing the friction through a supervision writing framework involves a dynamic and adaptable approach that moves through functional, critical, enculturation, and emancipatory modes as needed. This process helps students navigate the complexities of legal writing and overcome challenges related to the law and language friction. Effective supervision requires a careful understanding of the various supervisory approaches and their nuanced applications in the context of supervision models. By addressing the friction constructively, supervisors can facilitate students' development and enhance their contributions to legal research. The problem is that the friction is so subtle and undetectable. It requires the supervisor to adopt a criticality posture.

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The COOL e-Research and Researcher Development Experiences: A Mentor and Mentee Perspective

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Abstract: As information and communication technologies (ICTs) continue to advance, research projects and processes increasingly adopt ICTs, and terms like 'e-research' gain popularity. However, disparities in access to ICTs and users' technology proficiency affect the adoption of e-research technologies. Despite these constraints, the COVID-19 pandemic forced many researchers (including postgraduate students), in diverse and unequal contexts, to take their research activities online. This paper reports on the 'e-research' experiences of the principal investigator, a research mentor and a researcher after the adoption of ICTs during the pandemic. This research took place in the context of the Cases on Open Learning (COOL) research project, commissioned by, and conducted jointly with, the Department of Higher Education (DHET) in South Africa. This was a multi-researcher (10 researchers located across the country, with varying degrees of research experience), multi-site qualitative social science research that took the form of 15 case studies, conducted across seven technical and vocational education and training colleges, six universities, two DHET sites, and a desktop study. The national lockdowns that were announced shortly after our first and only face-to-face project meeting forced us to conduct all aspects of the project entirely online. We used the Google suite for collaboration and Zoom for COOL team building, researcher knowledge and skills development sessions, and online interviews conducted by the researchers. WhatsApp played a dual role – supporting ongoing communication within the research group, and as a data collection tool. The paper highlights our experiences on what it meant to be part of a research team, as well as the opportunities and challenges of conducting research of this nature. It shed light on the COOL team building and researcher development strategies. Drawing on insights from our experiences, we recommend that higher education institutions (HEIs) develop both technical and human-oriented guidelines for conducting e-research. This paper could provide insights for independent researchers, postgraduate students, principal investigators, and supervisors considering a cohort-supervision model, comprising diverse students, who may be in dispersed geographical locations.

Keywords: Covid-19 pandemic, e-Research, Information and communication technologies, Mentoring, researcher development

1. Introduction

There is an increasing interest in how to conduct research across geographically distant spaces with research teams with a diversity of experience and skill. This paper draws on the experiences of three participants from the Centre for Innovation in Learning and Teaching (CILT) at the University of Cape Town (UCT) in the Cases on Open Learning (COOL) project, commissioned by the Department of Higher Education and Training (DHET). The COOL project was a multi-researcher, multi-site collaborative research project, conducted fully online during the COVID 19 pandemic. One of the project aims was capacity development for young and emerging researchers, many of whom faced challenges relating to connectivity, access to software, and conducive work contexts, challenges heightened by their standing as contract employees. Furthermore, as the project adopted a social justice framework for analysis, we were determined to design a collaborative research project that, in addition to reaching a successful completion, would function in socially just ways.

This paper describes the entanglement of the research process, practices and technologies in response to the challenge of completing the COOL project during the pandemic, as an illustrative case. Drawing on research process models from the literature, we present a description of the e-research process undertaken by the COOL project, based on the experiences of the principal investigator, a research mentor and a researcher.

2. The Story of the COOL Case

The COOL project was commissioned by DHET in March 2019, initially scheduled for completion in December 2020. The project, as conceptualised by DHET, required the successful achievement of two outcomes: (1) the development and dissemination of case studies to demonstrate the uptake of open learning in the Post Secondary Education and Training (PSET) sector, and (2) the strengthening of the capacity to research open learning through the development of a cadre of emerging researchers.

Successful achievement of the first outcome required that we describe the extent to which the notion of 'open learning', as defined by DHET in the draft Open Learning Policy Framework (2017), was being taken up by various

PSET institutions. DHET nominated a selection of topics and sites, allowing the core research team some leeway in identifying additional sites and topics of interest. The project culminated in the study of seven TVET sites, six university sites, two DHET sites and one desktop. A broad range of topics including leadership, online assessment, blended and online learning, student support, fundraising and staff development were nominated as areas of interest.

In order to address the second outcome, we were required to hire a representative and diverse group of researchers, taking into consideration geographical location, institutional affiliations, race, gender, age, and home language. The final research team for the project was composed of ten researchers: nine of whom were early-career or newly established researchers, with one highly experienced researcher being brought in later in the project. The research team comprised Masters and doctoral students, post-doctoral researchers, and two staff members from other institutions. Team members came from a variety of human and social science backgrounds, including education, law and urban planning. The research team was based across five provinces, in urban and semi-urban locations, lived in varying circumstances – alone, with family, in residences and had different levels of access to internet connectivity. Furthermore, many of our researchers experienced some degree of financial insecurity or uncertainty, as they were either on limited student-funding or self-employed and the project remunerated them on a paid-on claim basis.

Given the scattered location of the sites, the research team and the financial limitations of the project, the COOL project had, from the outset, been designed to draw on digital resources, tools and platforms, as well as strategic face-to-face activities such as three whole team meetings and site visits to successfully complete the project. However, even with the comprehensive risk analysis conducted at the beginning of the COOL project, no-one anticipated a pandemic. As the project was funded through DHET and European Union grants, cancelling or suspending the project would have required the return of funds. Furthermore, as was the case with other research projects at the time (see, for example, Yan, 2020 and Buckle, 2021), cancelling or postponing the COOL project would have compromised our researchers' already precarious living arrangements, expected knowledge contributions and research careers. Taking this into consideration, the project team redesigned research and support activities to accommodate lockdowns and to take advantage of the affordances of digital tools and the project deadline was extended to December 2021.

In the next section, we draw on literature that explores researching with technology and developing researchers at a distance, to contextualise our experiences and practices during the COOL project.

2.1 Researching With Technology and in Digital Spaces

The terms 'e-science', 'cyberinfrastructure' and 'e-research' represent three key traditions in researching with technology and digital spaces. While initially emerging from different geographical and disciplinary contexts, overtime, these traditions have converged, broadening their scope beyond their original focuses (Koschtial, 2021; Jankowski, 2009).

'E-science', commonly used in the United Kingdom (UK) and Germany, was introduced by John Taylor, the then Director General of the UK's Office of Science and Technology, in 1999 in a bid to obtain funding for e-infrastructure developments, which later give rise to the UK's e-science programme. 'Cyberinfrastructure', commonly used in the United States, emerged from a 2003 commission report funded by the National Science Foundation (NSF). Jankowski (2009) observes that within the e-science tradition, Internet and computer technology is seen as a key tool to transforming the scientific enterprise, while within the cyberinfrastructure tradition, "the development is seen as parallel to the infrastructure already integral to modern societies".

'E-research', more commonly used in Europe and Australia, emerged in 2005 through an initiative of the Australian Research Council. Research within this tradition sees a disciplinary shift towards the social sciences and humanities (Jankowski, 2009) and a focus on the use of computing infrastructures within the academic domain (Schroeder, 2007). Unlike e-science, which prioritises high-speed computing for large datasets, e-research "places weight on incorporation of a wide variety of new media and electronic networks in the research process" (Jankowski, 2009). The tradition has tended to focus on e-collaborations (Mohamed et al, 2013) and open initiatives (Schroeder, 2007).

The relevance of e-research became apparent during the COVID-19 pandemic, where lockdowns substantially interrupted traditional research approaches. Field- and lab-based research was interrupted (see, for example, DeMatthews et al, 2020 and Kroenke et al, 2021). Due to lockdowns, even desktop researchers were unable to access libraries (see, for example, Alam et al, 2021). Contract researchers were plunged into conditions of financial precarity (see for example, Park, 2020 and Yan, 2020). Under a range of pressures, scholars turned to

a range of technological solutions to continue their research. For example, video conferencing platforms were used for qualitative data generation (Lobe et al, 2020; Roberts et al, 2021; Shepperd et al, 2021). Virtual methods are noted to produce data comparable in quality to in-person interactions (Shepperd et al, 2021), while offering logistical benefits, such as, recruiting geographically distant populations (Roberts et al, 2021) and facilitating the ease of managing and conducting telephone interviews (Buckle, 2021).

2.2 Developing Researchers in a Distance Context

The scholarship of researcher development beyond the formal postgraduate supervision space only surfaced over a decade ago. Evans (2011) defines researcher development as "the process whereby people's capacity and willingness to carry out the research components of their work or studies may be considered to be enhanced, with a degree of permanence that exceeds transitoriness". She intentionally uses the term "people" rather than "researchers" to include anyone who could be transformed into a researcher in the process of development (Evans, 2011, p. 82). For instance, Nguyen (2012) noted that "there has been lack of focus on the development of other sub-groups such as practitioner-researchers, research staff, academics, early career researchers, and other constituencies contributing to the development of people as or into researchers". From a postgraduate supervision context, Albertyn, van Coller-Peter and Morrison (2018) explore the three perspectives of researcher development: research education, relational support and personal engagement. Research education involves the acquisition of research-related knowledge, skills, and competencies, where the most appropriate pedagogy embraces learning by doing research. With respect to relational support, they emphasise the need for researcher support as they internalise and assimilate research-related knowledge. These authors acknowledge that "the adult learning process is enhanced when it moves to a participatory one, where change is fostered in the company of others" thereby drawing on the notion of situated learning and communities of practice (Albertyn et al, 2018). Furthermore, personal engagement is about how one's perceptions about, or attitude towards research (Evans 2011) and their agency could potentially enhance change and development (Albertyn et al, 2018).

Developing early career researchers can pose challenges when research teams are geographically dispersed (Mbuagbaw and Thabane, 2013). The use of independent, contract researchers can exacerbate an already complicated situation.

3. Method and the Authors

In writing this paper, we drew on the experiences of three members of the COOL team who were involved in the COOL research project in three different roles (PI, mentor, mentee) and are now all employees of CILT at UCT. When we initially started writing the paper, we engaged in a collective remembering and reflection process – reviewing a range of artefacts created during the project. Examples of artefacts included are recordings of training sessions, weekly research team, and core team meetings, outlines of protocols, document templates, emails capturing group decisions, researcher-generated texts, voice, and text messages via Whatsapp, slides and drawings.

Initially, we engaged directly with these artefacts to reinvigorate our memories of the project and the circumstances surrounding it. On an examination of the literature, we encountered the notion of collective memory, described as a multidisciplinary research method integrating insights from psychology, sociology and cultural studies (Orianne and Eustache, 2023). Our ground up practice, of collectively engaging with artefacts such as emails, and sharing our individual memories, echoed the intentional methods of collective remembering. According to Orianne and Eustache (2023), collective memory "is not the memory of the collective, but that of its individual members, as either members of social groups (shared memory) or as participants in social interactions (collaborative memory)".

As we worked through our recollections of the project and engaged in an informal process of remembering together, we realised our choices were being directed by methodologies we had used in other contexts. We were strongly influenced by some of the concepts underpinning ethnographic research. Ethnography provides a powerful approach to learning about complex social phenomena (O'Reilly, 2021), such as the undertaking of research, while providing useful tools for thinking about the relationship of researchers to the field of study. Through our varied participation in the COOL project, we had had a range of opportunities to participate in the research life of the project "for an extended period of time, watching what happens, listening to what is said, and/or asking questions through informal and formal interviews, collecting documents and artefacts - in fact, gathering whatever data are available to throw light on the issues that are the emerging focus of inquiry" (Hammersley and Atkinson, 2019). Through a redefining of the notions of 'insiderness' and 'outsiderness', we

drew on the work of McNess et al. (2015) to understand how, as COOL researcher team members, we might move between various insider roles, and as authors of this chapter, outsider roles. Additionally, we drew on concepts, such as, that of the “interpretive bricoleur” (Kincheloe, 2011) and “patchwork ethnography” (Günel et al, 2023) used in ethnographic ways of working, as we worked iteratively with this range of data and each other, to make sense of our experiences.

3.1 Towards an e-Research Framework: Mapping the COOL Research Process

While there are substantial differences in researchers’ practices, including varying positions on questions of ontology, epistemology and methodology, a common research process may be identified. Multiple authors including, Lê and Schmid (2022), Jankowski (2009), and Bordens and Abbott (2002) disaggregate the research process in varying ways. Our work closely aligns with that of Jankowski (2009), Herrington et al (2007), Bordens and Abbott (2002), who link practices and tools to research phases and activities. By consolidating these models in the context of qualitative social science research, we understand our experiences through a five-phase model, underpinned by communication, team building and administrative activities. Phase one outlines the focus of the study, develops research questions, locates the researcher, plans the research process, considers ethical concerns, and gains the necessary institutional approvals for access. The second phase takes the researcher into the field of study either through actual field work, desktop studies or data generating activities in a controlled or semi-controlled environment. This data phase is often followed by, but may also exist simultaneously, in online versions of certain traditions such as ethnography, with the phases of analysis, representation and dissemination. Figure 1 illustrates our research phases.

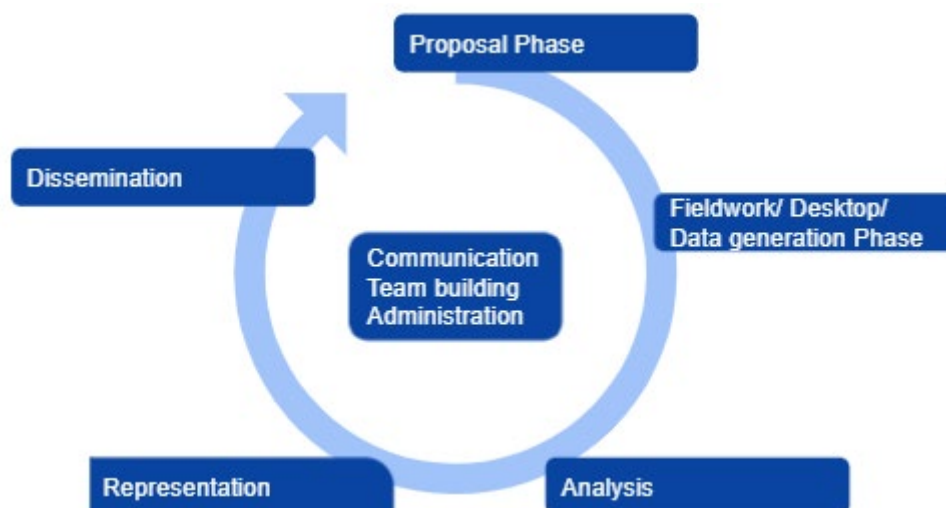


Figure 1: COOL Research Phases

In the context of the COOL project, having a strong focus on communication, team building, and administration was crucial. Furthermore, we located some elements of the research processes differently to the models - such as foregrounding ethical choices and researcher positionality as key elements of the proposal process. Finally, language such as reporting in the models tends to have positivist connotations, so we have used ‘representation’, drawing on the work of a tradition of sociologists and ethnographers (e.g. Adler and Adler, 2008), allowing for more partial, contingent and emergent writing about the research experience.

4. Practices and Tools

The next section explicates the five phases, highlighting the practices that developed in the project over time, and connecting these to the tools that enabled us to engage in these ways.

4.1 Research Proposal and Design Phase: Research Conceptualisation, and Scoping

Between March and September 2019, the project team at UCT developed a research proposal, consulted the DHET Open Learning Directorate on the identification of research sites, and subsequently, conducted scoping interviews to elicit whether there was reasonable substance to research at the various sites. The project PI and an experienced researcher conducted site visits (in Cape Town), recruiting phone calls and e-mails, and visited institutional websites. The contract researchers were recruited in September 2019 and, drawing on the initial

scoping process above, each developed a research proposal for their case studies. To support this, we paired researchers with a mentor, tasked to develop a relationship with their individual mentees. The proposal development process was supported by project mentors, and the PI and project team through individual consultations and group online research training session. Researchers subsequently wrote their proposals in Google Docs and received feedback from their mentors and the PI via Google Docs and verbally.

4.2 Research Team Building

Team building, defined as the drawing together of “a disparate group of people united by certain objectives, cohesive and effective team working” (Nikitenko et al, 2017), is widely viewed as a necessary activity. The COOL project extended its understanding of team building beyond simply cohesive and effective team working to the development of a research community and of researcher positionality around two issues: open learning and social justice in the PSET sector.

Initially we had planned to meet three times in Cape Town for team building and project activities and had expected that our contract researchers would be able to work from their affiliate institutions, accessing stable internet and conducive working conditions. In the end, we were only able to host one meeting before the Covid pandemic required a national and extended shutdown; at which point, some of the contract researchers who were also students in residences were sent home. This posed substantial challenges for team building, which we viewed as essential to the success of the project.

In order to meet weekly on Zoom, we had to address a number of operational and learning needs. We provided our researchers with portable modems and a monthly data allowance to support internet connectivity. Many of the required online activities required stable internet connectivity - permitting the simultaneous use of Zoom with collaborative software such as Google docs or web-based participation software such as *Mentimeter*. However, we quickly discovered that many of our team members would join the weekly meetings via their phones rather than computers, making engagement via alternate browser-based activities unstable, and challenging for team members with limited digital literacy to navigate. The live sessions became more like presentations, with interaction being limited to voice or chat, and other research and team building tasks happening before or after the session.

Whatsapp became a key tool for social support and communication, strengthening team cohesion. Most mobile operators in the South African context offer preferential data access bundles for social media platforms, making Whatsapp a cheap and popular choice of tool for ‘light’ communications. Reminders of meetings, links to additional resources, birthday greetings, condolences and wishes for speedy recovery, all made their way onto the Whatsapp group, which became a key site for mutual support and affirmation.

4.3 Fieldwork: Data Generation During COOL

Initially, we planned to elicit student quantitative data through questionnaires and visit the research sites to elicit qualitative data in the form of one-on-one interviews with staff research participants and focus groups with students. However, the national lockdown and social distancing requirement meant that residences were vacated, and in-person research could no longer be conducted, making the likelihood of the successful use of student questionnaires unlikely. In the end, the questionnaires were eliminated, and all the studies became qualitative in nature, instead of the initially planned mixed-methods approach. Once ethical clearance was granted, gatekeeper permission was sought to conduct research at the universities, while DHET granted this for the TVET colleges.

The data was generated between July and December 2020. Some rapport with the participants had already been built through scoping and contact with the research sites before the pandemic. The PI and the project manager sent emails, made phone calls and even WhatsApped potential participants, located in different provinces, to invite them to participate in the research. Administrative personnel were very helpful, for instance where the principal or contact person had retired (between the scoping and data collection stages). All the researchers used Zoom for staff interviews and the three researchers who conducted focus groups with students used WhatsApp in addition to Zoom. During the interviews, Zoom’s video conferencing capacity enabled researchers to build rapport through being able to maintain eye contact, and display encouraging and attentive body language as they would do in a face-to-face interview. This enabled discussions similar to what one might expect in an in-person interview. Additionally, the use of digital technology for data generation enabled us to interview geographically distant participants. For example, one researcher was able to interview three international participants through Zoom.

As has been found by other researchers (see for example Shepperd et al, 2021, Lobe and Morgan, 2021 and Roberts et al, 2021), lack of access to devices and varying levels of digital literacy impacted on our project. In the COOL project, a Zoom account was created for all the researchers. Most of the researchers were able to manage their Zoom accounts, setting up interviews on their own; however, there were instances where a researcher lacked the required level of digital literacy to set up and manage settings during the interviews. In such instances, the project manager set up the interviews on the researcher's behalf and joined the interviews to assist with technical issues that could arise.

We anticipated our student interviewees would require support with data and hence provided them with data for the interview. We initially debated whether to offer them WhatsApp bundles or data, but ultimately gave them data so they could be reachable in case a researcher had to WhatsApp call them. This worked smoothly except for one case, where the student used up the data before the focus group took place and we had to top it up.

Consent is commonly obtained via email prior to conducting virtual research (Lobe et al, 2020). However, like Sy et al (2020) and Robert et al (2021), we realised that our participants had varied levels of technological proficiency. Hence, we allowed for different approaches to obtaining consent. For instance, some participants could not append their digital signature on the electronic consent form we sent, so in some cases, participants printed, signed and emailed us the consent form. In one instance, the researcher adapted the Word document into a Google form and asked the participants to give consent to participate by checking a box. In cases where the engagement with the participants were done through Whatsapp, the consent form was sent as screenshots. Through the edit mode in picture settings, the participants ticked and filled in the consent form accordingly. For participants who did not know how to access the edit mode, we allowed for the participants to respond through a message text detailing that they consent to the research.

Traceability is a key concern as "digital data holds the possibility of locating and identifying participants, sites, social interactions and the ethnographer herself, and makes particular issues such as anonymity, visibility, exposure, ownership and authorship especially prominent" (Beaulieu and Estalella, 2012). For example, at two researcher sites, to the surprise of the researchers concerned, a senior manager brought along a colleague to the Zoom interview – these raised concerns about traceability as multiple interviewees were now exposed to each other's comments. We opted to treat these interviews as interview couplets, being careful about what questions we could ask under the circumstances. In another case, with student Whatsapp focus groups, student participants were requested to treat the focus group as confidential and were alerted that full anonymity was not possible in such a context. Another risky context for traceability concerns was transcription. We sent the Zoom audio recording for transcription to two reputable transcription companies, with clear memoranda of understanding regarding confidentiality. Some researchers opted to transcribe very sensitive interviews themselves.

4.4 Data Analysis

The researchers were prepared for the data analysis process by being briefed on the analytical framework and software (Google Sheets) that would be used to code and analyse the data. In our initial project plan, we had a planned face-to-face workshop for this analysis phase. While the use of Nvivo or Atlas or similar software would have led to a smoother process, as many members of the research team were on short-term contracts at UCT, they could not access proprietary, collaborative software licenced to the university for data analysis. As an alternative, the COOL project provided a Google Sheets template on which they could input and categorise the data. After coding, the researchers presented their spreadsheets to the team who provided feedback and input. Individualised feedback was also provided by mentors to their mentees.

4.5 Representation: Sharing a Writing Process

The writing process in the COOL project, a key opportunity for capacity building, was envisaged as a strongly collaborative, mutually supportive and fundamentally open process. In both the proposal and the writing stages, researchers were encouraged to place their drafts in the Google Drive Folder that had been created for their case studies. By maintaining a single document, Google Docs reduces discrepancies in document versioning. At the same time, anyone with access to the document has access to the work in progress. Mentors could see the work, as it developed, and the researchers could see suggestions left by their mentors in real time. In feedback sessions, researchers and mentors could work synchronously to make changes on the document. All researchers in the project also had access to each other's Google Drive Folder. This meant that individual researchers were

also able to consult fellow researchers' work, and, in this way, provide feedback and receive inspiration from each other's writing.

Despite envisaging a collaborative, supportive and open process, many researchers preferred writing more privately and shared texts in more 'complete' forms. While some researchers worked on their drafts using Google Docs, as suggested, others opted to write in Microsoft Word, and either upload their documents to Google Drive or send documents to their mentors via email. For some writers, this was a consequence of internet connectivity issues as accessing Google drive documents with unstable internet proved challenging. But others, even relatively experienced and confident writers, expressed discomfort at the possibility of being 'watched' while they wrote, suggesting that our goals of open and collaborative writing processes required more community building efforts to undo existing practices and patterns of behaviour.

With the aim of creating an open-source bibliography that could possibly serve as a resource for others doing similar work, a bibliography system that served as a bank of reading resources was created using Google Sheets during the literature review phase. For easy access to the reading, other than the reference details, hyperlinks to the resources were also made available where possible. During the write up phase, researchers had the resources handy and could easily generate their reference lists.

4.6 Dissemination

In the dissemination phase, we turned to practices such as open publication and participated in a live, online colloquium hosted by DHET, where all the researchers presented their findings and insights emanating from the research. With respect to sharing the 16 case studies produced from this research, each case study makes up a chapter of the COOL edited volume. In addition to these theory-oriented book chapters, an accessible abridged booklet (one for each of the 16 case studies) directed at practitioners, including lecturers, people to be introduced to open learning, institutional planners, managers and administrators, was published as part of the Open Learning Knowledge Series. Both products were published through an open access publisher, under the CC-BY Creative Commons licence. The book is downloadable as a complete digital book and as individual chapters from a publicly accessible site, and the book and the booklets are also hosted on the DHET's in-house National Open Learning System (NOLS).

5. Closing Thoughts

The COOL project, a multi-researcher, multi-site, commissioned research project, provided an opportunity to explore practices contributing to the capacity building of young and emerging researchers. In addition to conducting and disseminating research on the uptake of open learning in the South African PSET sector, the project sought to conduct research in socially just ways. As a result of the COVID 19 pandemic, we had to restructure our research process and transfer, translate and transform events and activities for an online space. We drew heavily on technological solutions such as the Google Drive suite, video conferencing tools such as Zoom, instant messaging, voice and video calling tools such as Whatsapp, and e-research tools such as curation sites and transcription services.

In addition to these technological solutions, we developed a range of contextually embedded practices that strongly influenced the success and completion of the project. Firstly, as a result of an initial plan that was already geographically-distributed, relatively low-tech, and relationally driven in response to our commitment to a socially just approach to research and research team design, transitioning to an online space, while challenging was not impossible. Secondly, we had a number of commitments and processes to maximise opportunities for participation and access in place. Thirdly, despite the inclusivity of the initial design, the change in landscape created by the COVID 19 pandemic required that we pay particular attention to the ways in which our researchers, as individuals, needed support or opportunities to participate or contribute to activities.

Through the experiences in the COOL project, it became clear to us that conducting research at a distance, in online spaces, required more than simply teaching people to use digital tools. It involved navigating existing practices and developing new ones, which took into consideration the diverse contexts in which our researchers worked and lived, in order to best support the successful completion of the project. While this paper has focused on the practices developed in the project, we would like to note that there remains a great deal to be explored around the experiences of mentoring in online spaces, focusing particularly on dimensions of difference and how these can be equitably addressed.

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Mapping the Evidence Around the Use of AI-Powered Tools in South African Universities: A Systematic Review

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Abstract: The integration of Artificial Intelligence (AI) in higher education is rapidly expanding on a global scale, transforming the realms of teaching, learning, and administrative functions. In this regard, this systematic scoping review seeks to map the current evidence regarding the implementation of AI-powered tools within South African universities. This systematic scoping review was carried out in accordance with the framework proposed by Arksey and O'Malley. An advanced literature search was conducted in the following databases Sabinet African Journal = 65m, Web of Science = 841, Emerald Insight = 417, Science Direct = 30, EbscoHost = 254, and Google Scholar = 3,470. The identified articles were uploaded to Rayyan software for initial screening. We assessed their relevance by analysing the titles and abstracts. After applying the inclusion and exclusion criteria to the articles obtained from the database search, 11 papers were selected for the study. Notably, three themes were identified following a thematic analysis and these includes the usage of AI-powered tools in South African universities; the challenges connected with using these technologies as well as the strategies required to address these challenges. This systematic scoping review highlights a significant rise in AI tool adoption in South African higher education, noting their benefits in enhancing academic support and efficiency. However, it also raises concerns about ethical issues such as increased cheating, unequal access to technology, infrastructural challenges, and data insecurity.

Keywords: Artificial intelligence, AI-powered tools, Chatbots, South African universities, Systematic scoping review

1. Introduction

Globally, AI in universities is a rapidly advancing phenomenon, revolutionising teaching, learning, and administrative processes. AI includes replicating human cognitive functions, allowing machines to perform tasks that will normally need human intellect, and this involves altering educational environments and increasing operational efficiency (Pokrivcakova 2019; Fitria 2021). This entails enabling machines to learn automatically from programmed data and information. Haleem et al, (2022) describe AI as a branch of computer science that allows machines (computers) to perform tasks with the same level of proficiency as humans. Whether we realise it or not, AI is integrated into our daily lives (Srinivasa, Kurni & Saritha 2022), with numerous applications leveraging AI to enhance their functionality (Fitria 2021). Recent advancements in AI have led to significant progress in computing and information processing techniques, enabling these systems to execute tasks that mimic intelligent human behaviour, such as making inferences, conducting analyses, and making decisions (Hwang et al, 2020). Funda and Piderit (2024) note that AI algorithms can customise learning materials and methods to address each student's unique demands, resulting in a more personalised and efficient learning experience, fostering real-time feedback, which significantly enhances student engagement and understanding. Studies have shown that AI-powered simulation can be beneficial in facilitating interactive learning experiences. Thus, it is safe to admit that AI-powered tools have demonstrated substantial efficiency in bridging educational gaps (Niyozov et al, 2023).

Studies have shown that South African universities are increasingly exploring AI tools such as ChatGPT to improve educational outcomes, improve student engagement, and streamline operations (Thomas 2023; Bosch et al, 2023). These tools, ranging from intelligent tutoring systems and predictive analytics to administrative automation and virtual learning environments, hold the potential to transform the academic landscape (Duhaney & Parekh 2020; Escotet 2023). Research indicates that AI tools have been employed in higher education to enhance teaching and learning processes, refine student evaluation, and develop personalised learning experiences. For instance, depending on students' learning preferences and historical performance. AI-powered recommendation systems have generated personalised learning pathways for them (Limna et al, 2022). Additionally, AI tools have been used to evaluate essays, assignments, and tests for students, saving teachers a lot of time and effort when handling a high volume of submissions (Zhou 2019).

Despite the promising prospects of AI in education, there is a need for a comprehensive understanding of how these technologies are being utilised in South African universities. Understanding how AI is integrated and its impact on students and institutions can offer meaningful insights for policymakers, educators, and researchers aiming to leverage AI for educational advancement in South Africa. The novelty and value proposition of the

systematic scoping review is found in its ability to map the existing evidence on the application of AI-powered tools in South African universities.

Based on the discussion above, the following research questions serve as a guide for the upcoming systematic scoping review on the Use of AI-powered Tools in South African Universities:

- What are the current applications of AI-powered tools in South African universities, and how are they being utilised to enhance teaching and learning?
- What challenges and opportunities have been identified in the adoption and integration of AI-powered tools within South African higher education institutions?

2. Methods

This review followed the framework for scoping reviews established by Arksey and O'Malley (2005). The authors maintained that scoping reviews are conducted with the intent of mapping out existing literature to ascertain the depth and breadth of a given topic in a specific field. The literature search and reporting were carried out systematically in accordance with the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines set by Moher et al (2009).

In scoping reviews, authors must extract only the data pertinent to the review questions (Pollock et al, 2023). Given that the eligible research was so diverse, we used a narrative synthesis method to synthesise, summarise, and organise the literature (Arksey & O'Malley 2005; Popay et al., 2006). This process included converting quantitative data into qualitative textual descriptions through identifying reoccurring themes, patterns, and trends for thematic analysis (Popay et al, 2006). We then conducted a thematic analysis (Arksey & O'Malley 2005) and categorised findings into themes and subthemes through deductive coding. This iterative process involved repeatedly reviewing the text to extract and refine the findings (Aromataris et al, 2014). The basic information extracted is reflected in Table 2 below.

2.1 Search Strategy

A pilot search was carried out to refine the search keywords. An advanced literature search was conducted in the following databases: Sabinet African Journal = 65m, Web of Science = 841, Emerald Insight = 417, Science Direct = 30, EBSCOhost = 254 and Google Scholar = 3,470. The following keywords were used: *AI-powered tools OR Artificial intelligence tools AND universities OR higher institutions AND Students AND South Africa*. The selected articles were checked for relevance based on their titles and abstracts. After meticulously screening the articles identified through the database search according to the inclusion and exclusion criteria, 11 papers were selected for further consideration, out of which 9 were deemed eligible for the study. Limiting the study to South African universities allows for localisation to the challenges faced. The 11 studies were the most rigorous and relevant to the study, the consistency of findings that emerged adds value to the study.

The criteria for including and excluding articles are detailed in Table 1.

Table 1: Inclusion and exclusion criteria

Inclusion criteria	Exclusion criteria
Original articles (including qualitative, quantitative, and mixed-method studies) and review articles that were published in electronic databases	Protocols, book chapters, systematic reviews, conference proceedings, commentaries, dissertations, and editorial
Papers published in the English language	Papers published in languages other than English
Papers specifically focusing on the use of AI-powered tools in South African universities	Papers focusing on the use of AI-powered tools in South African universities but outside South Africa do not align with the objective of this review
Papers published between 2021 and 2024	Papers published before 2021
Peer-reviewed articles and full-text articles	None peer-reviewed articles and no full-text accessible

Source: Authors

2.2 Screening and Selection Process

The screening and selection process involved several stages. First, the search findings were imported into Rayyan software, which removed duplicates using its built-in function. Next, the titles and abstracts of all imported studies were screened according to the inclusion criteria. Consequently, the researcher reviewed the reference

lists of the identified articles to ensure comprehensive evidence coverage, employing a method known as backward snowballing, as described by Arksey and O'Malley (2005) and Heeren et al (2021). Furthermore, a full-text screening of all identified articles was conducted, carefully examining each step of the process. Additionally, the researchers thoroughly examined the bibliography lists of the included articles to confirm that no relevant studies were omitted.

Table 2: Data extraction, analysis, and report (selected studies)

Author and Publication Year	Title	Journal	Location	Design or Method	Sampling Technique	Data Source	Data Analysis	Key Findings
Chauke et al, (2024)	"Postgraduate Students' Perceptions on the Benefits Associated with Artificial Intelligence Tools for Academic Success: The Use of the ChatGPT AI Tool"	Journal of Curriculum Studies Research	South Africa	Qualitative research approach	Purposive sampling	Semi structured interviews	Thematic analysis	Incorporating ChatGPT into research notably improves the academic achievements and research results of postgraduate students at historically disadvantaged universities in South Africa.
Van Wyk (2024)	"Is ChatGPT an Opportunity or a Threat? Preventive Strategies Employed by Academics Related to a GenAI-based LLM at a Faculty of Education"	Journal of Applied Learning & Teaching	South Africa	An exploratory qualitative design	Purposive sampling	Semi-structured interviews	Thematic analysis	AI-powered tools are used in teaching and learning.
Mangundu (2023)	"Information Technology Decision Makers' Readiness for Artificial Intelligence Governance in Institutions of Higher Education in South Africa"	The 9th African Conference on Information Systems and Technology 2023	South Africa	Qualitative design	Purposive sampling	Semi-structured interviews	Qualitative data analysis. Integrating inductive and deductive techniques and guided by critical realism philosophy's tenets. In accordance with Saxena (2019),	HEIs use AI-powered tools to meet critical academic needs, including identifying at-risk students, detecting bottleneck subjects, enforcing academic integrity remotely, and addressing diversity and inclusion.
Tarisayi (2023)	"Lustre and Shadows: Unveiling the Gaps in South African University Plagiarism Policies amidst the Emergence of AI-generated Content"	AI and Ethics	South Africa	Qualitative research	Confirming and disconfirming sampling	Policy analysis		Policies to empower academics to engage with AI-generated content and educate students on academic integrity, responsible research conduct, and critical thinking should be encouraged.

Author and Publication Year	Title	Journal	Location	Design or Method	Sampling Technique	Data Source	Data Analysis	Key Findings
Opesemo wo and Adekoma (2024)	"Harnessing Artificial Intelligence for Advancing Sustainable Development Goals in South Africa's Higher Education System: A Qualitative Study"	International Journal of Learning, Teaching, and Educational Research	South Africa	Qualitative research	Purposive sampling	In-depth interview and focused group discussion	Thematic content analysis	The findings indicated that educators utilized AI-powered tools to enhance student learning and engagement, preventing students from becoming disengaged during class. It was found that AI-powered tools have facilitated opportunities for collective learning. Additionally, the study demonstrated that AI-powered tools can enhance personalized learning experiences for students with diverse learning styles and abilities. This has resulted in a more inclusive and interactive classroom environment, where students feel more motivated and supported in their educational journey.
Mhlanga (2021)	"The Fourth Industrial Revolution and COVID-19 Pandemic in South Africa: The Opportunities and Challenges of Introducing Blended Learning in Education"	Journal of African Education	South Africa	Literature review approach		Unobtrusive research methods	Documentary analysis	The study confirmed that higher institutions use AI-powered tools, 3D printing, cloud computing, IoT, and robotics to enhance learning. The study highlighted that fast and reliable internet, like 5G, is transforming and redefining existing digital technologies from the third industrial revolution, making them part of the new

Author and Publication Year	Title	Journal	Location	Design or Method	Sampling Technique	Data Source	Data Analysis	Key Findings
								technology category.
Nkhobo, and Chaka (2023)	"Student-Written versus ChatGPT-Generated Discursive Essays: A Comparative Coh-Metrix Analysis of Lexical Diversity, Syntactic Complexity, and Referential Cohesion."	International Journal of Education and Development using Information and Communication Technology	South Africa	Exploratory research design (Qualitative research)	Convenience sampling	A set of seven student discursive essays and seven ChatGPT-generated discursive essays.	Data was analysed by using the corpus software application, Coh-Metrix, to analyse their lexical diversity, syntactic complexity, and referential cohesion.	The study explored the use of AI-powered tools in South African universities by comparing student-written discursive essays with those generated by ChatGPT. Using Coh-Metrix software, the analysis examined various linguistic features, including lexical diversity, syntactic complexity, and referential cohesion.
Khoalenyane, and Ajani 2024	"A Systematic Review of Artificial Intelligence in Higher Education-South Africa."	Social Sciences and Education Research Review	South Africa	Systematic review		In-depth analysis		AI-powered tools are utilised to create personalised learning experiences, improve administrative processes, and enhance teaching methods.
Maphoto et al (2024)	"Advancing Students' Academic Excellence in Distance Education: Exploring the Potential of Generative AI Integration to Improve Academic Writing Skills."	Open Praxis	South Africa	Qualitative methods	Purposive sampling method	Interviews and focus group discussions	Qualitative data coding	AI-powered tools play a crucial role in teaching and learning in South African higher educational institutions, but it is important to exercise caution to prevent misuse.
Patel and Ragolane (2024)	"The Implementation of Artificial Intelligence in South African Higher Education Institutions: Opportunities and Challenges."	Technium Education and Humanities	South Africa	Qualitative research		Unobtrusive secondary sources		Higher institutions use AI-powered tools to enhance administrative efficiency, data-driven decision-making, and personalised learning.
Singh (2023)	"Maintaining the Integrity of the South African University: The	South African Journal of Higher Education	South Africa	Qualitative research	Purposeful sampling	Semi-structured interview		It was noted that to standardise the use of ChatGPT as a

Author and Publication Year	Title	Journal	Location	Design or Method	Sampling Technique	Data Source	Data Analysis	Key Findings
	Impact of ChatGPT on Plagiarism and Scholarly Writing."							commonly used AI-powered tool, assessments should be restructured to promote creativity and avoid copy-and-paste tasks. Consequently, lecturers need to improve their knowledge and skills to stay current with teaching methods and assessment practices.

3. Results

3.1 General Characteristics of the Literature Search

In the systematic scoping review, 81.82% of the articles were qualitative research, while 18.18% were reviews (literature review approach and systematic review). Three themes were generated through the thematic data analysis: the use of AI-powered tools in South African universities, challenges associated with the utilisation of AI-powered tools and strategies to minimise the difficulties posed by using AI-powered tools.

3.1.1 Theme 1: The use of AI-powered tools in South African universities

The emergence of AI-powered tools has significantly transformed higher education institutions, providing innovative solutions that enhance teaching and learning experiences. This systematic scoping review identifies and categorises the use of AI-powered tools in South African universities. One of the identified articles revealed that ChatGPT is one of the AI-powered tools used by postgraduate students, particularly those whose native language is not English and find academic writing challenging (Chauke et al, 2024). ChatGPT assists these students by providing language writing assistance, editing, and paraphrasing services. This support helps them produce high-quality dissertations free from grammatical and spelling errors, thus improving their academic writing skills and meeting academic standards (Chauke et al, 2024). Corroborating this finding, Van Wyk (2024) revealed that ChatGPT is used by students for citing and referencing in academic writing.

Similarly, another reviewed article posits that universities use AI-powered tools, such as virtual reality simulations, in classrooms to immerse students in realistic scenarios, enhancing their understanding of complex concepts through engaging and practical experiences, in contrast to conventional teaching methods (Opesemowo & Adekoma 2024). Additionally, the article reported that educators utilise personalised learning platforms that employ AI algorithms to examine student data and customise contents according to individual needs and preferences. These AI-powered tools empower educators to design personalised learning experiences, allowing learners to progress at their own pace and achieve a deeper understanding of the subject matter (Opesemowo & Adekoma 2024). Patel and Ragolane (2024) and Singh (2023) reported that ChatGPT is among the common AI-powered tools used by higher institutions in South Africa. Similarly, another study confirmed that higher institutions use AI-powered tools, 3D printing, cloud computing, the Internet, and robotics to foster learning (Mhlanga 2021). The author further advanced that AI-powered technologies are benefiting education by making computers faster and smarter. The fast and reliable Internet, such as 5G, is transforming existing digital technologies from the third industrial revolution, enabling them to serve entirely new functions (Mhlanga 2021). As a result, these technologies are redefined and are now considered part of the modern technology category.

The study by Nkhobo and Chaka (2023) provided insights related to the use of AI-powered tools in South African universities by comparing student-written discursive essays with those generated by ChatGPT (ChatGPT-3.5). The analysis, conducted using Coh-Metrix software, focused on several linguistic features such as "lexical diversity, syntactic complexity, and referential cohesion."

3.1.2 Theme 2: Challenges pertaining to the utilisation of AI-powered tools

One of the reviewed literature revealed that there is increasing cheating among students through the use of AI-powered tools, citing that this has raised an ethical concern and moral issues in academia (Van Wyk 2024). South Africa is considered one of the most unequal societies globally, a disparity evident in unequal access to education, leading to digital divides. These digital divides exacerbate the issue of accessing digital tools in higher institutions (Mhlanga 2021). Khoalenyane and Ajani (2024) argued that the issue of access to infrastructure, especially in areas that have limited access to it, is among the challenges related to the use of AI-powered tools in South African tertiary institutions. The authors acknowledged that installing the necessary AI-powered hardware, software, and internet is costly and requires a huge investment. Similarly, Patel and Ragolane (2024) also reported that resistance from faculty and staff and lack of infrastructure are among the challenges militating against the utilisation of AI-powered tools by higher institutions of learning.

Moreover, the authors maintained that concerns over security and privacy issues, specifically when handling sensitive student information, is a serious challenge. In addition, they highlight challenges related to the skills needed to manage these digital tools. They, therefore, submit that educators should possess basic end-user computing skills, including internet navigation, networking, typing, spreadsheet processing, and electronic presentation skills (Mhlanga 2021).

3.1.3 Theme 3: Strategies to mitigate challenges related to the use of AI-powered tools

Respondents in one of the reviewed literature advocated the prevention of cheating using AI-powered tools (Van Wyk 2024). Accordingly, preventing cheating could be facilitated through advocating principles of integrity and ethical responsibility in using AI-powered tools. Furthermore, the study proposed that students should be exposed to software that can detect cheating, as this will discourage students from indulging in fraud, plagiarism, cheating, and dishonesty (Van Wyk 2024). Another of the identified articles recognized AI-powered tools as essential in academic work, emphasizing the importance of implementing policies to enable academics to interact with AI-generated content and educate students on academic integrity, responsible research conduct, and critical thinking. Tarisayi (2023) highlighted that this approach motivates students to take control of their learning process, enhances their ability to write, and cultivates genuine admiration for originality and ethical academic practices. Singh (2023) noted that for the standardised use of ChatGPT as one of the widely used AI-powered tools, assessments should be redesigned to encourage creativity and prevent copy-and-paste activities.

4. Discussion

The findings of this systematic scoping review revealed a growing interest of higher institutions in South Africa, in AI-powered tools. Many of the reviewed studies revealed various potential benefits of AI-powered tools such as scholarly writing assistance, student support and administration, interactive learning, technological integration, linguistic analysis, facilitating administrative processes, teaching methodologies and designing of curriculum. Similarly, existing literature discloses that AI-powered tools are fundamentally productivity enhancers that have significantly transformed academic writing and research in various fields, including Library and Information Science (Akwang & Ebiwolate 2024). It is crucial to recognise the significant impacts of AI-powered tools on research writing, which include increased efficiency, improved accuracy, enhanced objectivity, updated context, and time-saving capabilities. Niyozov et al (2023) further state that AI-powered tools offer immediate feedbacks and customised study plans, enhancing student engagement and promoting efficient learning paths.

The systematic scoping review further identified the challenges associated with the utilisation of AI-powered tools. According to Funda and Piderit (2024), AI-powered tools, like any other technological advancement, are not without challenges regarding their usage. Among the findings of this paper is the increase in cheating among students through the use of AI-powered tools. This report is similar to that of existing literature (Jarrah, Wardet & Fidalgo 2023; Gao et al, 2023). In line with existing literature, Chigona (2018) confirmed that access and the digital divide are among the major challenges associated with the utilisation of AI-powered tools especially in regions with constrained resources. Selwyn (2019) also maintained that significant issues related to data privacy, ethics, and algorithmic bias have emerged, prompting questions about the responsible use of AI in educational contexts.

Additionally, this systematic scoping review underscored the importance of AI-powered tools in higher education while emphasising the need for ethical use and balanced integration with traditional teaching methods. This is in line with the report of O'rinbekovna (2024), which established that enabling educators should

effectively incorporate AI technologies into their teaching practices while promoting critical thinking and fair assessment, will lead to a more efficient and engaging learning experience. Students should be exposed to cheating detection software to discourage academic dishonesty, including the implementation of policies and regulations that enable employees to interact with AI content and educate students on academic integrity, responsible research conduct, and critical thinking. The findings further stressed the need for training faculty members and providing support for using AI tools, involving appropriate planning, collaboration with technology providers, and understanding ethical implications.

A balance should be maintained between AI-powered tools and traditional teaching methods, considering curriculum design and teaching strategies to foster academic writing pedagogy effectively. Given the widespread use of AI in higher education, university teachers and administrators must recognise the current spatially advised learner identity (Niyozov et al, 2023). This recognition should form the basis for developing AI-related educational and assessment policies. These policies should focus on enhancing students' learning experiences by integrating AI into higher education rather than simply addressing potential academic misconduct. In this respect, Akwang and Ebiwolate (2024) advocate for a need to re-strategise and enhance efforts and interests in AI-powered tools by ensuring the provision of technological facilities, system support, staff training, and relevant policies. These aspects are currently lacking in the public university libraries being studied.

5. Conclusion

The systematic scoping review reveals a significant surge in the adoption of AI-powered tools within South African higher education institutions. These tools have shown considerable promise in enhancing academic writing assistance, improving student support, and streamlining administrative processes. They offer transformative benefits, including increased efficiency, accuracy, and engagement, thus reshaping educational practices and productivity. Despite these advantages, the review also brings to light several challenges and concerns. Among the primary issues are ethical dilemmas, such as the rising incidence of cheating facilitated by AI tools. The review highlights concern unequal access to technology, infrastructure limitations, and the challenges of securing and managing sensitive student information. These issues reflect broader concerns about digital divides and the need for responsible AI use in education. Several recommendations emerge to address these challenges while maximizing the benefits of AI-powered tools such as promoting ethical use and academic integrity. This involves developing robust policies to prevent cheating, integrating advanced detection software, and teaching students on the moral application of AI. By fostering a culture of integrity, institutions can mitigate the risks of academic dishonesty. Furthermore, AI-powered tools should complement rather than replace traditional teaching methods. Integrating these technologies should enhance, not overshadow, established pedagogical practices, ensuring that AI tools support and enrich the learning experience. Besides, institutions need to invest in technology to provide equitable access, particularly in underserved areas. This includes ensuring that resources and support are available to institutions with limited technological access. Comprehensive training programs should be implemented to help faculty members understand and effectively use AI tools, covering their potential, limitations and ethical considerations. Future research should explore the integration of AI-powered tools in South African universities, as AI in higher education is still in its early stages. Conducting case studies on AI deployment in teaching and learning can provide insights into the unique challenges, benefits, and outcomes within this context. Additionally, studies on faculty and student perceptions, as well as barriers to AI adoption, will further inform best practices. Comparative and longitudinal research on AI's impact on academic performance and engagement is also recommended. Lastly, ethical and privacy concerns should be prioritised to guide responsible AI integration in South African higher education.

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Unveiling Experiential Skills' Impact on Life Sciences: Leveraging Bloom's Taxonomy for Proficiency

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Abstract: This article delves into the impact of experiential skills development on the proficiency of Life Sciences (Biology) learners, specifically focusing on integrating Bloom's Taxonomy in formulating assessment questions. Within the framework of South Africa's educational system guided by the Curriculum Assessment Policy Statement (CAPS), this mixed-method approach underscores the importance of aligning assessment questions with Bloom's Taxonomy to enhance experiential skills development and improve learner proficiency. The research, using a dual study methodology (PhD and MEd), emphasises the significance of question complexity and difficulty in driving experiential skills development despite varying perspectives among teachers on question sequencing. It argues that while standardised assessments may dictate question formats, teachers' inherent questioning styles are crucial in facilitating authentic learning experiences. Moreover, the article unveils a notable enhancement in learner proficiency resulting from effective planning and execution of experiential skills lessons, corroborating existing literature. In conclusion, valuable light is shed on the pivotal role of experiential skills development in enhancing learner proficiency in Life Sciences education, particularly within the South African context. By leveraging Bloom's Taxonomy in questioning and lesson planning, teachers can effectively cultivate critical thinking and problem-solving skills in learners. The findings advocate for tailored approaches to address proficiency gaps and stimulate learner achievement, thereby fostering engaged learning and real-life skill application in Life Sciences classrooms.

Keywords: Bloom's Taxonomy, Experiential skill development, Life sciences, Modes, Proficiency

1. Introduction

Under-developed skills due to the lack of knowledge of experiential learning hinder the creation of new experiences in the Life Sciences classroom. The initial goal was to recognise the essential experiential skills relevant to the Life Sciences field and comprehend their importance in teaching the subject. In this paper, a dual study methodology was adopted to compare findings of teachers' understanding of experiential learning in MEd (Mc Pherson-Geyser, De Villiers & Kawai, 2020). In contrast, the PhD study examined the current techniques used in learning and methods of teaching and evaluating experiential skills. This study focused on identifying areas for improvement and innovation. Experiential skills are acquired over a series of learning stages related to the subject or area of learning at hand, with each of these stages allowing a learner to reach a performance objective through practical experience (Kolb & Kolb, 2005; Kolb, 2006; McDonald, 2020). It suggests that a deliberate focus on the four modes of experiential skills development (concrete experiences, reflective observations, abstract conceptualisation, and active experimentation) within questioning strategies can address proficiency gaps and foster learner achievement. By prioritising experiential skills development and adopting learner-centric approaches, educators can nurture a culture of engaged learning in the classroom, driven by learners' expressed desire for the real-life application of acquired skills. Ultimately, the research underscores the importance of collaborative planning discussions and alignment between teachers and learners in assessments to optimise learning outcomes and empower learners in their experiential skills development journey.

The question of whether teaching and learning Life Sciences through experiential skills utilising Bloom's Taxonomy was prompted by conducting a master's research study (Mc Pherson-Geyser, De Villiers & Kawai, 2020). This study demonstrated teachers' limitations in implementing experiential learning and developing experiential skills.

Following the need for skill development, a PhD research study was conducted to investigate whether assessments planned by the teachers, with emphasis on experiential skill development on the learners' part, would lead to higher learner proficiency. The curriculum used in South Africa for Further Education and Training (FET) in the CAPS (2011) for Life Sciences consists of four sections. These sections are as follows: Section 1: Introduction to the Curriculum and Assessment Policy Statement; Section 2: Introduction to Life Sciences; and Section 3: Content covered in Grade 10, Grade 11, and Grade 12. Section 4 focuses on assessments and is divided across the Life Sciences practicals, identifying the assessment requirements for Life Sciences end-of-year examinations.

Experiential skills should create opportunities for the learner to take a personal role in the direction of their learning through first-hand experience (Bartle, 2015). University of California Davis (UC Davis) (2011) posits that learners are involved in practical problems. The University also states that learners want the freedom to be involved with challenging content while discovering solutions and observing their progress in the learning process (UC Davis, 2011). The findings will provide information to the Department of Education (DoE) and other relevant stakeholders on strategies that could be used to develop methods and strategies to aid experiential skills development in learners. This, in turn, may positively influence learners' proficiency, better enabling them to interpret questions on all the cognitive levels of Bloom's Taxonomy.

2. Problem Statement

In 2019, the Minister of Education instructed a change to the Curriculum Assessment Policy Statement (CAPS) that would be implemented in 2020, where informal practicals were increased and more scientific skills were required to complete practical assessments (DoE, 2019). Taking into consideration the limited degree of knowledge among teachers on experiential skills development (Mc Pherson-Geyser et al, 2020), as well as the lack of training available for teachers to implement CAPS practicals, this expectation by the DoE presented a potential challenge. As a practitioner, I saw a gap between experiential skills development and the content taught. Brink (2015) argues that Life Sciences cannot continue unless skills development and content education work together and that South African society should understand the crucial role of this connection. Experiential skills are essential in our South African society, as they can be used to create and verify knowledge or to analyse truths and belief systems (Thuketana, 2020). Teachers are exposed to many modern teaching strategies over their careers, and most of these strategies utilise experiential learning as a scholastic platform (Kolb & Kolb, 2017). From this, it could be deduced that certain skills are needed to develop proficiency in a Life Sciences learner. Furthermore, teachers may have limited knowledge of developing experiential skills in their learners (Girvan, Conneely & Tangney, 2016). This, in turn, creates further challenges for learners who attempt to achieve the higher cognitive levels of Bloom's Taxonomy.

As a practitioner, and by observing learners in the classroom, I realised the need to develop experiential skills and recognise the lack of alignment with the practical aspect of the Section 4 assessments. Teachers had no training in developing their learners' skills to a degree sufficient for completing practical assessments successfully. Teachers also lacked the fundamental knowledge to align specific skills with their assessments when evaluating their learners' proficiency.

3. Literature Review

3.1 Overview of Bloom's Taxonomy

Bloom's Taxonomy, created by Benjamin Bloom in 1956, classifies educational learning objectives into six levels of complexity (Chandio et al, 2021). This model, depicted as a stairway, guides learners from basic knowledge to higher-order thinking as they ascend the levels. Teachers, including those in Life Sciences, use it to create assessments and develop various skills in learners. The lower levels focus on knowledge and comprehension, often stimulated by teacher lectures where learners absorb and reproduce information. The higher levels - analysis, synthesis, and creation (evaluation) - may be harder to attain due to contextual factors. Bloom's Taxonomy has proven enduring (Lasley, 2024), with teachers still trained to use it through CAPS. The six levels of Bloom's Taxonomy are divided into three domains (Armstrong, 2010) to promote higher-order thinking skills:

- cognitive: mental skills (knowledge)
- affective: growth in feelings and emotional areas (attitude or self)
- psychomotor: manual or physical skills (skills)

These three domains can provide the enhancement needed for learning and teaching Life Sciences through experiential learning. By implementing these three domains when teaching or learning Life Sciences and using them in collaboration with assessments, teachers may achieve maximum results and skills development in the Life Sciences classroom. Each framework's six categories requires the previous skill to be attained before progressing to the next, more complex skill. This approach allows teachers and learners to identify higher-order thinking skills and to modify their teaching and learning habits accordingly (Main, 2022). The graphic representation below, which indicates each level of Bloom's Revised Taxonomy, is more verb-oriented to ensure skills development through the use of the hierarchical model. Please see Figure 1 (Armstrong, 2010) in this regard.

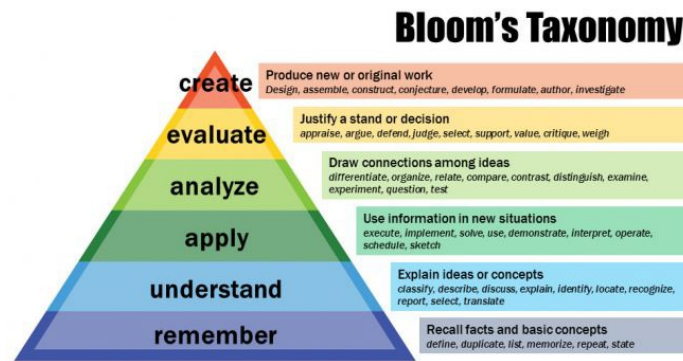


Figure 1: Bloom's Revised Taxonomy (Armstrong, 2010)

The development of this model employed common vocabulary, facilitating skill development that was aligned with learners' thinking processes to meet assessment goals (Kelly, 2017). This vocabulary should not only be used for assessments but also in the learning and questioning processes within Life Sciences classrooms. A clear interrelation emerges by connecting Bloom's Taxonomy's cognitive levels to the experiential skills needed for Life Sciences learners (Kolb & Kolb, 2017). Considering this, using cognitive levels teachers are trained to apply in assessments and learner development highlights the need for research in South African Life Sciences classrooms to optimise both teaching strategies and learning outcomes.

3.2 Exploring Experiential Learning: Defining and Theorising the Concept

Efficient classroom practices by well-trained teachers are essential for developing learners' skills and ensuring an effective education system. Usman (2016) states that achieving educational objectives enhances service quality. The CAPS document (DoE, 2019) highlights scientific knowledge and the importance of 'process' skills and 'attitudes' (Maranan, 2017). Robinson (2001) criticises ritual knowledge in teaching. Kolb's model categorises learning styles into Concrete Experience, Abstract Conceptualization, Reflective Observation, and Active Experimentation, impacting classroom effectiveness (McLeod, 2017).

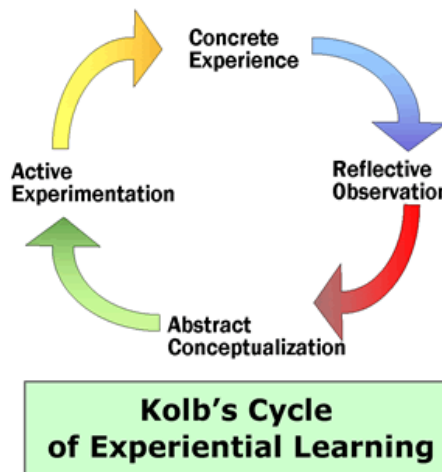


Figure 2: Kolb's cycle of experiential learning (McLeod, 2017)

John Dewey highlighted the tension between education and personal experience, emphasising 'reflective thought' for learning from observations (Kolb & Kolb, 2005; Dimova & Kamarska, 2015). He advocated moving from inductive to deductive reasoning. Dewey and Kolb, both experiential learning theorists, focus on enhancing classroom learning but overlook the specific skills teachers should impart and learners should develop through experiential methods. There are many characteristics related to experiential learning that are needed for the development of skills in the Life Sciences classroom. Dewey (2001) and Kolb (1984) both outline experiential learning by stating five main activities:

- **Involvement:** Learners must be active in the lesson, both physically and mentally.
- **Reflective thought:** If learners have been active during the lesson and have reached a conclusion, the current learning objective should be reflected upon.

- **Meaning:** The lesson's outcomes should not be forced onto the learner. Instead, learners should be allowed to assign meaningful interpretations to the learning process.
- **Subjectivity:** The experience should be formed by each learner's view of the world and not automatically take on the teacher's view.
- **Human experience:** Experiential learning opportunities must be provided as part of the learning process.

The foundation of each lesson centres on the skills critical for learner development. These skills are grouped in a logical order of increased sophistication (Dewey, 2001; Durham, 2017; Kolb, 1984), and they are as follows:

- observation (concrete experiences)
- communication
- classification (abstract conceptualisation)
- measurement (active experimentation)
- inferences (reflection)
- prediction

Every Life Sciences lesson should begin with observation as a way to stimulate the learner's senses, as sensory stimulation is essential to learning about the world (Maranan, 2017). Observations and communication work hand-in-hand as the active source of the experiential lesson, and this is provided through the effective sharing of observed information. Classification is indispensable; it forms an expected part of CAPS, as it clears the path to better understand objects or phenomena within given contexts. Through experiential skill development, there is a shift from the passive learning experience to an active learning experience in which a learner can acquire the necessary skills. In Life Sciences, as it is usually taught where learners merely listen and complete assessments (Mc Pherson-Geyser et al, 2020), active learning does not do this. Therefore, it is necessary to establish how experiential development lessons operationalise skills, linking them to learner proficiency in Life Sciences. Unlike observations, inferences and predictions are not gathered through direct evidence but through interpretation. Successfully integrating these skills in the Life Sciences classroom will ensure a richer learning experience that has a more meaningful impact on the learner.

Following the need for experiential skills development in the South African classroom, experiential learning raises awareness of the challenges teachers and learners might face if experiential learning activities were completed (Mc Pherson-Geyser et al, 2020). According to Mc Pherson-Geyser et al (2020), South African teachers face many ambiguities in conceptualising the term 'experiential learning'. Uncertainty of experiential learning and the diversity of the modes could enhance the uncertainty of skills development when changes are made to the curriculum.

3.3 Bloom's Taxonomy in Education

These skills include understanding, observing, reflecting, analysing, judging, and creating (Kolb & Kolb, 2017). Kelly (2017) affirmed that developing these skills would, in due course, lead to the development of higher cognitive levels of Bloom's Taxonomy, which would then influence the proficiency of Life Sciences learners. Chan (2023) confirms that teachers struggle to change long-standing practices and accommodate quality experiential learning. Besides the findings from my previous study, school district meeting results for all grades in the Further Education and Training (FET) Phase are discussed. It was observed that the learner performance analysis for 2019 indicated that most learners were challenged in their attempts to answer more complex questions. They demonstrated that they had not yet achieved some of the higher cognitive levels necessary for a fuller, more holistic degree of understanding.

A demand for skill development among learners exists. Although an increase in practicals in the amended Section 4 suggests learners be continuously assessed, learners struggle to achieve most or all cognitive levels needed to apply their knowledge effectively in these assessments (Roadshow Statistics, 2020). This indicates that, in terms of content, the subject questions in themselves may be difficult despite being phrased within reach of a lower cognitive level. The opposite may also be true when asking for a higher-order thinking skill when using standard language, as shown in the end-of-the-year examination statistics for Grade 11 in 2019 (Roadshow Statistics, 2020). (Please see Figure 3 in this regard.) Jansen (2011) argues that there is a collapse in the South African education system. A breakdown of alignment between experiential skills development and content with continuous assessment at a higher cognitive level signifies the severity of this problem and makes a loud call for intervention. Hence, it is necessary to develop experiential skills in learners.

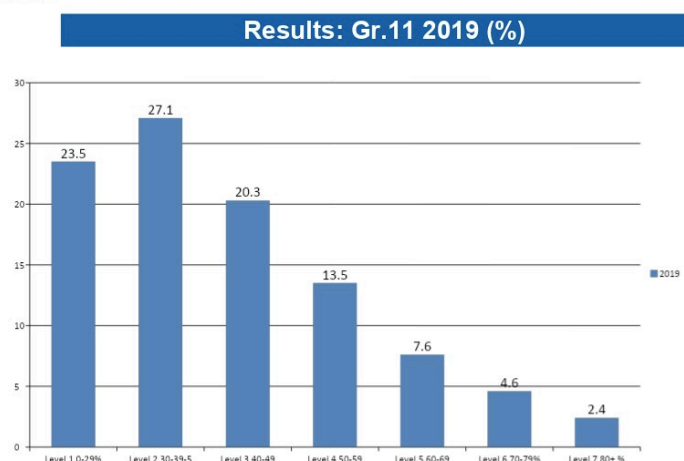


Figure 3: Roadshow statistics for end-of-year exams in skills development in Grade 11 Life Sciences (DoE, 2019)

The graph in Figure 3 clearly indicates limitations on the higher cognitive levels developed in learners. A proficient learner in Life Sciences should be able to align the levels of cognitive demand with the difficulty level in an assessment. The levels, as detailed by the graph, indicate that the majority of learners fall under the category of levels 1 to 4, confirming that learners in the 2019 examination only mastered the lower cognitive levels. Category questions for levels 1 to 4 are seen as low-order questions where information is simply recalled. The minority of learners achieved levels 6 or 7 - the levels indicating that the learner is proficient in most or all of the cognitive levels. Category questions for levels 6 and 7 are grouped on the higher cognitive platform, allowing learners to interpret information, analyse its importance in the context of the knowledge learned, and judge its significance in real-life situations.

Underdeveloped skills due to the lack of knowledge of experiential learning hinder learners from creating new experiences in the Life Sciences classroom (McDonald, 2020). Teachers may not know about experiential skills development or struggle to incorporate all the skills learners require in real life.

4. Method

This dual methodology study applied qualitative and quantitative approaches within an interpretive and positivist paradigm. Qualitative descriptive case studies, utilising checklists for classroom observations, were used to analyse experiential skills development lessons based on the conceptual framework. Concurrently, quantitative pre-, during-, and post-testing explored the impact of these skills on learner proficiency. Purposive sampling targeted Grade 10 Life Sciences teachers (N=8) and Grade 11 Life Sciences learners (N=66) in Gauteng (a province in South Africa), aiming to represent specific groups and ensure transferability. Ethical considerations were upheld, including expert-reviewed instruments and participant anonymity. Triangulating findings from both approaches provided an in-depth understanding of this study's objectives.

5. Findings and Discussions

These findings underscore the pivotal role of Bloom's Taxonomy in enhancing experiential skills development in the Life Sciences classroom. Teachers can significantly improve learners' proficiency by integrating experiential learning modes into assessments. Daft and Marcic (2014) demonstrate that when teachers perceive Bloom's Taxonomy as a tool for incorporating experiential learning, it can lead to better learner outcomes. Table 1 shows that over 50% of learners reported improved understanding, explanation, analysis, judgment, and discovery skills.

Table 1: Experiential skills developed in learners

Experiential skill	Cumulative percentage of the sample
Understanding or identification	66.7%
Explanations	66.1%

Experiential skill	Cumulative percentage of the sample
Demonstrating knowledge	66.7%
Analysing data	92.5%
Judging	56%
Creating new knowledge and applying it to known theories	53.6%
I think I now possess ALL of the skills needed to complete a Life Sciences task, which could be content-based.	50%

These findings suggest the existence of a standard for effective experiential skills development in assessments, supported by a robust conceptual framework from which this study originates. Each assessment focused on a specific mode of experiential learning to develop an experiential skill. After a lesson was concluded, a test was written. The pre-test and during-test each focused on the same question types, progressively moving from a lower-order cognitive skill to a higher-order cognitive skill. The pre-test and the during-test can be directly compared. An intervention lesson occurred between the two tests to develop more experiential skills. The feedback on the pre-test allowed learners to improve on the skills they had not yet mastered. By directly comparing the pre-test and the post-test results, the difference in skills development from the beginning of the lessons to the end of the lessons is readily apparent.

Each test was based on Bloom's Taxonomy and included learning questions that predominantly focused on experiential learning modes. The first mode, concrete experiences, focused on lower-order questions, which only required a demonstration of basic understanding. The second mode, reflective observation, focused on discussions with insight, telematics, and data analysis. The third mode, abstract conceptualisation, focused on discovering new knowledge while referring to known theories. The final mode, active experimentation, focused on linking science to society while answering higher-order questions, allowing the learner to receive maximum marks in an assessment.

Descriptive and inferential analyses were conducted to reduce data and validate the instruments. This analysis was done using various scales that measure different experiential skills in the pre-, during-, and post-tests. Audio recordings were used to draw inferences from the experiential skills developed by the participants (Zikmund & Babin, 2013). The raw scores were used using a t-test. Then, it was summarised into a table, which made it more manageable to analyse the entire set of final scores for each learner (Gravetter & Wallnau, 2009). The paired, one-tailed t-test, which focused on results from an alternative test that would decrease or increase significance, was used to compare the Life Sciences learners' (N=66) experiential skill development and their proficiency. All the 15-mark tests were assessed using a rubric with a Linkert scale to ensure consistency.

Researchers such as Stronge, Ward and Grant (2011) and Armstrong (2010) specify the need for formatting questions, declaring that when they are formulated, they should be considered carefully and prepared well before a lesson. This careful consideration and thorough preparation ensure that the questioning leads to experiential skills development. Furthermore, it ensures that the questions included allocate different marks in an assessment per the level of Bloom's Taxonomy. Utilising Bloom's Taxonomy ensures that lessons support the development of experiential skills, emphasise the key points in a theme, and maintain an appropriate level of complexity and difficulty. However, the reality is that teachers have definitively different points of view regarding questioning and the specific ways of planning for the sequence of questions asked (Mc Pherson-Geyser et al, 2020). The focus was on how questions were developed in the tests and how the questions might best be aligned with Bloom's Taxonomy. The questioning sequence did not matter, as the modes of experiential skills development take place cyclically.

In this model, provided that all four modes are completed with the correct difficulty level, the learner would show improved proficiency in the developed experiential skills. Therefore, this focus on how questioning sequences are ranked becomes the least important aspect of experiential assessment lesson planning. The sequence of questioning was significantly less critical in regard to learner achievement. The focus was more on the difficulty level, as the questions were asked to develop experiential skills. The classroom becomes less prescribed by not focusing on the questioning sequence but rather on how questions are raised. This approach allows learners to develop new experiential skills through their classroom experiences. The movement of the DoE and its amendment to Section 4 ushered teachers into an era where they are told what to teach, and learners are assessed using standardised, government-prescribed assessments. Sometimes, the curriculum materials from the government or the district include questions a teacher should ask, thereby directing the

learners. This might feel like another way teachers are told how to teach; the teacher only has the classroom activity or the assessment to showcase their art of teaching. When showcasing the assessment results, the teacher's authenticity is a highly sought-after aspect in the classroom—this way of questioning is a natural skill.

However, questioning as a natural teaching approach does not require planning. These questions are leading questions that focus on a review of previously read materials or materials presented and are usually questions of a lower cognitive level. Nevertheless, it became clear in the pre-, during-, and post-tests that various questions are needed to ensure that the cognitive level of an assessment is met by the end of a theme in the CAPS. Therefore, it was clear that planning questions according to Bloom's Taxonomy was a key aspect of the assessment outcome when developing experiential skills. In this regard, the findings indicated the following:

By not focusing on the sequence of questions but instead considering each question's complexity and difficulty, the learner's proficiency was improved, and most learners experienced a sense of achievement. This is affirmed by Armstrong's research and literature (2010).

Questioning is a crucial skill that a teacher must have. This skill is put to use when a teacher teaches a learner. High-quality questions ensure an experiential skill of the same quality. High-quality questions unlock various experiential skills by equipping learners with clarity, purpose, usefulness, and thinking orientation. Bloom's Taxonomy not only secures in-depth knowledge of a theme but also ensures that teachers prepare their learners for end-of-year examinations and the possible questions they may face. Skill development can be simple, but it takes time. From my own experience and observation, the main factor for teachers not spending time developing different skills is the limited time available in the curriculum. This issue can be bridged when planning an approach to questioning using Bloom's Taxonomy. Another reason for planning the types of questions in advance is not only to ensure quality but also variety. According to Armstrong (2010), six levels or categories of questions should be developed:

- Remembering
- Understanding
- Applying
- Analysing
- Evaluating
- Creating

These questions run parallel to experiential skills development, moving from a lower cognitive skill to a higher one. The findings showed that the learners were exposed to a range of questions, which required different cognitive skills and enabled them to apply their own mental initiative. Employing different questioning allows the learners to think creatively, critically, and analytically while developing the appropriate experiential skill. It also allows learners to utilise an array of knowledge when answering the questions employing the acquired skill, and this, in turn, improves their proficiency.

Finally, experiential skills are developed after formulating quality questions and ensuring variety. Consequently, learners are able to question others inside or outside the classroom critically. This ability to judge and question is in itself a lifelong skill. Effectively questioning (or judging) should fill gaps in knowledge and allow learners to solve the problems in their assessments. Therefore, utilising Bloom's Taxonomy in developing experiential skills will enable learners to discover a valuable learning tool and organise their thinking to achieve the desired proficiency. They will also start developing new experiential skills.

6. Conclusion

The benefits of experiential skills development through Bloom's Taxonomy and its influence on the learners' proficiency in Life Sciences were explored. This was done by highlighting the implementation of experiential learning modes in assessment-question formulation by the teacher, the experiential skills the learner needs, and these skills' influence on learner competencies in assessments in Life Sciences. Furthermore, this dual methodology study, where there's an interconnection between the interpretive and positivist paradigm (using both qualitative and quantitative research, in other words), explored the extent to which the experiential skills developed through Bloom's Taxonomy in assessments influenced the learners' proficiency. An important recommendation in this article is that teachers should be educated on the need to establish experiential skills as a modern teaching strategy. This strategy shows traits of flexibility, sustainability, accessibility, efficiency, and innovation, all of which work together to accomplish outcomes and produce proficient learners. The aim is

to inform the DoE of the need to train teachers to be confident in applying experiential skills development to the various assessments that must be completed throughout the year. These findings could assist teachers in providing better support for learners when using experiential skills and gauging the effectiveness of the experiential skills in the classrooms and assessments, showcasing attributes and shortcomings that would influence learners' proficiency. The findings have confirmed that merely building on concrete experiences is not enough to develop a proficient learner who also requires knowledge through reflective observation, abstract conceptualisation, and active experimentation. A learner learns by doing, and this form of active, involved engagement develops experiential skills. Integrating Bloom's Taxonomy in Life Sciences assessments significantly enhances experiential skills development and learner proficiency, advocating tailored approaches for fostering critical thinking and real-life applications in South Africa's educational context.

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Degrees of Freedom: Rethinking Higher Education Credentials in South Africa

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Abstract: The shifting landscape of higher education and the labour market has necessitated re-evaluating conventional degree programmes, leading to an exploration of micro-credentialing as a link between university offerings and industry requirements. This paper examines the traditional dominance of the degree and the concurrent rise of strategic partnerships between higher education institutions and businesses to develop credentials more closely aligned with the dynamic needs of the modern workforce. Traditionally, university degrees have been viewed as the bedrock of educational achievement and a prerequisite for professional success. However, rapid technological advancements and changing economic demands have exposed limitations in the degree model, particularly its often inflexible curriculum and lengthy completion time. Consequently, there is growing interest, especially within Private higher education, in micro-credentialing, which encompasses an array of non-degree awards that can be directly linked to specific skill sets and employment opportunities. Through qualitative analysis of partnership models across diverse industries and countries, this study identifies core elements contributing to the successful integration of micro-credentials into educational and professional spheres. These elements include co-creation of curricula (between industry and the university), shared governance structures between academic and corporate entities and robust assessment methodologies that validate learner competencies in a manner consistent with industry standards. Additionally, the study explores potential challenges and resistance within academia and industry, including credential recognition issues, balancing theoretical knowledge versus practical skills, and economic impacts on traditional degree pathways. It proposes strategic approaches to mitigate these challenges, emphasising the importance of transparency, stakeholder engagement, and continuous evaluation. The incorporation of micro-credentialing via university (both public and private), TVET college and Community College, business partnerships possess considerable potential to tackle future student discipline trajectories, the dire unemployment of South African youth and the growing needs of upskilling via life-long learning. It demands continuous innovation in educational models to guarantee these models promote individual career achievements and societal progress in an increasingly intricate global economy. This paradigm transition from the conventional degree to a more adaptable, competency-based credentialing structure signifies a crucial development in matching higher education and industry.

Keywords: Micro-credentialing, University-business collaboration, Skill-based education, Workforce alignment, Educational innovation, Labour market adaptation

1. Back to the Beginning

Before delving into a subject that describes future aspects of higher education in South Africa, it may be instructive to go back to the beginning and the National Commission on Higher Education (NCHE) report. The language employed in the report emphasises cooperation, accountability, negotiated settlements, and the diffusion of power across broad bases, aiming to include as many stakeholders as possible in policy formulation and implementation. In short, it was completely opposite to the language of the Nationalists. The document outlines various governance scenarios: advisory, strong steering, and cooperative governance. The latter emerged in the final report as the preferred model for relations between the state and higher education institutions.

Central to the report's conclusions was establishing two new higher education structures: the Higher Education Forum (HEF) and the Higher Education Council (HEC). These were envisioned as buffer bodies mediating between the Ministry and higher education institutions. The HEF would serve as an advisory body representing key stakeholders in higher education. At the same time, the HEC would act as a policy formulator and monitoring entity, operating in collaboration with the Ministry (1996, 174). The HEF was conceived as a forum to bring together stakeholders from the public and private sectors and independent research organisations. The aim was to foster a space for discussion and, ideally, reach a consensus among the various players in higher education. It was also intended as a space for collaboration and partnerships.

The impetus behind these recommendations aligned with the notion of cooperative governance, seen by the report's authors as a uniquely South African approach to state/institutional relations. The report was intended as a guiding document rather than an immutable directive. For instance, the recommendation for two higher education guiding bodies was ultimately replaced by establishing the Commission for Higher Education (CHE),

which was only an advisory body. At the same time, the guiding principles of diversification and interactivity were quietly discarded when The White Paper was issued.

The question must be asked: What went wrong? How did a cooperative and integrated vision for the future of higher education turn into, at times, a ruthless exercise in government enforcement, as seen with the mergers? While pinpointing the exact reasoning is impossible, one can make an educated guess. The root issue was that apartheid had so entangled higher education institutions that cooperation and institutional collegiality were virtually unimaginable. Higher Education institutions found themselves in a state of effective solitary confinement. Many Historically Disadvantaged Institutions (HDIs) were trapped within impoverished Bantustans, while others were ensnared by an ideology of Afrikaans nationalism that was rapidly losing support. Liberal universities cut off from the international community via boycotts that had long been their literal and metaphorical alma mater faced their unique challenges. Despite the differing sources of alienation, the end effect was strikingly similar across all institutional groupings.

In the face of such isolation, institutions naturally focused on areas where control and certainty still existed. Funds continued to trickle down through the higher education sector in the dying days of Apartheid, but priorities shifted towards ensuring the future survival of each institution. Consequently, the collective response to this isolation was introspection and self-preservation, with institutions becoming increasingly protective over their interests and survival. Moreover, with some degree of partnering that came with COVID-19, such has remained since.

The reason for this historical representation of alienation is simple. It is the contention of this paper that we stand now on the precipice of an entirely new educational world where to continue isolated and protecting our turf — from institutions like universities to the CHE, SAQA, DHET, etc. — becomes entirely untenable to deal with the problems of AI and a rapidly changing marketplace. Providing a feasible alternative to the PSET system to respond to this state of affairs becomes increasingly urgent.

2. The Mismatches

The incoherence of the current system has even more dire consequences. Student success should not merely be perceived as the attainment of diplomas, certificates, or degrees but also in terms of how well these students align with the requirements of the existing and future job market. As the DHET notes in “Skills Supply and Demand in South Africa Labour Market Intelligence Research Programme”, its key policies “all draw attention to the risks associated with the poor supply of skills from the national education and training system and the misalignment between skills supply and demand for the implementation of economic growth strategies” DHET (2021,19). This alignment is particularly significant considering the increasing dissatisfaction businesses express regarding the skills our graduates possess. As the DHET PSET Monitor states:

The report observes that the extent of mismatches between education and the labour market in South Africa is higher than in many other countries. Although this problem can only be partly attributed to the PSET system not providing programmes that are responsive to the needs of the labour market, it remains imperative that the PSET system continuously identify, develop, and deliver programmes that are flexible and relevant to the ever-changing needs of the economy and the labour market DHET (2021, 16).

South Africa grapples with high levels of education-job mismatches. The country’s qualification mismatch incidence is 51.5%, surpassing the OECD average of 35.7%. However, the field of study mismatch in South Africa aligns with the OECD average, indicating that this issue is not limited to South Africa DHET (2021, 89). With 51.5% of graduates being underqualified, overqualified, or possessing qualifications in disciplines unrelated to their employment, it still indicates a striking misalignment and absence of coordination. This means that our graduates are underemployed, over-employed or working tangentially in their field. If we are talking about a degree, that is three years of focus on a particular skill set that is all too often becoming dated, if not obsolete.

This mismatch is compounded by youth unemployment. Even StatsSA notes with some alarm:

This is supported by statistics indicating a 45,5% unemployment rate among young individuals (aged 15-34 years), in contrast to the national average of 32,9% in the first quarter of 2024 Stats South Africa (2024).

3. A Thought Experiment

How does one mend a system that is so fundamentally flawed? The staggering 45.5% unemployment rate of students unable to access university even if they desired to is a glaring issue. The NSFAS payment system is already stretched to its limits and would be utterly incapable of accommodating such an influx of students.

Our mess originates in secondary education, where life orientation primarily aims to cultivate compliant citizens. However, this curriculum should instead be utilised to impart practical skills such as basic coding, an introduction to entrepreneurship, web design, and communication and soft skills. The list is virtually endless.

As Kana & Letaba (2024) point out in their discussion of 4IR, Technical and Vocational Education and Training (TVET) colleges are encountering substantial challenges in their efforts to respond to the demands of the 4IR effectively. A primary challenge is the inflexible, top-down approach to curriculum development mandated by the DHET. This centralisation restricts the autonomy and creative input of TVET lecturers, who possess valuable firsthand experience and knowledge of industry requirements. Consequently, this rigid structure hinders rapid adaptation to the swiftly evolving technological landscape, making it difficult for TVET institutions to remain pertinent and responsive to industry demands.

Additionally, Kana and Letaba highlight the fragmented nature of stakeholder engagement. TVET lecturers frequently find themselves marginalised, effectively diminishing their capacity to influence curriculum development and integration with industry needs. This marginalisation undermines the potential for meaningful partnerships with industries, which are essential for providing students with relevant in-service training, internships, and practical experience necessary for employability in the 4IR era (interestingly, they never explore the potentiality of micro-credentialing). Perhaps most importantly, the TVET sector remains an unpopular choice among students. It suffers from underfunding and has historically demonstrated a weak pass rate, returning R2.6 billion to DHET in November 2023 due to student dropouts.

The university sector, meanwhile, continues to languish in a degree discourse that is often no longer fit for purpose. An interesting comparison between degrees and micro-credentials is illustrated, provided by Pander and Kaur (2023). An Australian [training site](#) predicts that 40% of degrees will be phased out by the end of the next decade. Indeed, this is, to some extent, an attempt at sensationalism, but at its core, the fundamental principles possess a degree of veracity.

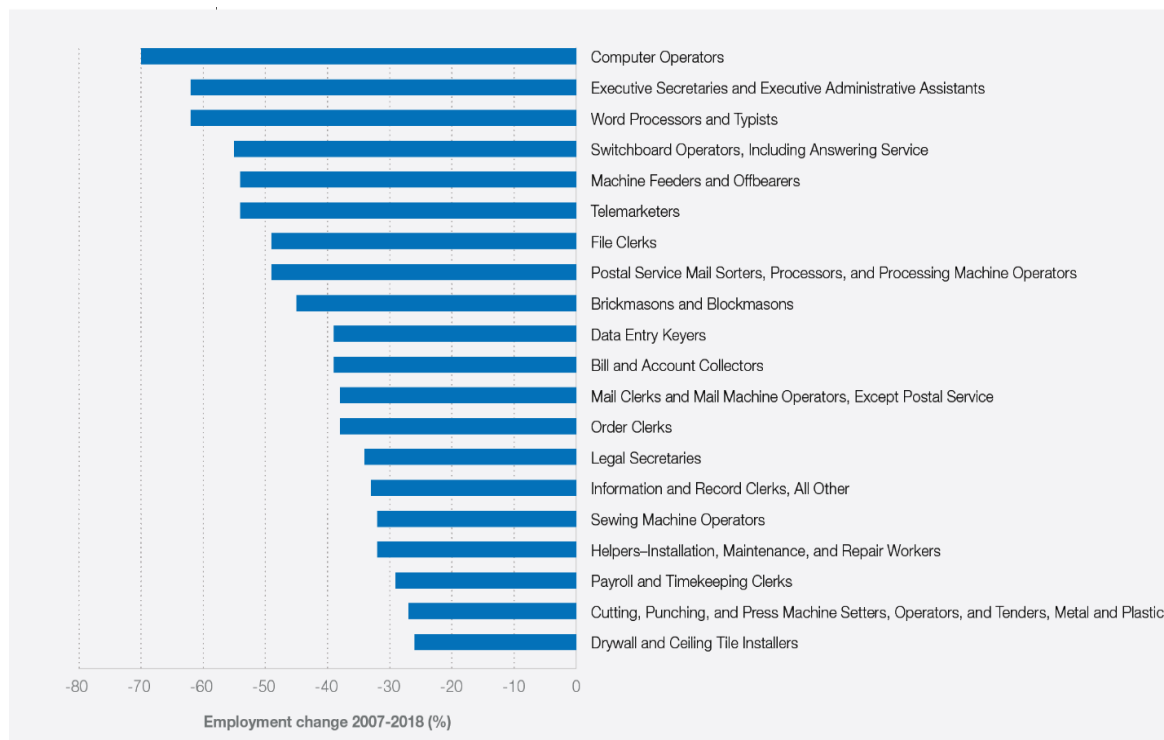


Figure 1: Employment Change 2007-2018. Pander and Kaur (2023)

Degrees in medicine, engineering, and law will retain their relevance, but many IT and Humanities degrees will become redundant.

As the World Economic Forum shows, these jobs are rapidly declining (WEF, 10). Examining these declining positions reveals that each necessitates training and some degree of experience. This indicates that these adults will need to re-skill and potentially transition to different industries to avoid contributing to the already significant unemployment figures in South Africa.

So, what is the solution? What is needed is a new model of higher education in this country. This paper contends that a micro-credentialing approach to higher education and lifelong learning may address many pressing issues.

The topic of micro-credentialing is fraught with semantic challenges. It is challenging to define precisely, as it can be used interchangeably with terms such as digital badging, stackable and unstackable credentialing, and non-formal learning Duklas (2020). This array of terminology often leads to confusion before one even has the opportunity to examine the concept in depth.

Universities often harbour suspicions regarding the concept of micro-credentialing, viewing it as antithetical to the fundamental principles of a degree. Their argument posits that a degree encompasses acquiring content and skills and inculcating a specific manner of thinking and analysis, which cannot be achieved through short, basic credentialing. Additionally, the terminology associated with badging evokes connotations of scouting, thereby complicating its acceptance among academics and the general public. Another reason for the reluctance to more broadly accept micro-credentialing stems from institutions' territorialism and the lack of institutional cooperation discussed earlier. A micro-credential from University X may be viewed unfavourably by University Y, simply because University Y did not draft the programme themselves and therefore find it difficult to accept its validity from an external source. Finally, it is contended that micro-credentialing is inadequate for imparting essential soft skills necessary for future business endeavours. Nonetheless, soft skills are not impeded from being incorporated into micro-credentialing through peer learning groups, real-life industry case studies, and mentorship programmes.

Moving past these reservations and considering credentialing as integral to a simplified National Qualifications Framework (NQF) could facilitate the transfer and recognition of credits between institutions. This approach is particularly relevant if we adopt a clustered mode of micro-credentials that collectively equate to a degree, as recently outlined by the minister in his policy on Recognising South African higher education institutional types. The fundamental idea is that access and transferability should be enhanced through a simplified NQF. As the document puts it

5.2.1. To promote diversification of access, curriculum and qualification structure, with programmes developed and articulated within the National Qualifications Framework (NQF), encouraging an open and flexible system based on credit accumulation and multiple entry and exit points for learners.

The New Zealand Qualifications Authority has incorporated micro-credentialing into their New Zealand Qualifications and Credentials Framework (NZQCF). It allows providers to register their courses on the database for access and transfer and ensures they are entered into a database for record keeping. British Columbia and many other countries also embed micro-credentialing in their access and transferability laws.

Selvaratnam and Sankey (2021) underscore a substantial rise in the adoption and interest in micro-credentialing within higher education institutions in Australasia, a trend notably accelerated by the COVID-19 pandemic. Comparative survey results from 2019 and 2020 reveal a significant shift towards implementing micro-credentialing policies and practices. Institutions increasingly recognise micro-credentials as a viable mechanism to offer flexible, targeted learning opportunities that can be swiftly deployed to meet the evolving needs of both the workforce and learners.

4. Authority and Micro-Credentialing

Even The Council on Higher Education has observed the increasing influence of micro-credentialing worldwide. It is currently evaluating its external landscape and the quality of these programmes and deliberating on their potential for credit-bearing status. The Council has requested that institutions already engaged in micro-credentialing submit any existing frameworks or guidelines that could serve as models for establishing a future stance on this matter. The CHE strives to retain control and oversight over micro-credentialing for apparent reasons. However, it may be too late, as we are witnessing a shift from the traditional, structured conception of the university as a provider of degrees, masters, and PhDs. Instead, there is an increasing fragmentation. Courses are being divided into smaller segments to meet industry demands, produced both within and outside the university.

For example, the Independent Institute of Education, Rosebank College provides CompTIA and Microsoft certifications over and above their current ICT offerings. Variations of Microsoft Certification have existed for at least the last 20 years in this country. It also signifies a shift in power from government-accredited programmes to those immediately required and endorsed by the private sector. Consequently, it is narrowing the gap between education and industry requirements. In this context, government approval becomes unnecessary, rendering it both attractive and enabling for the university of the future.

5. Solutions for our Future

In 2006, the American Council on Education (ACE) initiated a campaign titled "Solutions for Our Future" in an attempt to secure increased financial support from federal governments. The campaign endeavoured to articulate the essential role of higher education in enhancing the individual's well-being and that of the nation. Drawing upon some research, it highlighted various benefits, such as graduates' readiness to engage as active and critical citizens, their reduced likelihood of smoking, and their willingness to volunteer. Despite its promising premise, the campaign was short-lived. This paper aims to propose a contemporary version of some kinds of solutions for South Africa.

1. Micro-credentials are intended to address specific skills and competencies required by the labour market, thereby bridging the gap between education and employment. Establishing strategic partnerships between higher education institutions and industry to co-create curricula that meet current and future workforce means the university or TVET College can potentially generate new income streams. This collaboration can help ensure that micro-credentials remain relevant and valued by employers. For example, IBM collaborated with Northeastern University to develop a series of courses and credentials, including micro-credentials, tailored to the skills necessary for various technology roles within IBM. This partnership entailed IBM funding the development of these courses to ensure they fulfilled the company's demand for skilled employees.
2. The concept of micro-credentialing, while potentially counterintuitive or even perceived as absurd, offers the significant advantage of being deliverable in any location. It can be facilitated through online lectures and accessible via data from TVET colleges, community colleges, and similar institutions. It can even be rendered via the student's mobile device and be zero-rated. This approach permits learners to progress at their own pace and in accordance with environmental demands.
3. By focusing on job-relevant skills, micro-credentials can enhance employability, particularly among unemployed youth. Imagine universities, TVET colleges, Quality Council for Trades and Occupations and community colleges collaborating with industry to deconstruct the 376 high-demand occupations into manageable micro-credentials. These micro-credentials could be accumulated progressively over time. Consider advertising an unemployment initiative for a 'town hall' meeting, where some of the 376 high-demand jobs are available. These micro-credentials could be utilised by unemployed youth to direct their efforts towards building some form of education. Such meetings could be convened at secondary schools and vocational training colleges. While the outcomes may not be immediate, this approach would establish a practical method for entering the skill development pipeline leading to youth employment in South Africa. Paulson et al. (2023) even offer a high-level template for the curriculum development for a Government Leadership Training Programme, which offers insight into the construction of these kinds of short courses (see also Galán-Muros & Davey, 2017) for a detailed framework for implementing micro-credentialing).
4. Micro-credentials offer flexible, modular learning opportunities that can be stacked over time to build towards a more extensive qualification. This particularly benefits working professionals and those seeking to upskill or reskill without committing to lengthy degree programmes. South Africa has a dismal track record of life-long learning. According to the OECD report, 1,1% received training through the SETAs in 2017 and "the World Bank Enterprise Survey suggests that in 2007 37% of South African employers were providing training." Micro-credentialing would promote lifelong learning by providing opportunities for continuous professional development. This is essential in a rapidly changing global economy where skills must be constantly updated.
5. Embedding micro-credentials within a simplified National Qualifications Framework (NQF) can facilitate the transfer and recognition of credits between institutions. This can help ensure that learning is portable and recognised across different educational and professional contexts DHET (2024). This can be modelled after successful frameworks like those in New Zealand and British Columbia. Developing quality assurance processes to validate the competencies and skills

represented by micro-credentials is essential. This would entail establishing standards and frameworks to uphold the credibility and trustworthiness of these credentials.

6. Once embedded in the NQF, support could be gained from government bodies like DHET and CHE to promote and regulate the adoption of micro-credentials. Institutions should be encouraged to offer micro-credentials and integrate them into their existing programmes.
7. Strategic partnerships between higher education institutions and industry to co-create curricula that meet current and future workforce needs. This collaboration can help ensure that micro-credentials remain relevant and valued by employers.
8. Utilising digital platforms and blockchain technology to issue, verify, and share micro-credentials has become increasingly popular with concepts like the creation of a variety of verification mechanisms Pander & Kaur (2023). This can enhance their portability and accessibility, ensuring learners can easily present their credentials to potential employers or educational institutions.
9. The CHE and Councils/Professional bodies could undertake awareness campaigns to educate students, employers, and educational institutions regarding the benefits and opportunities of micro-credentials. Such efforts can mitigate scepticism and foster broader acceptance.
10. Moreover, pilot programmes should be implemented to evaluate the effectiveness and acceptance of micro-credentials across various sectors. Documenting and disseminating case studies illustrating successes and lessons learned can inform and guide broader implementation efforts.

6. Overcoming the Isolation

This paper initially outlined several aspects of the isolation and alienation experienced by South African universities both post-apartheid and especially following the merger process. This analysis did not address the broader issue of silofication within the PSET sector. The confusion prevalent at the university level renders discussions about collaborations with TVET institutions and community colleges redundant, but it remains crucial to creating a coordinated, coherent system.

Our argument posits that micro-credentialing, due to its implementation at numerous points within the PSET sector, can serve as a significant mechanism for bridging gaps between these elements and allow for vertical and horizontal transferability within the NQF. Micro-credentialing can serve as a pivotal tool in unifying the PSET system in South Africa. Micro-credentials can fill gaps and create a more cohesive and responsive educational framework by fostering collaboration among various educational institutions and aligning their curricula with industry needs. It has the potential to gradually erode the borders between various sectors, which has, in the past, facilitated the consolidation of power within government and across different educational domains.

Integrating micro-credentials within the NQF can standardise the recognition and transfer of credits across institutions and different types of institutions. This approach ensures consistency in the quality and value of credentials, enhancing their acceptance and respectability. Establishing hardy quality assurance processes for micro-credentials, as evidenced in New Zealand, can further bolster their credibility within the PSET system.

Involving industry partners in developing micro-credential curricula ensures that the skills taught are directly relevant to current job market needs. This collaboration can lead to more targeted and effective educational programmes that enhance employability. Additionally, business partnerships can facilitate internships and apprenticeships, creating direct pathways from education to employment. These partnerships help integrate theoretical knowledge with practical skills, making graduates more job-ready. Public-Private Partnerships raise the critical question of how to fund the creation of a micro-credential. Part of the answer may lie with industry partners who urgently need specific skills and are willing to pay higher education institutions to develop or co-create credentials for those skills. However, the issue extends further, once a micro-credential is available on the market, it has the potential to be sold on to other users, potentially even on a subscription basis. Furthermore, the funding question is intrinsically linked to the role of our SETAs and the inadequate training levels among the general populace. SETAs are ideally positioned to finance the development of micro-credentials.

Micro-credentials offer a flexible, modular approach to education that allows learners to acquire and stack credentials over time. This flexibility benefits working adults and those needing to upskill or reskill, promoting lifelong learning as a viable option in this country. Online and blended learning options make micro-credentials accessible to a broader audience, including those in remote or underserved areas, thereby democratising education and training opportunities.

Housing micro-credentials in the NQF can facilitate the transfer of credits between TVET colleges, universities, and other educational providers. This mobility ensures that learners can build on their education without redundancy or loss of credit. Encouraging collaboration between TVET institutions, universities, and private training providers can help create a more integrated PSET system. Such collaboration aligns educational offerings with the country's broader economic and social goals.

Micro-credentials can help address the skills mismatches highlighted by the DHET by aligning educational outcomes with labour market demands. This alignment can reduce unemployment and underemployment among graduates. Furthermore, by providing targeted training programmes, micro-credentials can empower historically disadvantaged communities with the skills needed to participate fully in the economy, thereby promoting social equity and inclusion.

Micro-credentialing can play a critical role in unifying the South African PSET system by standardising credentials, fostering industry partnerships, promoting flexible learning, bridging institutional gaps, and addressing economic and social challenges. This cohesive approach can create a more responsive education and training system that meets the workforce's and society's evolving needs.

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The Impact of Implementing Gamification Elements on Motivation, Engagement and Academic Achievement

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Abstract: This study investigates the influence of gamification on students' motivation, engagement, and academic achievement in a managerial communication course at a large Australian university. Amidst growing concerns about student disengagement in traditional educational settings, gamification has emerged as a promising instructional approach. Utilising game elements like points, and leaderboards, this quasi-experimental study sought to create a more engaging and motivating learning environment. The intervention was conducted in weeks 5-8 of the semester, with students participating in gamified online activities and in-class challenges that contributed to a team-based leaderboard. The research design included pre- and post-gamification surveys using the Higher Education Student Engagement Scale (HESES), the Gameful Experience Questionnaire (GAMEFULQUEST), and the Questionnaire on Motivation for Cooperative Learning Strategies (CMELAC). Independent samples t-tests were conducted to analyse the data, focusing on five engagement variables: academic engagement, cognitive engagement, social engagement with teachers, social engagement with peers, and affective engagement. The results, based on responses from 665 students (410 pre-intervention and 255 post-intervention), indicated significant increases in cognitive engagement and social engagement with teachers post-gamification. Cognitive engagement scores showed a notable improvement, with students reporting higher satisfaction, enjoyment of intellectual challenges, and motivation to study. Similarly, social engagement with teachers improved, with students feeling more understood and supported by their instructors. However, there was no significant change in academic engagement and social engagement with peers. This suggests that while gamification can enhance specific aspects of the learning experience, its effects on overall academic performance may vary. The study concludes that gamification has the potential to positively impact certain dimensions of student engagement, particularly cognitive and social aspects, but its influence on academic outcomes remains complex. These findings underscore the need for further research into the nuances of gamification and its role in educational contexts. Educators are encouraged to consider the implementation of gamified elements to foster a more dynamic and interactive learning environment.

Keywords: Gamification, Engagement, Motivation, Higher education, Gameful experience, Academic performance

1. Introduction

Management education often fails to engage students effectively, with traditional lecture and tutorial formats proving tedious and disconnected from real-world experience (Gosling and Mintzberg 2006; Lindorff and McKeown 2013). Students' lack of interest in learning poses a significant challenge for educators (Zichermann and Cunningham 2011). Gamification has emerged as a potential solution to address this disengagement.

Gamification involves applying game-like elements (such as points, badges, and leaderboards) to non-game contexts, using mechanics, aesthetics, and game thinking to engage people and promote learning (Kapp 2012; Dicheva et al. 2015). It is the "use of game design elements in non-game contexts" (Dicheva et al. 2015).

As an emerging instructional approach, gamification has shown promising results. Studies have reported increased motivation, engagement, and information retention among students (Qiao et al. 2022; Raju et al. 2021). Gamified systems provide immediate feedback and foster a growth mindset (Dichev and Dicheva 2017). They create a relaxed atmosphere where students feel safe to take risks, reducing anxiety and encouraging participation (Sanchez et al. 2020; Bouchrika et al. 2021). Gamification has the potential to positively impact demotivated and disengaged students. Its applications extend beyond education to areas such as business, marketing, wellness, and ecology (Dicheva et al. 2015). However, there is a scarcity of scientific studies on gamification in management education. Existing research lacks robust conclusions and scope, highlighting the need for further investigation in this area (Silva et al. 2019).

2. Literature Review

2.1 Gamification and Academic Performance

Research has consistently shown a positive relationship between student engagement and various learning outcomes, including academic performance (Zhoc and Webster 2019). Understanding how gamification affects academic performance can help educators design more effective learning experiences. Bai et al. (2020) conducted a meta-analysis that examined 24 quantitative studies investigating the impact of gamification on

academic performance and found an overall significant medium effect that gamification can increase students' academic performance. They highlight three reasons for this result - gamification's ability to promote goal-setting, its ability to fulfil the student's need for recognition, and its ability to provide feedback on the student's performance (Bai et al. 2020). Researchers also argue that gamification elements (such as points, badges and leaderboards), improve student motivation to engage more deeply with the material which can lead to better learning outcomes (García-López et al. 2023; Tsay et al. 2018; Dicheva et al. 2015).

Gamification increases engagement through several mechanisms.

2.2 Academic Engagement

Gamification can enhance academic engagement by incorporating game elements that motivate students to participate actively in learning activities. For instance, the use of points, badges, and leaderboards can encourage students to attend classes, complete assignments, and engage with course materials (Seaborn & Fels, 2015). Academic engagement refers to observable behaviours directly related to the learning process, such as class attendance, preparation for class, and persistence in study (Zhoc et al. 2019). It is essential for achieving the minimum threshold level of learning and is linked to higher academic achievement. However, the effectiveness of gamification in promoting academic engagement can vary based on context and individual differences. Some studies indicate that while gamification may initially boost motivation, it may not always lead to sustained academic engagement or improved academic performance (Seaborn and Fels. 2015).

2.3 Cognitive Engagement

Cognitive engagement, defined as the psychological investment in learning and understanding complex ideas, is crucial for academic success. It requires students to be intellectually inspired beyond minimum study requirements (Zhoc et al. 2019). Gamification has been shown to increase cognitive engagement by encouraging deeper understanding of complex concepts. Game mechanics stimulate critical thinking and problem-solving skills, as students strategize and apply knowledge in gamified environments (Sanchez et al. 2020; Ding et al. 2018). Gamified learning often incorporates complex problems or real-world scenarios that promote higher order thinking skills and content connections (Alt 2023). Additionally, gamification fosters metacognitive skills by encouraging reflection on thinking processes (García-López et al. 2023). It provides immediate feedback, allowing students to evaluate and adjust their strategies critically. This process enhances critical thinking and promotes adaptive learning approaches (García-López et al. 2023).

2.4 Social Engagement With Teacher

Gamified learning environments can also enhance social engagement with teachers by creating more interactive and dynamic classroom experiences. Teachers can use gamification to provide immediate feedback and recognition, which can strengthen the student-teacher relationship, fostering a supportive learning atmosphere (Seaborn and Fels. 2015). Social engagement refers to the interaction with teaching staff, which takes place in the institution. There is an abundance of research evidence supporting that student-staff relationships are critical to the improvement of student learning and development (Guenther and Miller 2011).

2.5 Social Engagement With Peers

Social engagement with peers is crucial in student development, influencing cognitive, affective, psychological, and behavioural aspects (Thomas 2012). Gamification fosters healthy competition and collaboration, encouraging excellence while building community (Raju et al. 2021; Bouchrika et al. 2021). Group challenges and team activities enhance student interaction, creating a more connected learning environment (Zhoc et al. 2019). Collaborative gamified designs promote positive learning behaviours as students work towards shared goals (Alsawaier 2017). However, the impact on academic performance can be mixed. While social engagement through gamification can enhance learning, it may also reduce individual study time, potentially affecting GPA negatively (Zhoc et al. 2019).

2.6 Affective Engagement

Gamification positively influences affective engagement by making learning more enjoyable and motivating. Affective engagement relates to a level of emotional response characterised by feelings of involvement in the institution as a place and a set of activities worth pursuing (Finn and Zimmer 2012). Research into the significance of affective connections at school has examined students' sense of belonging, identification with school and sense of relatedness, which are factors influential to student motivation and participatory behaviours (Appleton et al. 2008). The incorporation of game elements can lead to increased interest and enjoyment in learning

activities, which are crucial for emotional investment in education (Ding et al. 2018; Alsaweir 2017; Seaborn and Fels 2015). Studies have shown that when students feel a sense of achievement through gamified elements, their overall satisfaction with the learning experience increases, which can lead to higher levels of affective engagement (Seaborn and Fels 2015).

2.7 Motivation

An area of research that emerges from the literature is the significant relationship between gamification and student motivation. Various studies have reported a positive correlation between the use of gamified elements, such as leaderboards, badges, and points, and increased motivation levels in students (Dicheva et al. 2015; Hamari et al. 2014). Gamification taps into intrinsic motivating factors, such as autonomy, competence, and relatedness by providing students with meaningful challenges, instant feedback, and a sense of accomplishment. By further exploring the mechanisms through which gamification enhances student motivation, researchers can develop more effective gamified interventions and tailor them to individual student needs, ultimately leading to improved learning outcomes (Landers et al. 2017).

2.8 Self-determination theory

Self-Determination Theory (SDT) is widely used to explain how gamification fosters engagement in education (Silva et al. 2020). SDT posits three basic psychological needs for motivation and engagement: autonomy, competence, and relatedness (Ryan and Deci 2002). Gamification can satisfy these needs - autonomy: badges and points give students control over their learning; competence: leaderboards allow students to gauge their performance against peers; relatedness: storylines create shared experiences, fostering connection. For example, a hero's adventure storyline can provide a sense of relatedness by creating a shared experience for all participants (Frost et al. 2015). Research demonstrates SDT's applicability across cultures, with the fulfilment of these psychological needs positively correlating with achievement (Nalipay et al. 2020). By addressing these fundamental needs, gamification can potentially enhance student motivation and engagement in educational settings.

2.9 Gameful experience

Högberg et al. (2019) distinguishes between game experience and gameful experience. Game experience involves emotions, perceptions, thoughts, behaviours in traditional gaming contexts (Ermi and Mäyrä 2005), Gameful experience, however, refers to motivational affordances integrated into non-game contexts, aiming to evoke game-like experiences while extending into real-world behaviours and interactions (Högberg et al. 2019). Gameful experiences often target specific outcomes like increased engagement with learning materials or class participation. Understanding these experiences helps in designing effective gamification strategies for meaningful behaviour change, unlike traditional game experiences (Högberg et al. 2019). There are seven aspects to gameful experience according to Högberg et al. (2019) which include 1. accomplishment - drive for successful performance, goal achievement, and progress; 2. challenge - perception of tasks difficulty; 3. competition - experience of competing against others or oneself; 4. guided - feeling supported guided through the gamified experience; 5. immersion - depth of engagement and focus; 6. playfulness - enjoyment and fun associated with the experience; 7. social experience - social interactions and connections within the gamified system.

3. Methodology

The study was implemented in the first year Managerial Communication (MGF1100) unit at a large Australian University in semester 2 2023. Ethics approval was obtained from the University Human Research Ethics Committee (Project ID: 39370). The project team gamified the online content and classroom activities in weeks 5-8. Gamification elements such as conditional activities, progress bars and leaderboards were integrated in Moodle. During the gamified weeks, the completion of Moodle online activities earned students points which they accumulated for their team. In the classroom, student teams had to complete challenges which included tasks that apply the specific knowledge and skills in managerial communication that the students learned from that week. Completing the in-class challenges earned the team points which was reflected in the leaderboard. The top team for the semester received prizes and had their photo taken and displayed in Moodle.

The research used a quasi-experimental design specifically using the pre- and post-test evaluation of the gamification intervention. All students enrolled in the unit were invited to complete the pre-gamification survey and the post-gamification survey via an email in week 4 and week 8 respectively. The survey used the Higher Education Student Engagement Scale (HESES) (Zhoc et al. 2019). It includes 28 items broken down into the

following subscales: academic engagement, cognitive engagement, social engagement with tutor, social engagement with peers, and affective engagement. The survey also included the Gameful Experience Questionnaire (GAMEFULQUEST) composed of 56 items, measuring seven dimensions - accomplishment, challenge, competition, guided, immersion, playfulness, and social experience (Högberg et al. 2019). Lastly, the Questionnaire on Motivation for Cooperative Learning Strategies (CMELAC) developed by Manzano-León et al. (2021) was also included in the survey. CMELAC included 16 Likert-type questions designed to assess various aspects of motivation and learning in the context of playful activities.

Independent samples t-tests were calculated to determine whether there are significant differences between the response's pre-gamification (week 4) and post-gamification (week 8). Students were asked to write a reflection on their gamification experience as part of their group report submission. These reflections were extracted, and a thematic analysis was conducted to identify how students perceive their gamification experience in relation to engagement. To prevent students from writing overly positive or insincere reflections, the assessment brief had clear set expectations of the value of honesty and thoughtful evaluation and provided specific prompts that encourage critical thinking by asking students to reflect on both the strengths and areas for improvement in applying gamification in teaching managerial communication.

4. Results and Discussion

A total of 665 students responded to the questionnaire, with 410 students (62%) completing it before the gamification intervention, and 255 students (38%) completing it post intervention. Around 35% of the pre-test respondents were first year, 34% were second year, 23% third year, 8% fourth year and the rest were fifth year students. In the post test, there were an equal number of first- and second-year respondents (35% each), 24% third years, 6% fourth years.

The study used the Cronbach alpha value to test for internal consistency, and the generally agreed lower limit is 0.6 (Field, 2024). The Cronbach's alpha coefficient (α) for the HESES instrument was 0.905. For the GAMEFULQUEST instrument it was 0.972 and 0.931 for the Motivation scale. Therefore, on all the instruments, the results showed very high levels of reliability.

To test the hypothesis that there are significant differences between the pre-Gamification and post-Gamification activities, an independent sample t-test was performed. Levene's test was performed to determine homogeneity of variances due to unequal sample sizes (Field, 2024). Results indicated that both groups were sufficiently normal for t-test analysis. For all seven variables (academic engagement, cognitive engagement, social engagement with teachers, social engagement with peers, and affective engagement), Levene's test showed equal population variances ($p > .05$). Comparison of these variables between the two groups using t-tests yielded significant results on several variables.

Table 1: Comparison of pre- and post-gamification on student engagement variables

Variables	Levene's F	Sig.	t-test	df	p	Cohen's D
Academic Engagement	.069	.793	-1.165	632	.244	6.19
Cognitive Engagement	.424	.515	-2.798	639	.005	4.57
Social Engagement with Teachers	.085	.771	-3.037	634	.002	4.43
Social Engagement with Peers	2.249	.134	-1.574	632	.116	9.87
Affective Engagement	.165	.684	-.898	632	.369	5.28

On the variable *academic engagement*, the results indicate NO significant difference between the two groups, the pre-gamification ($M = 41.28$, $SD = 6.18$) and post-gamification group ($M = 41.87$, $SD = 6.21$), [$t(632) = -1.165$, $p = .224$, $d = 6.19$]. The 95% confidence interval of the difference between means ranged from $[-1.58299$ to $-.40391]$ and did not indicate a difference between the means of the sample. The results show that for only one item under this variable (I usually come to class having completed readings or assignments), there was significant difference in the means ($Mean_{pre} = 4.64$; $Mean_{post} = 4.88$) between the two groups.

On the variable *cognitive engagement*, the results indicate significant difference between the two groups, the pre-gamification ($M = 18.08$, $SD = 4.51$) and post-gamification group ($M = 19.12$, $SD = 4.66$), [$t(639) = -2.798$, $p = .005$, $d = 4.57$]. The 95% confidence interval of the difference between means ranged from $[-1.76831$ to $-.30992]$ and did not indicate a difference between the means of the sample. The results show that there was significant difference in the means between the groups on three of the four items. These questions include: /

enjoy the intellectual challenge of courses I am studying (Mean_{Pre} = 4.87; Mean_{Post} = 5.09); I get a lot of satisfaction from studying (Mean_{Pre} = 4.38; Mean_{Post} = 4.68), and I am usually motivated to study (Mean_{Pre} = 4.05; Mean_{Post} = 4.40). On all the items, the post gamification group had a higher mean score for all questions.

On the variable *social engagement with teachers*, the results indicate a significant difference between the two groups, the pre-gamification (M = 19.09, SD = 4.40) and post-gamification group (M = 20.19, SD = 4.48), [t (634) = -3.037, $p = .002$, $d = 4.43$]. The 95% confidence interval of the difference between means ranged from [-1.80898 to -.38836] and did not indicate a difference between the means of the sample. The results show that there was significant difference in the means between the groups on all items. These questions include: *Staff make a real effort to understand difficulties I may have in my work* (Mean_{Pre} = 4.62; Mean_{Post} = 4.94); *Academic staff take an interest in my progress* (Mean_{Pre} = 4.47; Mean_{Post} = 4.74); *Teaching staff usually give helpful feedback on my progress* (Mean_{Pre} = 4.80; Mean_{Post} = 5.12); and *Staff are usually available to discuss my work* (Mean_{Pre} = 5.19; Mean_{Post} = 5.49); On all the items, the post gamification group had a higher mean score for all questions.

On the variable *social engagement with peers*, the results indicate NO significant difference between the two groups, the pre-gamification (M = 31.82, SD = 9.53) and post-gamification group (M = 33.09, SD = 10.41), [t (632) = -1.574, $p = .116$, $d = 9.87$]. The 95% confidence interval of the difference between means ranged from [-2.86196 to -.31506] and did not indicate a difference between the means of the sample. The results show that there was significant difference in the means between the groups on only one item. This question was: *I am involved in university extracurricular activities* (Mean_{Pre} = 2.84; Mean_{Post} = 3.25).

Lastly, on the variable *affective engagement*, the results indicate NO significant difference between the two groups, the pre-gamification (M = 18.40, SD = 5.52) and post-gamification group (M = 18.79, SD = 5.37), [t (632) = -.898, $p = .369$, $d = 5.287$]. The 95% confidence interval of the difference between means ranged from [-1.23646 to -.46024] and did not indicate a difference between the means of the sample.

Thematic analysis of student reflections provided insight into the impact of gamification on various aspects of engagement. The results are categorised into academic engagement, cognitive engagement, social engagement, and affective engagement, aligning with the literature findings.

Students reflected positively on the impact of gamification on their academic engagement. They noted the use of the points and leaderboards motivated them to attend classes regularly, complete the assignments and participate actively in learning activities. One group noted, *"Competition and rewards... were helpful in motivating and boosting our engagements and efforts... the marshmallow challenge utilised the healthy competition system... These rewards and competitiveness provide a sense of achievement and incentivize continued participation (T8 G1)."* This aligns with research indicating that gamification elements competition can increase motivation and engagement in academic settings (Zhoc et al. 2019; Seaborn and Fels 2015).

Cognitive engagement involves the investment in learning tasks that require higher order thinking. Participants reported that gamification facilitated active learning and critical thinking - *"Gamification places learners in active scenario-based roles, forcing them to apply, adapt, and critically appraise academic principles in context. This active participation promotes a deeper, more layered understanding (T11 G4)."* This supports the notion that gamification requires students to use higher order thinking skills (Sanchez et al. 2020; Ding et al. 2018).

Gamification also enhances engagement with the teacher. One team remarked, *"The gamification elements allowed for more dynamic interactions with our instructor, who provided immediate feedback and recognition... This made the learning process more engaging but also helped build a stronger student-teacher relationship (T3 G2)."* This highlights the role of gamification in creating a supportive learning environment, where teachers actively engage with students, give timely feedback and foster an interactive classroom (Seaborn and Fels 2015).

The importance of teamwork and collaboration was a recurring theme. One group reflected, *"Through teamwork, the gamification activities allowed us to actively see where we failed or succeeded in our use of collaboration and communication (T3 G5)",* evidencing gamification fostering social engagement between peers while competition pushed students to do better (Raju et al. 2021; Bouchrika et al. 2021). A group notes, *"When individuals are pitted against each other in a friendly contest... this competitive edge fosters a heightened level of engagement as participants strive to outperform one another (T5 G2)."*

Participants expressed that gamification improved affective engagement and made learning enjoyable and less stressful. One group pointed, *"The inherent enjoyment of gamified activities motivated us to invest time and effort in mastering managerial communication concepts (T3 G6)."* The gamified elements of the activities led to increased enjoyment and learning (Ding et al. 2018; Seaborn and Fels 2015).

The analysis of the GAMEFULQUEST also yielded significant results across all seven dimensions.

Table 2: Comparison of pre- and post-gamification on gameful experience variables

Variables	Levene's F	Sig.	t-test	df	p	Cohen's D
Accomplishment	.515	.473	-4.574	619	.001	8.44
Challenge	.004	.950	-4.555	615	.001	8.95
Competition	16.721	.001	-11.129	613	.001	9.24
Guided	.555	.457	-3.998	606	.001	7.50
Immersion	.832	.362	-7.810	604	.001	11.05
Playfulness	.159	.691	-8.135	604	.001	10.62
Social experience	.595	.441	-5.463	606	.001	8.32

Referring to the variable *accomplishment*, the results indicate significant difference between the two groups, the pre-gamification (M = 39.77, SD = 8.75) and post-gamification group (M = 42.96, SD = 7.91), [t (619) = -4.574, $p = .001$, d = 8.44]. The 95% confidence interval of the difference between means ranged from [-4.55257 to -1.81770] and did indicate a difference between the means of the sample. The results show that there was significant difference in the means between the groups on all eight items.

On the variable *challenge*, the results indicate significant difference between the two groups, the pre-gamification (M = 36.78, SD = 9.01) and post-gamification group (M = 40.16, SD = 8.85), [t (615) = -4.555, $p = .001$, d = 8.95]. The 95% confidence interval of the difference between means ranged from [-4.83270 to -1.92272] and did indicate a difference between the means of the sample. The results show that there was significant difference in the means between the groups on all eight items.

On the variable *competition*, the results indicate a significant difference between the two groups, the pre-gamification (M = 28.95, SD = 10.06) and post-gamification group (M = 37.55, SD = 7.68), [t (613) = -11.129, $p = .001$, d = 9.24]. The 95% confidence interval of the difference between means ranged from [-10.06137 to -7.04307] and did indicate a difference between the means of the sample. The results show that there was significant difference in the means between the groups on all items.

On the variable *guided*, the results indicate significant difference between the two groups, the pre-gamification (M = 33.90, SD = 7.54) and post-gamification group (M = 36.40, SD = 7.44), [t (606) = -3.998, $p = .001$, d = 7.50]. The 95% confidence interval of the difference between means ranged from [-3.72886 to -1.27242] and did indicate a difference between the means of the sample. The results show that there was significant difference in the means between the groups on all items.

Furthermore, on the variable *immersion*, the results indicate significant difference between the two groups, the pre-gamification (M = 35.43, SD = 10.99) and post-gamification group (M = 42.66, SD = 11.14), [t (604) = -7.810, $p = .001$, d = 11.05]. The 95% confidence interval of the difference between means ranged from [-9.04552 to -5.41041] and did indicate a difference between the means of the sample. The results show that there was significant difference in the means between the groups on all items.

Furthermore, on the variable *playfulness*, the results indicate significant difference between the two groups, the pre-gamification (M = 36.29, SD = 10.67) and post-gamification group (M = 43.53, SD = 10.53), [t (604) = -8.135, $p = .001$, d = 10.62]. The 95% confidence interval of the difference between means ranged from [-8.98369 to -5.48953] and did indicate a difference between the means of the sample. The results show that there was significant difference in the means between the groups on all items.

Lastly, on the variable *social experience*, the results indicate significant difference between the two groups, the pre-gamification (M = 37.95, SD = 8.33) and post-gamification group (M = 41.74, SD = 8.31), [t (606) = -5.463, $p = .001$, d = 8.32]. The 95% confidence interval of the difference between means ranged from [-5.14850 to -2.42571] and did indicate a difference between the means of the sample. The results show that there was significant difference in the means between the groups on all items.

Table 3: Comparison of pre- and post-gamification on motivation variable

Variables	Levene's F	Sig.	t-test	df	p	Cohen's D
Motivation	.827	.364	-7.172	581	.001	14.86

Referring to table 3, on the variable *motivation*, the results indicate significant difference between the two groups, the pre-gamification (M = 42.72, SD = 9.07) and post-gamification group (M = 48.41, SD = 8.99), [t (595) = -7.504, $p = .001$, $d = 9.04$]. The 95% confidence interval of the difference between means ranged from [-7.18483 to -4.20399] and did indicate a difference between the means of the sample.

Table 4: Comparison of pre- and post-gamification on motivation items

Item	Levene's F	Sig.	t-test	df	p	Cohen's D
In general, I have enjoyed the activities	.006	.940	-6.512	607	<.001	1.185
I would repeat these types of activities	3.927	.048	-7.320	606	<.001	1.293
I have felt motivated	.260	.610	-6.063	606	<.001	1.299
I improved my knowledge of the subject	3.297	.070	-2.695	601	<.001	1.098
My interest in the subject has increased	.151	.697	-5.721	604	<.001	1.280
This activity format has been appropriate to check my knowledge of the subject	3.532	.061	-3.801	598	<.001	1.119
Helped me identify my weaknesses in the subject	4.884	.027	-4.013	597	<.001	1.131
It helped me understand the content of the subject	1.323	.251	-4.820	596	<.001	1.106
With these types of activities, I learn more than in traditional classes	.245	.621	-6.430	596	<.001	1.175
I feel like I was able to connect with my teammates to learn	1.415	.235	-4.407	597	<.001	1.194
I learned from my classmates during the activity	.341	.559	-4.953	598	<.001	1.209
I found the game elements fun	1.187	.276	-6.762	604	<.001	1.174
The game elements have motivated me to carry out the activity	.785	.376	-5.115	604	<.001	1.237
While doing the activities, I was not aware of what was happening around me	.072	.789	-6.638	604	<.001	1.403
I felt capable of carrying out the proposed activities	2.715	.100	-5.063	602	<.001	1.120
I found the activities comforting and valuable to me	.001	.981	-5.236	603	<.001	1.220

Table 4 presents the 16 items in the motivation instrument. On all items, there was a significant difference between the pre- and post-gamification groups with the mean being significantly higher in the post-gamification group. The results show a significant positive impact of gamification on student motivation across all 16 items measured. In all items, from enjoyment of activities to perceived learning outcomes, the post-gamification group reported significantly higher scores compared to the pre-gamification group.

Table 5: Comparison of quiz results across the 10 weeks (gamification in weeks 5 – 8)

Quiz & week number	Completed	Mean score (%)	Std Dev (%)	Skewness	Kurtosis
Quiz 3	218	78	13	-0.53	0.15
Quiz 4	211	77	15	-0.34	-0.52

Quiz & week number	Completed	Mean score (%)	Std Dev (%)	Skewness	Kurtosis
Quiz 5	189	84	13	-0.97	1.34
Quiz 6	220	83	18	-0.35	-0.37
Quiz 7	219	81	15	-1.13	2.01
Quiz 8	205	84	13	-0.67	-0.04
Quiz 9	198	83	15	-0.94	0.54
Quiz 10	177	83	16	-1.09	0.92
Quiz 11	176	86	15	-1.62	4.20
Quiz 12	164	85	15	-1.43	2.72

Referring to table 5 above, the data shows a noticeable improvement in quiz performance during and after the gamification period (weeks 5-8). The average quiz scores increased from around 77-78% in weeks 3-4 to 81-84% during the gamified weeks (5-8). This improved performance was maintained in subsequent weeks, with scores remaining in the 83-86% range. Additionally, there was a general increase in the number of students completing the quizzes during the gamified period.

5. Conclusion

This study provides compelling evidence for the positive impact of gamification on student engagement, motivation, and academic performance in higher education. By implementing gamified elements such as competition, rewards, and interactive challenges in a managerial communication course, we observed significant improvements across multiple dimensions of student engagement and motivation.

Our findings reveal that gamification particularly enhanced cognitive engagement and social engagement with teachers. Students reported higher levels of intellectual satisfaction, enjoyment of challenges, and motivation to study. They also felt more understood and supported by their instructors. While academic engagement and social engagement with peers did not show significant changes, the overall impact on the learning experience was notably positive. The study's results on gameful experience and motivation were especially striking, with significant improvements across all measured dimensions. Students reported higher levels of accomplishment, challenge, competition, guidance, immersion, playfulness, and social experience after the gamification intervention. This comprehensive improvement in the learning experience translated into better academic performance, as evidenced by the increased quiz scores during and after the gamified period.

These findings have important implications for educational practice. They suggest that carefully designed gamification strategies can create a more engaging, motivating, and effective learning environment. By tapping into students' intrinsic motivation and fostering a sense of achievement and social connection, gamification can potentially address issues of student disengagement in traditional educational settings. However, it's important to note that while gamification showed clear benefits, its implementation should be thoughtful and aligned with learning objectives. The lack of significant change in some areas, such as academic engagement, indicates that gamification is not a panacea and should be part of a broader, well-rounded educational strategy. Future research could explore the long-term effects of gamification on academic performance and engagement, as well as investigate how different types of gamified elements impact various aspects of the learning experience. Additionally, studies across different disciplines and educational levels could provide insights into the broader applicability of these findings.

In conclusion, this study adds to the growing body of evidence supporting the use of gamification in education. It demonstrates that when implemented effectively, gamification can significantly enhance student engagement, motivation, and learning outcomes, paving the way for more innovative and student-centred approaches in higher education.

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Contextualising the South African Higher Education Academic Interventions for Student Success: Challenges and Opportunities

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Abstract: South African Higher Education Institutions (HEIs) are increasingly feeling the pressure to produce graduates that contribute towards economic transformation, and sustainability through skills necessary to address the challenges of the Fifth Industrial Revolution (5IR). However, the rate of academic failures and high dropouts in South African Universities has been alarming. This study contextualized the South African HEIs' Academic Interventions to uncover the challenges and opportunities HEIs face in their quest to advance student success throughout their academic and early professional career. To aid the study's investigation on the institutional practices that inform the forms of academic interventions for Student Success, in South African Universities, this study's main research question focuses on uncovering how the student success interventions conceptualisation within the context of the South African system of Higher Education are carried out. The objectives of the are multifaceted. Firstly, the study investigates how academic interventions address the challenges leading to the high drop-out rate in Higher Education Institutions. Secondly, the study employs a narrative literature review to uncover the challenges and opportunities to mitigate possible risks affecting the advancement of conducive and equitable prospects for effective student success interventions. Finally, the study contributes to the ongoing discourse on student success interventions in relation to the South African 1997 White Paper on Higher Education Transformation, which indicates an improved access to HEIs. However, this study's findings uncover a deficit in interventions that mitigate drop-out rates. The paper argues for an enhanced collaboration to strengthen institutional best practices as a fundamental step to transform challenges into opportunities when responding to student success interventions, in South African HEIs.

Keywords: Academic interventions, Fifth industrial revolution, Narrative literature review, Student success, South Africa, Higher education institutions, Platformisation

1. Introduction

South African Higher Education Institutions (HEIs) are increasingly feeling the pressure to produce graduates that contribute towards economic transformation, and sustainability through skills necessary to address the challenges of the Fifth Industrial Revolution (5IR). However, the rate of academic failures and high dropouts in South African Universities has been alarming, with a scale of "between 50-60% of first-year students dropping out" (Dyomfana, 2022). African Universities, particularly in South Africa, have been affected by socio-economic and technological divide resulting from historical disadvantages. However, platformisation challenges associated with preparedness in Higher Education did not solely affect African Higher Education Institutions (HEIs). It becomes imperative to examine institutional practices and academic intervention strategies that foster student success. To better understand and conceptualise the intervention practices in South African Universities, this paper contextualises student success and provides an insight into the existing challenges and possible opportunities to redress the uncovered weaknesses

A narrative literature review (NLR) conceptualises academic intervention practices used in South African HEIs. The objective is to synthesize the current data on how academic interventions address the challenges that lead to higher dropout rates in HEIs in South Africa. A NLR provides an overview of the status quo (Kraus, Breier, & Dasírodríguez, 2020), while addressing distinct "research questions and methodologies" (Pautasso, 2019:303). The research questions investigate the following: 1) how are the student success interventions conceptualised within the South African context and 2) how are academic interventions carried out?

The descriptive analysis in this study will classify and categorise the primary themes covered in educational journals. This analysis provides valuable insights into the South African HEIs' parameters. Thereafter, a conceptualisation of academic intervention practices and analysis of institutional strategies of South African HEIs enables the study to draw conclusions and recommendations.

2. Literature Review

2.1 Student Success Interventions Within South African Context

Student success intervention as defined by the Department of Higher Education and Training (DHET) in South Africa, uses the enrolment versus completion rates as the key measurement of student success (*Annual Report 2022/23*, 2023). The 1997 White Paper on Higher Education Transformation (Department of Education, 1997)

alludes to the correlation between access to education and success amongst students in HEIs. HEIs within South African context are guided by the DHET. The HEIs comprise technical institutions known as Technikons or Universities of Technology, comprehensive Universities with blended educational programmes, traditional Universities offering degrees as well as a wide range of private institutions operating under the auspices of the South African Council on Higher Education (CHE), (South Africa Education, 2024).

To transform the education system in South Africa, the democratic government adopted the White Paper (Department of Education, 1997). The South African White Paper stresses the need to expand student accessibility in the HEIs, particularly amongst previously disadvantaged members of society. Inclusive accessibility in HEIs improves student success rates equitably when no member of society is excluded from the processes of academic development. The White Paper further stresses the need for “equity of access” and “equity of outcomes” as core principles supporting educational practices in South African HEIs institutions (Lewin and Mawoyo, 2014:29). In South African institutions, these efforts often move beyond addressing individual academic failure and focus on systemic institutional factors that contribute to student struggles.

Having conceptualised the genesis of South African educational prerogatives and the inclusive educational policy implementation evidence suggests that equitable access to education alone is not adequate to advance student success. An increased need to match national educational policies with the resources required to respond to the challenges posed by growing technological advancements strengthens student success interventions (Moloi & Salawu, 2022).

Equitable accessibility to HEIs not only addresses the incompatibilities created by the racialised education provision of the apartheid era but also advances a more balanced educational and progressive environment. Until pre-democratic South Africa, the number of African students in HEIs was minimal due to the repressive legacies of the apartheid (Sims, Govender, Lundie and Titus, 2024).

Despite having made many positive changes in terms of student accessibility to HE, it remains fundamental for the practitioners in the HEIs to “critically reflect upon and consistently review the assumptions, content, delivery and appropriateness of student development programmes, support structures, services and initiatives” adopted as measures that advance student success (Madiba, 2014:vi). One of the challenges to student success is the insufficient use of experiential learning in the classrooms. Students have shown great concern about this barrier which affects their preparedness and success in assessments (Moodley, 2022:120). This study argues for a consistent critical reflection and re-evaluation of the content delivery and support structure amongst other earlier mentioned teaching and learning (T&L) processes.

The conceptualisation of “student success” is a complex phenomenon. It should involve strategies beyond the low pass rate HEIs experience. For instance, HEIs beyond South Africa such as US Colleges still use the low rate of 34% to define student success and guide staff in contributing towards a strategic plan of action (Wheeler, 2023). This paper argues that student success requires more than merely assessing graduation rates. Student success interventions must also include academic interventions that impact the overall academic success such as technology literacy, independent learning, and the ability to conceptualise, critique and reflect on academic material (Machika and Johnson, 2016; “Top three strategies for student success,” 2024; Wheeler, 2023). Student success does not solely entail the advancement of basic academic skills. It requires a comprehensive set of activities aligned with structural and educational goals to ensure that students attain an overall academic success experience (Nel, 2014).

2.2 Practical Academic Success Interventions

Advancements in information technology gave rise to platformised education. This in turn, exposed some underlying challenges in African HEIs. Regardless of students’ “socio-economic backgrounds,” students still have to rapidly adapt to technological changes in teaching and learning activities (van Staden and Naidoo, 2022:271). In the height of COVID-19 mobility restrictions, HEIs across South Africa adopted over 50 technological platforms that supported students’ academic activities including Learning Management Systems (LMS) as critical and practical educational tools (Moloi & Salawu, 2022:11-12). Some private HEIs such as the Independent Institute of Education (IIE) adopt a collaborative approach by engaging with “leading scientific and technology research, development and implementation organisations in Africa” such as the Council of Scientific and Industrial Research (CSIR), to continue to make use of cutting-edge technology, and to support student academic success (CSIR, 2023).

The speed through which platformisation became a norm, exposed challenges associated with preparedness in many HE. These challenges did not solely affect African HEIs. For instance, the transition to blended teaching

and learning also impacted HEIs European countries, the United Kingdom, as well as countries in South Pacific Ocean such as New Zealand (Peterson *et al.*, 2023). Despite progressive strides in institutional transformation processes, the shift from face-to-face interaction to virtual education has not been achieved without challenges. The radical “platformisation” required extensive use of digital platforms for teaching and learning and remains a norm to continue to support students’ distinct needs in post-Covid 19 crisis (Lange, 2022). Some students can succeed academically without physical student-lecturer contact but others feel alienated when they do not receive sufficient “individual attention from their lecturers” (Moodley, 2022:118). The adaptation to online and blended learning approaches continues to be a challenge throughout student’s HE experience (Machika and Johnson, 2016; Manik, 2017; van Staden and Naidoo, 2022).

Despite the existing challenges, this transition creates opportunities for HEIs to effectively tap into technology innovative practices. However, the rapid transition left many, students ill-equipped due to either a lack of technological skills or direct support to remotely navigate virtual teaching and learning systems (van Staden and Naidoo, 2022). In essence, the transformation aimed to redress not only the social inequalities of the past in terms of the inequitable racial representation, curriculum practices and student support mechanisms but also an accelerated preparedness for remote and blended education (van Staden and Naidoo, 2022).

Academic interventions are critical teaching and learning practices adopted in most HEIs, including those in South Africa. The primary goal of academic interventions is to support at-risk students and improve their chances of success in their academic careers (Lewin and Mawoyo, 2014). Most academic interventions in South African institutions do not necessarily focus on discourses surrounding student academic failure but rather channel the support to systemic institutional aspects that often influence failure in students. Thus, becoming instrumental to ensure that operational systems are student-centred, and that the HEIs support students’ welfare as well as development reflected in the teaching and learning activities. When the institutional operational systems are adequately designed in such a way that inclusiveness and support are accessible to all students, the expectation is an enhanced students’ success. It is critical to take into consideration the “sensitivity to, and understanding of, the complexities that learners face” stemming from pervasive socio-economic inequalities (Social Surveys, 2023).

One of the major steps for educational inclusion has been the promotion of educational policies, in line with the Salamanca Statement adopted globally by the United Nations Educational, Scientific and Cultural Organization (UNESCO), (UNESCO, 2024). Having international backing on the educational processes prevents South African HEIs from perpetuating and somewhat re-creating societal inequalities. South African HEIs have a mandate to, not only find solutions to problems in society, but also to “positively impact lives” across the globe through their educational curriculum and student support programmes (Madiba, 2014 and IIE MSA 2022).

Strategic interventions for student success are critical to limit the “success gaps” in HEIs (Perna and Thomas, 2008:2). Globally, student success intervention programmes primarily target first-year students (Gore, 2020; Manik, 2017; Nel, 2014; Peterson *et al.*, 2023). Van Staden and Naidoo (2022) argue that first-year entrants often struggle to adjust to the transformational academic transition from high school to an institution of Higher Learning for several reasons. In the post-Covid-19 era, these challenges are compounded by psychological and technological changes which require constant reassessment of its responses.

3. Methodology

This study adopts the NLR as a qualitative method of data analysis. It examines student success parameters within the context of South African HEIs employing a content analysis. The analysis data collected is drawn from peer reviewed secondary sources viz: international and national academic journals, study-area citations and publications from relevant surveys and peer-reviewed articles. The data evaluation determined how effective student success interventions have been and the factors limiting the achievement of student success.

The scope of the study encompasses the post-COVID-19 era between 2019-2024. The study deliberates on the identified challenges and opportunities of academic interventions and the impact on student success, in South Africa. Thus, uncovering best practices, making suggestions, and providing directions for further study.

4. Discussion

Substantial accessibility improvements can be noted in South African Universities previously plagued by the legacies of racial exclusion. However, the outcomes of the institutional development remain “skewed by race” with low changes in academic career demographics (Lewin, 2024). In South Africa, the overall number of students enrolled in South African universities by 1994 was 495 356 (Lewin and Mawoyo, 2014:23). By 2024,

the number of students of African origin, in South African HEIs has almost tripled. Over “1.3 million students in public and private HEIs (more than 80% in public universities)”, have been recorded in the past 30 years (Lewin, 2024). This means that student enrolment numbers have improved substantially in the South African HEIs despite the prevailing challenges in HEIs. However, this does not mean that student success priorities have been fully addressed.

The need for policy reforms in South Africa public universities became especially urgent the mass student protests such as the #feesmustfall movement (Griffiths, 2019; Ntombana, Gwala and Sibanda, 2023). The #feesmustfall protests which brought public universities to a stand-still across the country, in October 2015, were driven by the students’ needs for “economic emancipation” as well as the “epistemic decolonisation of the university” (Griffiths, 2019:2). The #feesmustfall protests brought to light the causal effects that slow paced governance responses to vital “structural and systemic inequalities” in South African institutions of HE (Ntombana, Gwala and Sibanda, 2023:1). The protests in HEIs underscored that equitable access alone is insufficient, without addressing the intertwined issues of affordability and curriculum relevance, student success will remain elusive.

To create the conditions necessary for academic success, it is fundamental for HEIs and policymakers to consider the relationship between access, affordability and curriculum innovation. As South Africa enters the era of the Fourth and Fifth Industrial Revolutions, the integration of new technologies, particularly artificial intelligence (AI) and robotics, demands that HEIs upskill their students to remain competitive and responsive to the evolving demands of the global workforce (IIE World of Work, 2023; Noble, Mende, Grewal and Parasuraman, 2022:199). As the 5IR, defines the convergence of human-centred approaches with technological advances, it is increasingly crucial to understand the nuances involved in identifying and implementing strategic interventions that yield student success, in HEIs.

Firstly, the psychological impact of the lockdown influenced both individual and institutional changes. As the rest of the world accelerated a blended T&L method, in 2020 academic year, so did most of South African HEIs. Greater support for accessibility and up-skilling on the use of virtual discussion and training expanded, particularly for undergraduate students (Lange, 2022). Secondly, given the drastic and somewhat unplanned changes brought by the Covid-19 pandemic the South African HEIs underwent significant transformation necessary for enhancing students’ ability to align with global competitiveness and development.

In this context, student expectations have grown. They expect the HEIs to prepare them for future workplace skills ensuring their well-being, a sense of belonging, flexibility and collaboration in student support intervention programmes (Peterson et al., 2023). However, when students fail to change shared knowledge and services into opportunities to succeed, the role of HEIs becomes questionable (Gore, 2020; Nel, 2014). The need for the empowerment of students and campus members to navigate the complexities of HEIs and seize the opportunities for student success is inevitable (Tirogabone and Strydom, 2021).

Collecting and Analysis of Information as a Student Success Intervention Strategy

Effective student success interventions in HEIs begin with the collection and analysis of data of predominantly at-risk students. The implementation of accurate interventions close teaching and learning gaps, thereby improving graduation rates and reducing attrition (Wheeler, 2023).

Dake and Buabeng-Andoh, (2022) argue that the use of patterns to predict learners' need for additional support reduce attrition. Their empirical study underlines that student success intervention programmes should address the entire academic journey, not only the first academic year. Data drawn through use of technological innovations such as Education Data Mining (EDM) underlines the significance of 4IR tools (Kayembe and Nel, 2019). Since the 4IR harnessed an environment of unlimited information through its powerful technological evolution, the EDM has become a useful in early alert systems. It not only activates student support interventions, but it also serves as an early alert strategy which can be implemented within the first four to eight weeks of a semester (Manik, 2017). It further provides the foundation that facilitates student intervention to increase student success through patterns that predict academic performances, the learning behaviour and the learning assistance requirements of students (Dake and Buabeng-Andoh, 2022; du Plessis et al., 2022).

Despite the systemic inequality, ill-preparedness of administrative and human resources and the lack of readiness for the 4IR in South African HEIs, the global changes that affect most HEIs create opportunities for building resilience, upskilling, collaboration, partnership and adaptive processes that support students’ academic success, specifically within a crisis situation, such as the pandemic era that changed society (du Plessis et al., 2022; Kayembe and Nel, 2019).

Technological revolutions often introduce new technologies that reorganises industries and foster a convergence of humanity and technology. As skills transformation experts put it, “the 5IR is a natural evolution of the 4IR, [but] putting more emphasis on the human aspect, sustainability, resilience and agility” (Sawahel, 2021). Hence, it is increasingly fundamental to prepare students’ skills set and support them academically to contribute positively to economic future and scientific collaborations.

Bridging Programmes as a Student Success Intervention Strategy

During early 2000s, the bridging or foundation programmes were introduced to eradicate educational disadvantages and deficits in student learning practices in HEIs (Manik, 2017). Factors such as language proficiency, the limited social and educational cultural capacity of parental support, and the lack of formal career guidance are major factors contributing to the student’s ability to graduate successfully, (Thomas and Maree, 2022).

Collaborative Programmes as a Student Success Intervention Strategy

Supplementary academic support programmes focus on specific modules identified as “high risk” due to low pass rates. Risky modules are supported through supplemental instructions and tutorial sessions in addition to the formal lectures (Manik, 2017). Students’ ability to adjust within the academic and social setting of the HEIs, manage the workload, adapt to teaching and learning methods. Students seek support is through intrinsic motivation and preparedness to adjust to change (Thomas and Maree, 2022). Peer learning, with master students leading content clarification encourages student participation and meaningful collaborative learning. Supplemental and tutorial sessions should not be limited to students at risk of failing but should provide continuously to support all students from admission to graduation (Manik, 2017).

Writing Centre Programmes as a Student Success Intervention Strategy

The Writing Centre support programme is a widely implemented student support strategy focusing on the academic needs of students. It provides valuable feedback and guidance during the preparation and crafting of draft assignments before submission. Time management and the ability to seek assistance are also critical measures for student success (Thomas and Maree, 2022) Writing Centres create platforms for dialogue between the writing expert and the student in contrast to formative authoritative comments during the assessment process (Manik, 2017). However, it is experienced that students often underutilise this programme in practice.

Monitoring and Mentoring Programmes as a Student Success Intervention Strategy

Student monitoring and mentorship involve multiple resources and intervention tasks. Monitoring student performance in attendance, tasks and formal assessments helps to identify poor performance to take effective remedial actions. For instance, interviews and referrals for academic counselling could be methods used to identify whether students require individual tutoring with qualified discipline tutor (Manik, 2017). This intervention enables teaching and learning inclusion, academic support, performance improvement indicators including pass and completion rates. (Peterson et al., 2023).

The mentorship programme aims to provide transition support from high school to HE by assigning small groups of first-year students to senior students as peer supporters (Manik, 2017). Mentor-mentee engagement provides a holistic and responsive network to collaborate, empower and support students through academic advising strategies (Tiroyabone and Strydom, 2021).

Early Academic Intervention Strategies for Student Success

A HEIs within the Cape province uses mark trackers, learner management system (LMS) activities, lecturer questionnaires and student interviews to apply a coherent response to early academic intervention (Manik, 2017). The capturing of data on LMS assists in coordinating student intervention strategies supported by evidence-based and systemic intervention implementation processes (Tiroyabone and Strydom, 2021). Despite the high cost, the effectiveness of LMS data lies in its ability to proactively support early academic intervention programmes (Manik, 2017).

5. Analytical Findings: Challenges and Opportunities for Student Success

There are several challenges and opportunities to the advancement of student success which need to be addressed, identified as follows:

Opportunities:

Adaptability to sudden changes coupled with growth mindset approaches create conditions for operational discussions within the HE system. When HEIs adopt interventions that are constructive in nature, and reflected in progressive feedback, creates opportunities for societal change, promotion of equity and enhancement of innovative support structures for well-being (Peterson et al., 2023). Although the sudden shift to online learning affected by the COVID-19 changes altered social norms, increased awareness and continuous practice of mental health well-being guidelines in work-life balance creates an encouraging educational environment (du Plessis et al., 2022; Peterson et al., 2023).

Additionally, cross-sectoral learning enhances students understanding of field specialisation that influence the political, and the nature of social life. Thus, leading to tailored learning such as development of basic technology skills to increase student success in any given field (Kayembe and Nel, 2019). While it is critical for HEIs to shape institutional academic interventions, it is equally important to involve students in designing academic interventions to foster accountability, ownership and to advance a participatory approach. Apart from promoting a growing mindset, a participatory approach unleashes inclusion as a student support strategy. A strategy that gives opportunities for HEIs to include traditional and culturally inherited practices and knowledge within curriculum (Manik, 2017, and Peterson et al., 2023).

Learning from others creates an intentional approach to improve structured interventions that meet students' needs and contextualise support within the academic process. Such approach provides support and activities students require through a coordinated support service point (Tiroyabone and Strydom, 2021). However, several challenges remain.

Challenges:

HEIs lack of documented reintegration strategies for staff component returning to work, after a critical life-changing interruption such loss of a significant parent in providing emotional and social support (du Plessis et al., 2022). A real-time intervention remains wanting and affects the effectiveness of any risk-mitigation strategy appropriate to address each student's academic success needs. Given the narrow definition of student success, the quality measuring, performance indicators and educational outcomes are equally challenging to conceptualise, let alone operationalise within HE space (Kayembe and Nel, 2019). Student success is still perceived as a linear process of access, progress, completion of qualification and graduation. This perception, overlooks the need to accommodate the complexities of students' lives, including exit from HE environment and return due to various obligations (Peterson et al., 2023).

The absence of a shared definition of student success aligned with broad institutional transformation leads to misconception, miscommunication and lack of efforts to upskill and reskill lecturers and institutional staff (Wheeler, 2023). Student success is a holistic effort and includes students' commitment and positive attitude towards academic outcomes, not solely institutional efforts (Manik, 2017). Various stakeholders play instrumental roles in student success interventions, including the HEIs that provide academic curriculum. Governments are responsible for drafting educational policies and practices. But the students are the major stakeholders, and their futures depend on sustainable and progressive educational environments are the major stakeholders (Ntombana, Gwala, and Sibanda, 2023). The shortages in human resource coupled by non-compliance to support requests of students needing support in most HEIs, pose a threat to the effective delivery of student success interventions.

6. Conclusion

Academic interventions are increasingly participatory, with students involved in shaping them to ensure relevance and effectiveness. This observation answers this study's research questions related to the design and implementation of academic interventions within the South African Higher Education system. Although the findings suggest that student support initiatives focus on encouraging a growth mindset, mental well-being, and culturally inclusive education to promote student success throughout their academic and early professional careers, there is still limited consensus on the definition of student success within South African HEIs. Given that the perception of student success focuses on linear academic progress, it also fails to account for the complexities of student lives. The lack of reintegration strategies within HEIs, specifically between the HE institutional faculties, and students remain one of the major barriers to the attainment of student success.

7. Recommendation

Arguably, to enhance student success, HEIs in South Africa must adopt a more inclusive and holistic definition of success that aligns with both institutional and societal goals. Student-led academic support initiatives should not

occur in silos but collectively. The prioritisation of cross-sectoral learning, the integration of African epistemologies in the curriculum should be given special attention. In addition to this, there is a need to streamline the institutional administrative processes. Integration strategies are also key to better support returning students. Additionally, a strengthened collaboration among stakeholders, including staff up-skilling, remains a priority to better address the evolving needs of students in HEIs. The study recommends a longitudinal study assessing the long-term impact of academic support initiatives. This approach will assist in tracking intervention outcomes beyond graduation and into early professional careers. Furthermore, accelerating the integration of African knowledge systems into the highly Eurocentric curricula could provide insights into the effects on student engagement, performance, and their well-being. Institutional collaborations create conditions to examine both local and international practices and determine lessons to mitigate challenges impacting students' success in South African HEIs. Moving beyond the traditional metrics of student success offers an opportunity to explore other aspects influencing student success such as employability and tact in the ethical use of technological tools such as AI.

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Challenges of Pedagogy in an ODeL Setting: [Making Magic out of Mayhem]

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Abstract: The teaching and learning environment has undergone substantial changes as a result of technological advancements. Educators at all levels constantly face the challenge of increasing students' interest. In response to students' exposure to technology and social trends, practices are changing. This presentation provides a case study of how technology can be used to improve the learning environment for engineering-based courses in higher education. The method includes integrating web application technologies to improve the learners' experience and delivering interactive materials via a virtual learning environment. There are phases in the pedagogy execution that demonstrate the development from the first event through the implementation of the materials, after which the module is evaluated and is improved even more in light of the qualitative assessment. Electronic surveys are used in the evaluation process to gather input on the distance learning module. Furthermore, there is oversight of how the students are using the resources. The first findings from a recent online course are presented as the presentation comes to a close. A qualitative research approach is adopted to explore and explain the challenges of pedagogy in an ODL setting.

Keywords: DE, Pedagogy, Technology, VLE, Student, ODL

1. Introduction

Due to its convenience, the Internet has become a necessary tool for managing the day-to-day aspects of our lives. Because of this, there is a need for more inventive, applications that are innovative and practical and that can help and uplift the digital generation. It is well known that teachers can make use of these cutting-edge resources to help bridge the gap between the classroom and learners (Benson, 2014), particularly for students who are enrolled off-campus or at distant locations.

Technology-enhanced learning (TEL) or e-learning are terms commonly used to describe the integration of technologies into educational settings (Hidayatno et al., 2019). This paper will outline a method for improving and delivering engineering-based courses to remote learners through the use of technology. The approach used in the creation of online educational resources, which is explained in Section 2 is a gradual and frequently time-consuming process. In Section 3, a selection of the produced and delivered materials is presented; in Section 4, conclusions are drawn.

It was decided early on in the development and implementation program that a protocol for fostering an e-learning culture among the University of South Africa's staff members in the School of Engineering, (SOE). As a result, the strategy that was going to be put into practice needed to be both practical and easily understood. The Plan-Do-Check-Act (PDCA) cycle was judged to be an appropriate method to use in light of these requirements. (Shewhart, 1986) created the PDCA cycle, which Deming popularized (Deming, 2018) when it was implemented as a quality control technique in Japan following World War II. The PDCA cycle, sometimes referred to as the Deming cycle or the Shewhart cycle, is depicted in Figure 1.

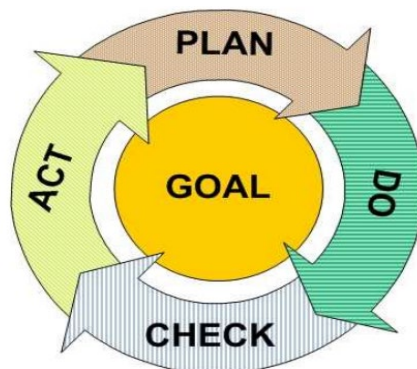
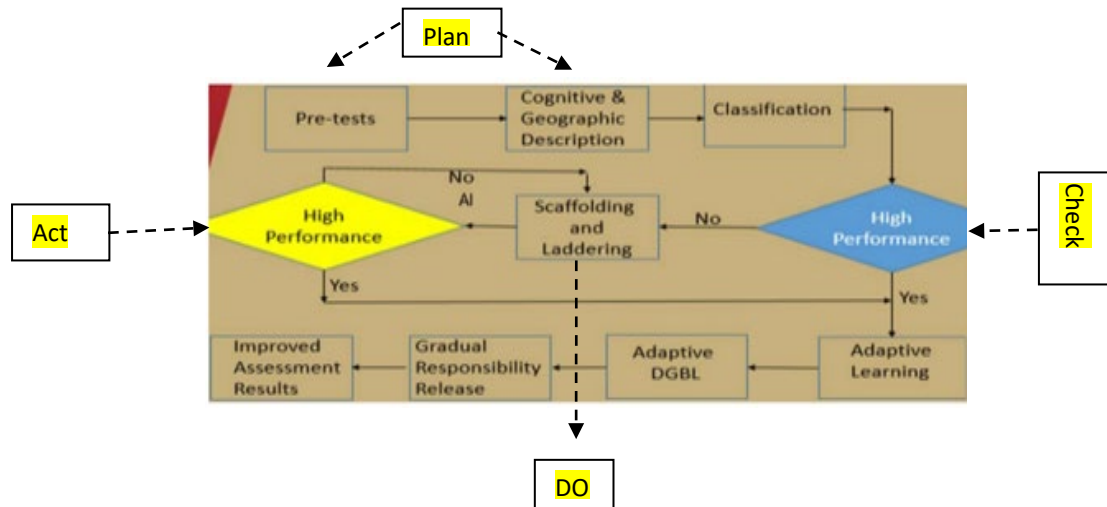


Figure 1: Plan-Do-Check-Act (PDCA) Cycle

The strategy was changed and modified for the e-learning development because of the way the school operates. The modified strategy, referred to as the teaching and learning mechanic, was kept mostly

unchanged from the PDCA cycle and is displayed in Figure 1. As can be seen, there are five primary stages to the Bradford methodology, which will be further discussed in Section 2.2.



The PDCA integrated Teaching Mechanic (Source: Author)

2. Literature Review

Engineering Education in the Context of Industry 4.0 is as Mogoş (2018) argues that the concept of Education 4.0 is based on symbiosis achieved among different role players in an educational eco-system, i.e., learners, teaching staff, administrative and managerial staff should strive to improve the practice in the education sector. A generic framework of Industry 4.0 engineering education was suggested as having main components related to curriculum, laboratory, and student club, with interdependences among these components by Navarro et al. (2023). Mian et al. (2020) developed a framework that evolved on the various factors that affect the planning and application of Industry 4.0 planning and applications for sustainable education in universities. The factors were, among others, employee willingness, learner understanding, infrastructural configuration, experts' availability, program of training, access to the internet, and partnership with industry.

Neaga (2019) argues that Education 4.0 is an expansion based on Industry 4.0 applied concepts and digitalization of higher education institutions and teaching and learning practices. Advancement of digital and/or online education supported by an Education 4.0 framework will facilitate the development of skills and develop graduates' competencies for modern-day industry based on Industry 4.0 principles. Education 4.0 is a transformation of education institutions and teaching and learning (T&L) methods depend on Industry 4.0 principles and digitalization. Developing skills and creating graduates' competencies for the current industry based on Industry 4.0 will be facilitated by the evolution of digital and virtual education accompanied by an Education 4.0 framework (Marzuki et al. 2022).

Mokhtar and Noordin (2019) propose a process of adaption to Industry 4.0 technology and digitisation in the educational process and argue that it is critical to emphasise teachers' competencies, as depicted in Figure 1. The conceptual model suggests that Industry 4.0 technologies greatly influence the teaching and learning environment. The Industry 4.0 teaching and learning environment is influenced by University administrators, lecturers and professors, and students. The teaching and learning environment are further influenced by industry expectations to prepare future-ready graduates that can meet industry requirements. Accreditation bodies influence teaching and learning environments by setting teaching and learning standards to which universities must adhere in the form of graduate attributes.

Hydayatno et al. (2019) developed a conceptual model based on the input–process–output where the input is interdependent variables, the process is the components and their interlinks in the system referred to as the Causal Loop Diagram (CLD), and the output is considered as output. These authors investigated the impact of Industry 4.0 on sustainable transition energy in developing countries. Rajab et al. [8] developed a causal loop of the Internet of Things and showed the relationships between the following factors individual, instructional, and structural factors. The use of big data and cloud computing was key to the implementation of IoT. From

the literature, it is apparent that CLDs have not been explored adequately in the context of technology and engineering education.

The proliferation of Open Distance and e-Learning (ODEL) has transformed the educational landscape, offering flexible learning opportunities and broader access to education (Andrade & Alden-Rivers, 2019). Despite these benefits, the implementation of ODeL presents unique pedagogical challenges. This literature review examines the challenges of pedagogy in an ODeL setting and explores how technology influences these problems and their potential solutions.

Isolation and Lack of Community: One significant challenge is the sense of isolation that students may experience, which can lead to disengagement and higher dropout rates (Simpson, 2018). Unlike traditional classrooms, ODeL environments often lack the immediate social interaction that fosters a sense of community. Success in ODeL requires a high degree of self-regulation and intrinsic motivation (Kizilcec, Pérez-Sanagustín, & Maldonado, 2017). Students must manage their time effectively and stay motivated without the structure of regular class meetings.

Timeliness and Effectiveness: Providing timely and effective feedback in an ODeL setting is challenging. Instructors may struggle to give personalized feedback promptly, which is crucial for student learning and improvement (Gikandi et al., 2011). Ensuring the authenticity and integrity of assessments in an online environment can be problematic. Issues such as plagiarism and cheating are more difficult to monitor and control (Nguyen, 2015).

2.1 Technical Skills and Access

Both students and instructors may lack the necessary digital literacy skills to effectively navigate ODeL platforms. This can hinder the learning process and the delivery of content (Lei & Gupta, 2010). Inequitable access to technology and the internet can exacerbate educational inequalities, as some students may not have reliable access to the necessary tools for ODeL (Mulenburg & Berge, 2005).

The use of interactive and adaptive learning technologies can enhance student engagement by providing personalized learning experiences (Johnson et al., 2016). Tools such as virtual labs, simulations, and gamified learning environments can make learning more engaging and interactive. **Social Media and Collaborative Tools:** Incorporating social media and collaborative tools can help build a sense of community among students. Platforms like discussion forums, group chats, and collaborative projects encourage interaction and peer support (Hrastinski, 2009).

Automated Assessment Tools: Technology can assist in providing timely feedback through automated assessment tools such as quizzes and tests that give instant feedback. Additionally, learning analytics can help instructors identify students who may need extra support (Ifenthaler, 2017). **Plagiarism Detection Software:** Tools like Turnitin can help ensure the authenticity of student work and reduce instances of plagiarism (Sutherland-Smith, 2010).

Digital Literacy Programs: Offering digital literacy programs for both students and instructors can bridge the skills gap and ensure that all participants can effectively use ODeL platforms (Fraillon et al., 2014). Efforts to provide equitable access to technology, such as lending programs for devices or subsidized internet access, can mitigate disparities and ensure all students can participate in ODeL (Van Deursen & Van Dijk, 2014).

The challenges of pedagogy in an ODeL setting are multifaceted (Tanyanyiwa & Madobi, 2021), encompassing issues of engagement, assessment, and access. Technology offers numerous solutions to these challenges, enhancing student engagement, improving assessment and feedback processes, and supporting the development of digital literacy. However, these solutions also require thoughtful implementation and ongoing evaluation to ensure they effectively address the underlying problems. Continued research and innovation in the use of technology in ODeL will be crucial for overcoming these pedagogical challenges and maximizing the potential of distance and e-learning environments.

3. Research Method

Qualitative case study methodology affords researchers opportunities to explore and explain a phenomenon within its context using a variety of data sources (Baxter & Jack, 2008). This approach ensures that the phenomenon under study is explored through a variety of lenses, which allows an in-depth understanding and multiple facets of the case under study to be revealed and understood (Baxter & Jack, 2008). The case study approach aligns with the goals of this research in that the focus of the study is to explore and explain the

challenges of Pedagogy in an ODeL Setting and how technology influences engineering pedagogy and it covers the contextual conditions in which the phenomenon (i.e., the impact of technology on industrial engineering pedagogy) under study occurs.

The unit of analysis (case) in this study is the current challenges of pedagogy in an ODeL Setting and how technology influences engineering pedagogy in the universities. This is a phenomenon occurring due to the impact of technology on industrial engineering pedagogy and is bound to the current impact of technology in the University of Technology setting. The attributes of this research satisfy the definition of a case as stipulated by Miles and Huberman (1994) and they are in line with Yin (2003), Stake (1995) and Miles and Huberman (1994) stipulations concerning setting boundaries for cases in a case study research approach (Baxter & Jack, 2008).

The research also appeals to boundaries stipulated by Creswell et al. (2003), those of time and place (Baxter & Jack, 2008). In line with the boundaries of the definition and context, and the research question (How technology affects engineering pedagogy?), the type of case study this research adopts aligns with explanatory and exploratory or descriptive case studies as categorized by Yin (Baxter & Jack, 2008).

This research will lead to the development of solutions or recommendations that will address the following propositions/ issues: (1) Current engineering education and tools are rooted in an epoch that is in itself outdated for today's needs, not to mention the future; and (2) Engineering curriculum for Universities cannot remain the same as it was for the past decades and not respond to the challenges of globalization and diversity; world culture and ethics and, provide a foundation necessary for the profession to remain competitive; and (3) The practice of engineering must be changed and this change can be accomplished through engineering education. Propositions and/or issues are necessary elements in case study research in that both lead and precede the development of a conceptual framework that guides the research (Baxter & Jack, 2008).

Baxter & Jack (2008) stipulate that a hallmark of case study research is the use of multiple data sources, a strategy that also enhances data credibility (Baxter & Jack, 2008). This case study will apply the following triangulation of data sources i) document analysis; ii) archival records and; iii) field notes. It is rational to apply document analysis in this research since it is often used in combination with other qualitative research methods as a means of triangulation. The combination of methods in the study of the same phenomenon enables a researcher to draw upon multiple sources of evidence and, to seek convergence and corroboration using different data sources (Bowen, 2015).

Rossman and Wilson (1985), in their study of evaluating regional education service agencies, designed document reviews to identify the mission of agencies as described in documents and reports (Bowen, 2015). Sogunro (1997) provided exemplary clarity concerning the use of document analysis, he reported that the use of document analysis provided information on the history, goals, objectives, and substantive content of the phenomenon under study (Bowen, 2015). Stake (1995) found that document analysis is particularly applicable in qualitative research for intensive studies producing rich descriptions of a single phenomenon (Bowen, 2015). Patton (2002) stipulates that field notes are rich, detailed descriptions, including the context within which the observations were made, and they consist of activities, behaviors, actions, conversations, interpersonal interactions, organizational or community processes, or any other aspect of documented human experience in the field (Patton, 2002).

The rationale for applying field notes is supported by Patton's (2002) reflections that field notes are applied in qualitative research to understand the true perspective of the subject being studied, and that they allow the researcher to access the subject and record what they observe in an unobtrusive and nonreactive manner. This research requires an in-depth understanding of the researcher's experiences and observations while participating in an intense and involved manner, thus field notes will be applied as data sources in this research. The decision to gather and analyze archival records is linked to the research propositions developed in the conceptual framework of this study.

The use of archival data is supported by the claim that archival data is an increasingly viable resource because an ever-greater amount of archival verbal and visual material has become universally available with the information proliferation attributes of the internet. Archival data comprises of wide array of empirical data created by researchers for their personal use or on behalf of an organization. Contents of an archive that is applicable in this research consist of various material (e.g., letters and diaries; weblogs and discussion list posting; press releases and reports; magazine articles and rating websites; etc.). Archival data will be used to

develop an understanding of the research context and where applicable to inform the development of concepts and theories.

An extensive archival document analyses research and a literature review relevant to research work completed in this area is conducted and information related to the research problem is gathered and analyzed. Students in a specific program were divided. Students in the program are grouped into two groups based on their preference for a teaching and learning (T&L) method. There are two distinct groups, i.e., a group that engages in technology-mediated learning through Unisa's LMS and a group that engages the print-based tutorial material. These two groups are formed without the student's knowledge and throughout the year they are not made aware that they are participating in a research project. The reason for this anonymity is to allow students flexibility to change from one mode to another and back to the first one, freely.

Therefore, their preference is captured untainted. In the 3rd quarter, both groups are requested to complete an e-learning assignment, which is not mandatory. The approach of data gathering is significantly exploratory and comparative and in the development of insight, the research employs comparative analysis of the results. Data collection tools and techniques are applied to each T&L method exclusively and the results are measured and compared to the results obtained when the approach is applied. This inclusive approach engages both the T&L methods. Analysis and comparison of the results in the two approaches lead to a validation of the apparent barriers of transitioning from print base method to electronic base engagement.

4. Discussion

4.1 Distance Learning to Bring About a "New Order" in the Teaching and Learning Environment

It is no longer necessary to use distance education techniques to bring people together at a specific location, either for training or the activity itself (with the dual goals of ensuring professionalization and reducing travel costs), it is no longer always a limitation. This methodology is appropriate for both initial and continuing training. Training schedules and training techniques are inextricably linked.

This well-known combination of theory-practice, scientific learning professional learning, and mutual contribution is typically completed by a succession of distinct periods without, in most cases, the emergence of measures that promote integration or the transfer of learned information. Not to mention how the assessment techniques employed in these situations had no counter-training effect).

The use of distance learning in teaching and learning preparation programs allows for consistency in the training process. Regardless of the time and place of the training, the student or trainee has access to resources, training support, and the opportunity to share ideas, experiences, and information with other trainees and students. Based on this, it will be possible to extend the training period without encountering any issues.

This brings us to the second benefit of distance learning for teaching and learning preparation: the development of real training networks that ensure innovation, system mobility, and training continuity. Most managers of educational policies concur that excellent teaching and learning preparation programs need to provide both a strong educational background and appropriate training for the position.

On the other hand, a strong professional foundation and engagement with research are prerequisites for a high level of University qualification. Beyond the question of whether the two approaches are intellectually compatible, there is also the matter of whether they are materially and chronologically feasible. Being in close intellectual proximity to a research group's discussions does not equate to conducting research itself.

Additionally, and this is a difficult task, the work of these networks can facilitate future students' acclimatization to working with others. Everyone there also stresses the need and duty to practice teaching and learning in a less isolated way, and significant advancements have been made in this domain. But there's still some work to be done.

We can assume that electronic communications will contribute to this reflective process and provide additional support to engineering students who are frequently confined within the walls of their establishment. Training that is part of long-term procedures, with more contracted periods (which enable the construction of job-related transposition forms), more interaction, and a greater range of references.

4.2 Challenges and why These Solutions Have not Worked

The case of this research is the high failure rate in STEM fields and undergraduate programs are being addressed by a number of efforts, however, their efficacy is hampered by major obstacles. In order to overcome these obstacles, a concentrated effort must be made to provide fair access, sufficient money, all-encompassing teacher support, and systemic adjustments to educational methods and regulations.

Inclusive and Equitable Access to STEM Education:

Digital platforms such as Lab-X-Change provide free online learning tools for collaboration amongst students, educators, scientists, and researchers, which is one example of how efforts are being made to make STEM education more accessible. By offering resources globally, particularly to underserved communities, this program helps close educational gaps (Penprase & Penprase, 2020).

Stem Focused High schools

High schools with a STEM concentration aim to improve students' preparedness for STEM-related higher education. To provide students with a solid STEM foundation from an early age, these institutions provide demanding STEM curricula and experiential learning opportunities (Means et al., 2017).

Teacher Support and Professional Development:

It's critical to provide teachers with financing and professional development opportunities. One way to help teachers better engage kids in STEM courses is by offering resources for biotechnology and robotics labs (Harvard Gazette).

Summer Programs and Extracurricular Activities:

High school students are exposed to STEM disciplines through summer programs conducted by colleges and universities, which are designed to maintain their interest and aspirations in pursuing STEM jobs. According to Kitchen, Sadler and Sonnert (2018), these programs provide immersive experiences that can increase students' interest in STEM disciplines.

STEM Integration in Basic Education:

The Next Generation Science Standards (NGSS) are one of the initiatives being taken to integrate STEM education into K–12 curricula. By encouraging inquiry-based learning and the development of critical thinking abilities, these standards seek to guarantee a comprehensive and consistent STEM education (National Research Council, 2013).

4.2.1 Challenges and Why These Solutions Have Not Worked

Unfair Access and Opportunity:

Notable differences still exist in spite of efforts to increase access. The lack of advanced STEM courses and resources for students from low-income, minority, and rural backgrounds sometimes restricts their preparation and chances in STEM careers. For instance, barely 20% of high school graduates are equipped for college-level STEM coursework, and less than half of American high schools provide computer science courses

Financial Restraints:

In order for many efforts to be successful, significant cash is generally required, but this funding is frequently insufficient. Public schools, especially those that serve underprivileged areas, have difficulty raising the funds required to carry out and sustain these initiatives (Whicker, 1999).

Teacher Preparation and Retention:

There is always a challenge in making sure that educators are adequately prepared to teach STEM courses. The continuity and caliber of teaching are disrupted by the high turnover rates among STEM teachers and the unavailability of professional development programs. The efficacy of STEM education programs is hampered by this lack of continuity and support (Whicker, 1999).

Systemic Problems in Education:

More entrenched systemic problems, like curricular restrictions and standardized testing, impede creative STEM education approaches. These problems restrict the flexibility required to put into practice inquiry-based and hands-on learning strategies, which are essential for successful STEM education. To remove these

obstacles and encourage a STEM learning environment that is more productive, systemic adjustments are needed (National Research Council, 2014).

Social and Cultural hurdles:

Stereotypes and a lack of role models in STEM professions are only two examples of the social and cultural hurdles that prevent some groups from pursuing STEM jobs. Due to cultural expectations and a dearth of visible representation in STEM fields, girls students of color may feel disinclined to fully engage with STEM courses, making these hurdles more important to them (SpringerLink, 2015).

Technology Enhanced Learning (TEL)

Current Pedagogy (in HE) has a low integration with teaching and learning strategies and faculty is still not fully applying available technology. Although in some institutions of higher learning effort to integrate technology into T&L is visible, there is a lot of work that needs to be done for innovation to transform pedagogy.

4.3 Execution of Teaching and Learning in a DE Environment (Applying the Mechanic)

The solution proposed to the challenges of pedagogy in an ODeL Setting is a technology-enhanced innovation that enables the creation of a dynamic learning environment that supports personalized learning, fosters critical thinking, and promotes collaboration (Schneckenberg, 2009). It adheres to the principles of constructivism, which emphasizes active learning and knowledge construction through experience, and connectivism, which highlights the importance emphasizes networks and digital literacy in the modern world (Mattar, 2018).

By integrating these theories, the innovation facilitates a learning experience that is engaging, flexible, and relevant to the needs of diverse learners. This learning innovation will improve throughput and the quality of the graduates. Many studies have shown that it is no longer possible to treat all students in the proliferating range of e-learning users with very different prior knowledge, backgrounds, learning styles, interests, and preferences, with the one-size-fits-all approach (Kusurkar et al., 2021).

This educational online system with the ability to adapt intelligently to the goals, tasks, interests, and other features of individuals and groups of users, is mission-critical for the ODeL environment (Kabudi et al., 2021). Thus, in an attempt to bridge the gap between pedagogy and technology, the potential of new technologies is used as a means to enhance Teaching and Learning.

A framework for thought and execution of pedagogical strategies is designed and developed, and a consideration of the four key components of a classical intelligent tutor system is deliberated on as a key success factor (Nguyen et al., 2020). The key components required and inspired by Bloom's learning theory, and the comprehensive framework components are the learner, the domain, the pedagogy, and the interface (Rathore & Arjaria, 2020). The learner is the main focal point of the intended innovation, the domain is the representation of the material that the learner must learn, the pedagogy deals with what, how, and when to learn, and the interface is the learning platform.

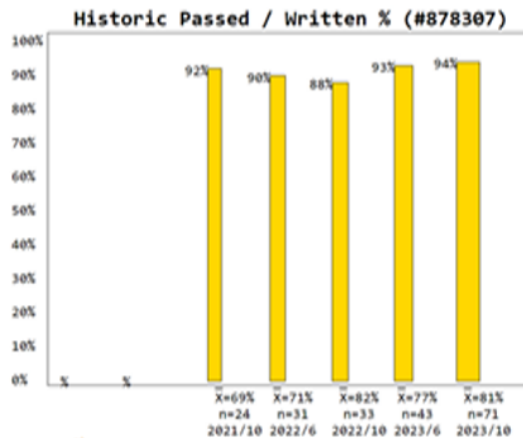
In the process of modeling a learning framework, a hybrid model is adopted (Wu, 2020). The model consists of two broad domains; the first domain consists of a cognitive description component and a stereotype component. The second domain consists of a geographic discriminant component and an overlay component of the model. The cognitive description model is used to classify learners based on their entry test performance scores and the stereotype model is used to classify learners based on the deduced behavior/attitude/characteristics (Shen et al., 2024). The geographic description model classifies students geographically and the overlay model classifies learners based on their knowledge of the subject content.

Then, the learner's learning style is modelled using the classical Jackson's Learning Style Profiler (LSP) (Ghadirli & Rastgarpour, 2013). The Jackson LSP proposes five learning styles, these are (i) Sensation seeker; (ii) Goal-oriented achiever (iii) Emotional intelligent achiever; (iv) Deep learning achiever; and (v) Conscientious achiever (Siadaty & Taghiyareh, 2007). Learners are classified into these learning styles based on their approach and their performance on the weekly tests and quizzes. This classification is dynamic and not static (Siadaty & Taghiyareh, 2007) for the period of the module tuition, i.e., for the semester or the year.

The innovation matches the educational content and the complexity or simplicity of the material, with the learning style of the learners along with giving consideration to the underlying pedagogical principles. The effect of the combination of strategies is observed and comprehended by analyzing the test scores of learners and therefore, making a decision to adapt learning content. The innovation is modeled to enable high-

performing students to excel (not held back) and to support Struggling students by pacing them through their studies. The mechanic of the innovation is designed to ensure throughput improvement and to increase the quality of the pass rate and the pass percentage.

5. Results



Assessment performance results from 2021 when the technology-enhanced innovation was first implemented. The results are a reflection of the impact of technology on pedagogy. The failure rate in STEM programs is eliminated by the application of a technology-enhanced innovation that is modeled to enable high-performing students to excel (not held back) and to support Struggling students by pacing them through their studies.

6. Conclusion

The research into the challenges of pedagogy in an Open Distance and e-learning (ODEL) setting highlights the complexity and multifaceted nature of delivering quality education in a virtual environment. Key challenges include fostering student engagement and retention, providing effective and timely assessment and feedback, and ensuring both students and instructors possess the necessary technical skills and access to technology. These challenges underscore the need for innovative and adaptive pedagogical strategies tailored to the unique demands of ODEL. Technology infused plays a crucial role in addressing these pedagogical challenges. Interactive and adaptive learning technologies enhance student engagement by offering personalized and immersive learning experiences. Social media and collaborative tools help build a sense of community, mitigating feelings of isolation among students.

Automated assessment tools and plagiarism detection software improve the efficiency and integrity of assessments, providing students with prompt and constructive feedback while maintaining academic standards. The results reflect an improved pass rate of above 80%, consistently for five assessment periods. While significant challenges remain, the strategic use of technology offers solutions to enhance the effectiveness of pedagogy in an ODEL setting. Future research should explore innovative technological approaches and outcomes, aiming to create a more inclusive, engaging, and effective distance learning environment. By addressing these challenges head-on and leveraging the potential of technology, ODEL can fulfill its promise of providing flexible and accessible education to a diverse and global student population.

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Developing a Curriculum for Practical Skills-Based Pedagogy in Engineering Education: [A Skills-Driven Teaching and Learning Approach for job Transition Pathways Applicable in Engineering Training and Development for a University of Technology]

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Abstract: The onset of the COVID-19 pandemic has necessitated a shift in focus for graduate engineering students, demanding their swift integration into the workforce. The Engineering Council of South Africa now stipulates that institutions must cultivate specific graduate attributes, particularly in the face of rapid economic and social transformations. This mandate prompts universities to equip engineers with the skills needed to seamlessly adapt to scarce skill positions and emerging roles within diverse disciplines dictated by industry demands. The evolving landscape is shaped by emerging technologies impacting production, manufacturing, and service sectors. Consequently, engineering graduates must acquire skills that facilitate a smooth transition into roles that align with their expertise. The imperative for universities is to fulfill the core mission of engineering education: fostering professionals capable of developing future technology to address upcoming challenges and produce technologists adept at solving present issues using current technology. This study employs a qualitative research method to explain and explore the training of engineers, ensuring that graduates possess the requisite attributes for a successful transition into new occupational roles aligned with industry needs. The focus of the research centers on analyzing the teaching interventions implemented in Industrial Engineering undergraduate programs at a university of technology.

Keywords: Engineering, Skills, Technology, Covid19, Education

1. Introduction

There is evidence that blended classroom models can be effective only when the online elements are active rather than passive, according to a 2010 Department of Education report, undergraduate students in blended classroom settings had better assessment outcomes than purely online or face-to-face classes (Panda, 2014). The reason is that blended courses in which the students spend their time online solving problems, moving through the material at their own pace, and spending half of the class time in the online component of the class, have more positive learning impacts than both face-to-face only and purely online only (Allen, 1992).

Engineering education academics have always explored innovative teaching techniques, and few instructional approaches developed entirely in engineering have achieved widespread acceptance. One that has is cooperative education, which was started at the University of Cincinnati in 1906 (Grayson, 1993). Cooperative programs in which students alternate semesters in school and periods of working in industry continue to be a popular option in engineering education. Another innovation that attracted widespread interest was adaptive digital game-based learning (DGBL). Adaptive DGBL teaching and learning techniques have many similarities to problem-based learning, but it is more structured and relies more on computer technology (Arnab et al., 2012).

The utilization of gaming platforms is not cutting edge in education any longer, but from the perspective of an online distance electronic learning (ODEL) institution in South Africa, it is still a few years from becoming the main attraction and common practice in the lecture rooms, as postulated by Bawden & Robinson (Bawden & Robinson, 2012). Online and large-scale multiplayer educational games are being used in coursework curricula to leverage the best skills and techniques required from graduates by industry (Arnab et al., 2012). The best game theory in education leverages teamwork, leadership, discovery, and tenacity, and these games are social networking games that compel students to create solutions for real-world challenges (Barseghian, 2012).

The largest distance education (DE) institution in South Africa acknowledges the fact that the generation of students enrolled in the university has changed from working adults to young, fresh-out-of-high school students. This new group of students comprises a large percentage of restless digital natives, who spend a big portion of their time online. In this changing teaching and learning (T&L) paradigm, the university has invested resources in figuring out how to use traditional engineering educational content for T&L in a game-based setting.

In this rapidly changing education environment, engineering technology education in a DE setting has to be true to its mission. The mission of technology education is to produce technicians and operators to work with current technology, while that of engineering education is to produce engineers to develop the next generation of technology. While related to engineering in many respects, engineering technology is more hands-on, and thus DGBL is more relevant for teaching and learning in technology education. Therefore, a system with the ability to adapt intelligently to goals, tasks, interests, and other features of individuals and groups of users, is an ideal engineering technology education medium.

Studies have shown that the more students work in cooperative learning groups the more they learn, the better they understand what they are learning, the easier it is for them to remember what they learn, and the better they feel about themselves, the class, and their classmates (Johnson et al., 1998c). Springer et al. (1999) meta-analyzed the research for college-level science, engineering, and technology and found significant effects on students' persistence and achievement in these fields and positive attitudes toward their education.

It is an undeniable fact, especially in DE, that it is no longer possible to treat all students in the proliferating range of e-learning users with very different prior knowledge, backgrounds, learning styles, interests, and preferences, with the one-size-fits-all approach. An educational online system with the ability to adapt intelligently to the goals, tasks, interests, and other features of individuals and groups of users, is mission critical for an online DE environment. Thus, in an attempt to bridge the gap between pedagogy and technology, the potential of new technologies should be used as a means to enhance Teaching and Learning.

An Online Distance Electronic Learning (ODEL) institution provides opportunities for working individuals who are engaged in other things but are keen to acquire a qualification or improve their skill levels through academic interventions. ODeL is a best-fit T&L paradigm for DE because an e-learning framework seeks to establish an environment where students start fast with their learning activity by capitalizing on their downtime and periods of time during which they are not constructively engaged (e.g., riding a bus; waiting in a queue; during lunch and breaks) (Bawden & Robinson, 2012) and (Bommarito, 2014). In an ODeL institution, access is given to all potential students with different competencies of the basic engineering modules such as mathematics and science. Some students have poor grades, while others have very good grades, thus an adaptive T&L strategy is critical.

2. Literature Review

In the realm of engineering education, scholars have long been dedicated to exploring creative teaching methodologies. While numerous instructional approaches have been developed within the field, only a handful have achieved widespread recognition. One such approach is cooperative education, which originated at the University of Cincinnati in 1906, as documented by Grayson in 1993. Cooperative programs, where students alternate between academic semesters and industry work periods, have maintained their popularity within the field of engineering education. Another notable innovation that has garnered considerable interest is adaptive digital game-based learning (DGBL) (Beavis et al., 2015). This approach shares certain similarities with problem-based learning but distinguishes itself through its higher degree of structure and greater reliance on computer technology.

The integration of gaming platforms into education is no longer considered groundbreaking. However, when observed through the lens of an online distance electronic learning (ODEL) institution in South Africa, it is still a few years away from becoming the predominant and universally embraced practice within educational settings, as documented by Barseghian in 2012. Online, large-scale multiplayer educational games have now become a part of course curricula, aiming to cultivate the vital skills and techniques that the industry demands from graduates, as emphasized by Arnab and their colleagues in 2012. These games, grounded in the fundamental principles of game theory in education, place a strong emphasis on fostering teamwork, leadership, discovery, and persistence. They manifest as social networking games that challenge students to formulate solutions for real-world challenges, as underscored by the insights of Bawden and Robinson in 2012.

Research indicates that when students engage in cooperative learning groups, they not only enhance their learning but also improve their comprehension, retention of information, and overall self-esteem. This finding was documented by Johnson and colleagues in 1998. Furthermore, a meta-analysis conducted by Springer and colleagues in 1999 focused on college-level science, engineering, and technology education, revealing significant positive impacts on students' persistence, academic performance, and overall attitude toward their education. In the realm of distance education, it has become evident that employing a one-size-fits-all

approach is no longer feasible, given the diverse backgrounds, prior knowledge, learning styles, interests, and preferences of the expanding e-learning user base.

In this context, the development of an online educational system capable of intelligent adaptation to individual and group characteristics, including goals and tasks, is crucial within the online distance electronic learning (ODEL) environment. To bridge the gap between pedagogy and technology, it is imperative to harness the potential of emerging technologies as a means to enrich the teaching and learning experience. This approach was advocated by Springer and colleagues in 1999, underlining the importance of leveraging technology to enhance educational outcomes

The transition to the knowledge era raised the contradiction from something dumb to be avoided, to human capital, to something to be cultivated within organizations (Palfrey & Gasser, 2008). Towards the higher education scenario, lecturers as core knowledge workers and are assigned to the task of developing new ideas and processes, by identifying, capturing, distributing, sharing, and encouraging knowledge development. Therefore, this implies adopting practices consistent with individual and organizational knowledge creation and learning processes (Takeuchi & Nonaka, 1995). However, the inconsistencies, polarities, dichotomies, and oppositions related to knowledge creation should not be considered improper, since it is formed by two complementary components: tacit and explicit knowledge (Takeuchi & Nonaka, 1995). Sveiby (1998) highlights that practical knowledge is largely tacit, which makes the process of discussing knowledge even more complex.

In short, it can be said that tacit knowledge is internalized by the individual in a unique and personal way; therefore, it is not very easily articulated (Takeuchi & Nonaka, 1995). By the way, it results from individual configurations done through data provided by the environment the individual is inserted in, thus it is almost impossible for two or more people to develop the same knowledge when they receive the same information (Takeuchi & Nonaka, 1995). That is why such issues should be carefully treated when discussing the learning processes, hence the focus of this study. Takeuchi & Nonaka (1995) believe that the explicit or codified knowledge which refers to the knowledge transmitted through systematic and formal language, only exists in, lies on, and is created by individuals. Explicit knowledge may be embedded, but its construction takes place when an individual interacts within a certain community.

Thus, explicit knowledge can be expressed in words, numbers, or even sounds that are often shared as data, manuals, audio-visual, and scientific formulas. In this sense, developing knowledge means expanding artifacts created by a group of individuals within organizations. This is what Von Krogh et al. (2012) call enabling context. According to their view, the academic perspective is the enabling context and is composed of the cooperative style of networking activities, team building, and of the support given to learning schemes such as mentoring and coaching (learning relationship that takes place when a more experienced professional takes the mentor/coach position and shares knowledge with the fresh player).

These features promote an environment where ideas are naturally created since knowledge is essentially related to human actions and, its development process depends on the participants and the actions they take (Teicher, 2018). The complexity of the knowledge transmission process that contemplates the learning process, and its requirements and facilitators from the enabling contexts for job readiness, requires the use of Intellectual Capital (IC) taxonomy in three dimensions (Stake, 1995). Since it is one of the most accepted bases for studying intangible assets and their impact on the value creation.

According to Faste (1994), this thinking paradigm encompasses possibilities inherent to the proficient use of both hands in performing an activity and, by extension, the use of the whole body and even the mind leading to wider possibilities linked to synaesthesia as a way of learning. Resorting not only to the symbolic level but also, to the sensory level and also those inherent to recognizing the importance of the brain hemispheres and modes as the basis for decision-making (Bartunek, 2014). The judgment and decision-making process represents the essence and the excellence of the role played by the managers in the Neuro-economics (Setzer, 2001).

Didactic pedagogy and conceptual distance between lecturers focused on the practice and those focused on the theory creates pedagogical noise regarding the academic unit of the undergraduate engineering course. As for an equivalent point of view, Bartunek (2014) discusses the need for pracademics in teaching and in the final delivered product from a university of technology. This transformational paradigm would be achieved by developing an ambidextrous mental model, able to mediate and bring together logic and boundaries that delimitate the academic and the corporate worlds, which are, at first exclusionary (Schwab, 2016).

Scientific rationality and instrumental rationality would need to be reviewed and realigned in order to get better results in the professional education of engineering technologists (from simple training courses in engineering science and mathematics to teaching 3IR skills that will enable graduates to transition into scarce skills positions and new occupations demanded by industry) and allow generating and improving theories that fit into practitioners' daily needs. The inability to deal with the increasing gaps between knowledge produced in universities of technology and that needed, has the industry blocking the research agenda with discussions on relevance and rigor, when, in fact, it should focus on debating relevance and applicability (Nonaka & Konno, 1998).

This T&L perspective would allow escaping the teaching and learning (T&L) traditional logic of industry positioning and operational efficiency planning by providing the institution with good conditions to innovate through exploration and exploitation, alternately. Education institutions would find in the thinking paradigm settled between managers and educators, an effective tool to survive in times of great transformations in students' profiles. This T&L paradigm will increase communication with stakeholders and with the manifesting prospects through guidance based on engineering education authorities such Engineering Council of South Africa (ECSA). More so, forecasting the opportunities will come from the Internet of Things (IoT) and the fourth industrial Revolution (4IR).

3. Research Method

Qualitative case study methodology affords researchers opportunities to explore and explain a phenomenon within its context using a variety of data sources (Baxter & Jack, 2008). This approach ensures that the phenomenon under study is explored through a variety of lenses that allow an in-depth understanding and allow multiple facets of the case under study to be revealed and understood Baxter & Jack (2008). The case study approach aligns with the goals of this research in that the focus of the study is to explore and explain with the aid of a comprehensive example that illustrates whether and how the application of technology tenants of the fourth Industrial Revolution, impact, aligns and integrate how engineers are trained to enable graduates to successfully transition into new occupation, with relevant graduate attributes required in industry. This type of research approach covers the contextual conditions in which the phenomenon under study occurs (Takanishi, 2019).

The unit of analysis (the case) in this study is the impact of technology integration, through vertical and horizontal activity integration, on how engineers are trained to enable graduates to successfully transition into new occupations, with relevant graduate attributes required in industry. The attributes of this research satisfy the definition of a case as stipulated by Patton (2002), and they are in line with Patton (2002) and Yin (1994) stipulations concerning setting boundaries for cases in a case study research approach (Baxter & Jack, 2008). The research also appeals to boundaries stipulated by Creswell, those of time and place (Baxter & Jack, 2008). In line with the boundaries of the definition and context, and the research question (how engineers are trained to enable graduates to successfully transition into new occupations, with relevant graduate attributes required in industry?), the type of case study research adopted, aligns with explanatory and exploratory or descriptive case study as categorized by Yin (1994).

Patton (2002) and Yin (1994) stipulate that a hallmark for case study research is the use of multiple data sources. A strategy that enhances data credibility (Baxter & Jack, 2008). This case study will apply a triangulation of the following data sources i) document analysis and archival records and ii) field notes; and iii) T&L system design applied. It is rational to apply document analysis in this research since it is often used in combination with other qualitative research methods as a means of triangulation. The combination of data collection methods in the study of the one and the same phenomenon enables researchers to draw upon multiple sources of evidence and, to seek convergence and corroboration with different data sources (Baxter & Jack, 2008). This approach ensures improved data and decision credibility and eliminates researcher bias in recommendations and conclusions.

Based on the theoretical framework established by various authors indicated above, the research adopted a qualitative case study approach in which a desktop research approach is engaged. The research applies data collection and analysis methods of i) document analysis and archival records, to establish literature reviews and current status in the teaching and learning in technology education. Then, ii) field notes of previous researchers are examined to capture the reality and the essence of teaching and learning in the institutions of technology and technology teaching and learning in action.

This method is applied in order to gain an understanding of the cold phase with regards to teaching and learning activities, so as to enable superior activity integration in the technology-based teaching and learning design. The last data collection method is iii) the technology teaching and learning data analysis method. This method is applied to collect data required in the design of the technology teaching and learning system and to identify all the required process steps in the application of ambidexterity in the teaching and learning processes. The data collection tools will enable the research to be approached in three ways and therefore the result is an improvement in data integrity.

4. Discussion

The teaching and learning program begins with an engineering curriculum established as a combination of applied engineering theory and hands-on instruction. Courses on mechanical drawing and design of engineering equipment are core in the instruction of engineering technologists. Engineering design is included because it is a linear and morphological process that requires a hands-on approach in instruction. The program is implemented as an engineering technology instruction that emphasizes more on synthesis as opposed to analysis, that is, course content includes design thinking-related courses rather than scientific analysis and mathematical modeling.

In the execution of the teaching and learning program, two components of the program followed are, learning and applying a programming language, in this case, students learn how to use Python. The second component is engineering design, in which students learn how to build equipment using Lego-robot material. In engineering design, students use drafting and drawing methods in the conceptualization of the products and then manufacture the products using Lego components. Students are encouraged to build equipment that requires mobilization, e.g., mining equipment or manufacturing conveyor belts. This type of equipment requires motors, sensors, actuators, etc.

Robots are very mechanical, most of these are still unintelligent mechanical arms. Learning robot technology started to develop in the 1970s, WABOT-1, the first anthropomorphic robot, appeared in Japan in 1973, sparking research on bipedal walking functions in robots into the 1980s (Takanishi, 2019). Robots had to be tediously hand-programmed for every task until about the late 1970s; to overcome this, robotics needed machine-learning technology (Moll, 2021). Increasing demand in the 1980s for robots capable of identifying parts from random selections, or maintaining positional accuracy when objects shift about on assembly lines (Yerkey, 1984), brought machine learning into robotics.

Students are exposed to Machine Learning, which in this program is limited to the capacity of computers to learn from experience by improving their information-processing ability over time by running algorithms to access and process data. Students are encouraged to research further and engage in concepts such as Deep Learning, which is an evolution of machine learning, that creates an artificial neural network that can learn and make decisions on its own. The teaching and learning philosophy adopted is the gradual release of responsibility (GRR), in which students are encouraged and resourced to research further about any of the topics in the 3IR and 4IR space.

The program acquired a 3D printing machine and students were introduced to additive manufacturing, Additive manufacturing 3D printing machine applies a technology known as fused deposition modeling (FDM), which is commonly known as desktop 3D printing because it is the most commonly used form of the technology today. There are other technologies applicable in additive manufacturing such as SLA, and SLS, but FDM makes up the bulk (90%) of our 3D printing teaching and learning program and, clearly, this technology constitutes an enduring, innovative technology of the 3IR.

Students are introduced to the Internet of Things (IoT), which in this program is taught as a system of networked mechanical and digital devices with the ability to transfer data amongst themselves without human intervention. The core technology of the IoT is the Internet, and converters used are from analog to digital (ADC) and from digital to analog (DAC), which students use to link mechanical devices via sensors and actuators into the IoT. Students study and replicate well-known projects such as the Carnegie Mellon University installation of micro-switches in a vending machine to check coldrink availability from their desks (Von Krogh et al., 2012).

IoT application using converters, sensors, and actuators, is extended to experimenting with regulating the temperature of a fridge remotely, switching lights on and off by clapping hands and topics around smart houses, such as energy-saving IoT projects. Some students in the GRR part of the program ventured into cybersecurity and household security-related topics such as motion analysis and energy consumption. Solar

energy-supporting designs that came out of this program include designing a motor that controls solar panels to follow the sun's movement, so as to optimize solar energy generation.

This program pivots around mechanical robot building and mobilization using programming languages such as Python. The program allows students to venture further in deep learning and machine learning, and support is provided to students who want to expand their knowledge with regard to 3IR technologies and the commensurate skills for the 3IR economy. The 3IR technology skills program is at its infant stages and runs for one (1) year, beyond the academic year students become part of the robotics and e-sport club in the industrial engineering department, in order to continue engaging in the 3IR skills program.

Further development of the 3IR skills training program will lead the teaching and learning to focus on ten (10) topics only for an academic year. Students who want to engage further will be well-resourced and supported to research further and to create innovative products. The major topics of 3IR, that the program will focus on are the following: Robotics, Machine learning, IoT, Automation, 3D Printing, Big Data, Digitalization/Digitization, AI, and Augmented/Virtual reality. The reason that our institution operates in Online Distance Electronic Learning (ODEL), makes these technologies favourable.

5. Research Results

Students succeed in completing the first challenge, which is improving current and existing technology. Projects such as automating the university boom gates and installing micro-switches in a vending machine to check cooldrink availability remotely are indications of students' acquired competence in technology improvement. This is an achievement of the mission of engineering technology education (to produce technologists who work with current technology to solve current problems). As this cohort is an Industrial Engineering group, they were challenged to apply continuous process improvement (CPI) techniques to improve the limitations of the systems they have designed and manufactured. While Kaizen is in full swing, it is noticed that the skills in applied engineering theory (design thinking) and hands-on instruction (Ambidexterity), kick in, and students solve numerous technology problems by applying both.

A typical solution manifesting from this stage is the design, manufacturing, and application of a solar panel motor. The solar panel motor improves the efficiency of the solar panel by controlling solar panels to follow the sun's movement, so as to optimize solar energy generation. Production of new technology is proof that students have moved through a tipping point (fig.1), i.e., from improving existing technology to producing technology (from evolution to transformation). At this stage, it is noticed that students are applying skills of design thinking and Ambidexterity with very high competency. This leads to the second tipping point, where students engage in the world of digital technology. In this stage, students produce apps to identify potholes in the university neighbourhood and manufacture pothole-filling material using additive manufacturing skills. A myriad of projects are done in this stage that support the notion that students are working with current technology to solve current problems. Some of the projects done at this level include smart housing and cyber security projects.

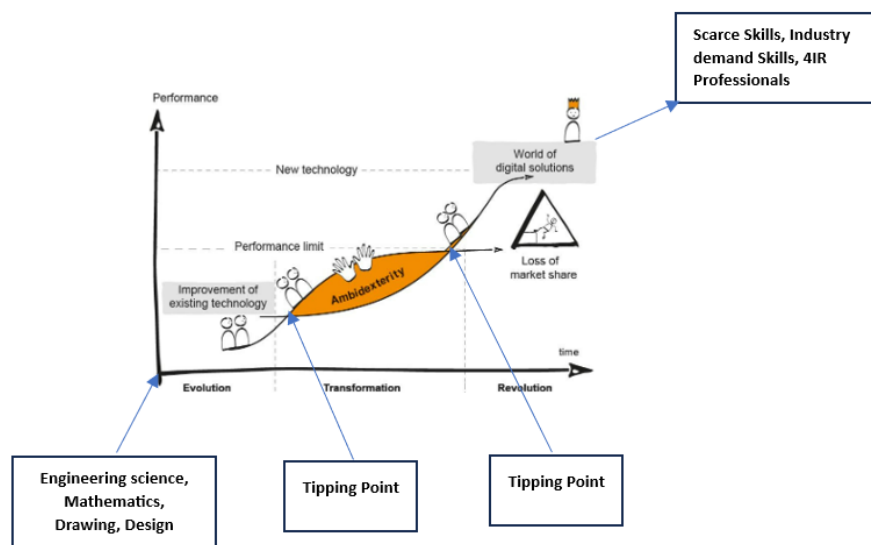


Figure 1: Technology Education mission (Teaching and Learning Model adapted from Duwe, 2018)

Three major aspects of T&L are achieved in this program, i.e. Capture student's interest, Motivate students to progress to higher and more difficult levels of learning, and Learn from and interact with other students. These are typical results of a DGBL environment and GRR pedagogy. Students achieve self-motivation, they collaborate to solve challenges and like in game-based learning they go through solving problems to a higher level. The T&L program proves that an education online system with the ability to adapt intelligently to the goals, tasks, interests, and other features of individuals and groups of users, is mission critical for an online DE environment. Thus, in an attempt to bridge the gap between pedagogy and technology, the potential of new technologies is used as a means to enhance Teaching and Learning in a distance learning setting.

6. Conclusion and Recommendations

The realization that all the technologies in the program represent a gradual evolution of the defining technological transformation of 3IR tenants (Moll, 2021), is the foundation of the drive and commitment to teach 3IR technology skills and the belief in engineering education mission. The program's success is proof that once the students are confident and knowledgeable about the 3IR economy and the engineering dynamics involved, they will be activated to transition into establishing themselves as proficient 4IR professionals. Thus, 4IR is evidently a staggering confluence of emerging technology breakthroughs, as proposed by Schwab (2016) and it blurs the lines between the physical, digital, and biological spheres through artificial intelligence application, as postulated by Marwala (2020).

The mission of engineering technology education is to produce technologists who can work with current technology, and therefore, engineering curricula must be a combination of applied engineering theory and hands-on instruction. This pedagogy strategy has achieved the mission of engineering technology education. T&L of courses on mechanical drawing and design of engineering equipment must be core in the instruction of engineering technologists. These courses must emphasize more on synthesis as opposed to analysis, that is, course content must include design thinking-related courses rather than scientific analysis and mathematical modeling. It is undeniable evidence that the university is able to meet the requirements of ECSA and produce graduates who can successfully transition into new occupations, with relevant graduate attributes required in industry.

It is thus, fitting that engineering curricula must include 3IR technology skills teaching and learning programs, to afford engineering students an opportunity to develop 4IR skills and ability to participate in the development of the 4IR economy. Currently, it must be noted that teaching the 4IR technology skills paradigm is rather complex, since 4IR technologies manifest because of the convergence, confluence, and evolution of the clearly defined technological transformation of 3IR technologies, as indicated by Moll (2021). Therefore, McGinnis's (2018) proposition, that 4IR is a fusion of advances in 3IR technologies, such as robotics, AI, etc, is plausible and core to the strategic beliefs in this 3IR technology skills teaching program. The success of the program is proof that a Skills-Driven pedagogy for Job transition pathways applicable in Engineering Education can successfully transition engineering graduates into new and scarce skills occupations, with relevant graduate attributes required in industry.

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Evaluating an Ethical Hacking Module: Case of a University in South Africa

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Abstract: The University of Johannesburg has Ethical Hacking content covered within the Information Security in the WWW module. This study was conducted at the University of Johannesburg, with honours students registered at the Academy of Computer Science and Software Engineering. This study aims to evaluate the Information Security in the WWW module. Specifically, it seeks to evaluate the content, teaching and learning, and extra activities such as participating in the first round of the National Cybersecurity Hackathon, through student perspectives. It also seeks to understand the views of the students on what they like the most about the learning module as a basis for continuous improvement. The instrument utilised was an amalgamation of module evaluation questionnaires in the body of knowledge. It was modified to suit the context of the study. The online questionnaire had both open-ended and closed questions that seek to get a better understanding of the concepts presented. The frequency distribution, percentage distribution, and weighted mean were calculated to offer the level of agreement and satisfaction. The findings suggest that students were satisfied with the content, teaching and learning, in the Information Security in the WWW module. The results further highlight some essential insights from the respondents that lecturers may consider when improving the instructional material. Further, considerations have been put forward for future improvement of the learning material.

Keywords: Module evaluation, Ethical hacking module, Student perspectives, Module improvement, Cybersecurity, cybersecurity hackathon

1. Introduction

The Fourth Industrial Revolution (4IR)'s technological convergence has increased connectivity, particularly through the Internet of Things (IoT) and smart devices. Systems that were previously isolated are now communicating with each other, sharing information, and establishing notifications (WEF, 2017; Ivanov & Das, 2020). A simple command like "Good Evening" to Amazon Alexa or Google Home can trigger a series of actions. This routine can automatically close your garage door, turn on your foyer, driveway, and living room lights, play specific music through a connected speaker, adjust the Climate Control thermostat to a comfortable setting, light the fireplace, and even start playing your favorite on-demand television show. While connected systems offer great convenience, they also pose a risk of cyberattacks. Any device connected to the Internet can be discovered and accessed by the public. This includes IoT sensors, smartphones, Wireless Fidelity (Wi-Fi) TVs, and even refrigerators, all openly communicating over your Wi-Fi network connected to the public Internet (Ivanov & Dolgui, 2021).

This digital revolution brings incredible conveniences. Users can access vast amounts of data, governments can address social challenges, and remote villages can connect with the rest of the country. Communities have transitioned into digital spaces, encompassing work, leisure, and commerce (WEF, 2017; Ivanov & Das, 2020). Digital tools in the classroom have given teachers and students increased opportunities. Teachers have been compelled to adapt their teaching strategies to support personalized learning, creativity, innovation, and problem-solving, and to allow more time for individual instruction (WTO, 2020). Many businesses suffered during and after the COVID-19 pandemic, with some Small to Medium Enterprises (SME)s closing down. 4IR has become more affordable and easier to implement, providing a viable recovery strategy for many businesses (Ivanov & Dolgui, 2021). Price Waterhouse Coopers (PwC) in 2018 conducted an annual global Chief Executive Officer (CEO) survey, where "81% of executives agreed that 4IR technologies created new efficiencies, and 78% agreed that they helped them automate tasks" (PwC, 2018). In the past systems were separated and now are connected and sharing data. According to Möller (2023), this connectedness also brings some drawbacks. When a device connects to the Internet, it becomes publicly accessible. As a result, these devices are vulnerable to cyberattacks (Singh & Kumar, 2020; Aphane, 2023).

Cybersecurity has become an essential part of everyday life due to the increasing frequency and severity of cyberattacks. The field of cybersecurity is highly challenging due to the rapid back-and-forth nature of the attack-defense dynamic (Cybersecurity Ventures, 2023). The national infrastructure, corporations, and agencies have been targeted by cyber-attacks, leading to the compromise of millions of sensitive data records, particularly in the financial and healthcare sectors (Singh & Kumar, 2020). These security breaches not only cause significant

financial losses but also severely damage the confidence of customers, business partners, and stakeholders (Möller, 2023; Kaspersky, 2023).

In the last quarter of 2022 and the first quarter of 2023, South Africa experienced a concerning 18.8% increase in cyberattacks. This highlights the growing threat of cybercrime and emphasizes the importance of individuals and organizations taking proactive measures to safeguard their digital assets (Kaspersky, 2023; DA, 2023). The 2022 Interpol report has labeled South Africa as the cybercrime hub of Africa, with hackers on the dark web showing interest in the country. A 2020 report by Accenture revealed that the country's internet users were less experienced and technically alert. Poor cybersecurity awareness and lack of end-user training have contributed to successful cyberattacks in South Africa (Möller, 2023; Ngoma, Keevy, & Rama, 2021).

Cybercrime poses a significant business risk in South Africa, with government departments expected to face a growing number of attacks. The economy suffers an estimated annual loss of 2.2 billion rands due to cybercrime (Kaspersky, 2023; Paganini, 2022; Mbelli & Dwolatzky, 2016). Cybersecurity involves technologies, processes, and practices to protect networks, devices, programs, and data from unauthorized access or damage (Cybersecurity Ventures, 2023; Ivanov & Das, 2020; Singh & Kumar, 2020).

Talents in cybersecurity are in high demand, leading to a surge in educational programs and pedagogical approaches in recent years (CyberSeek, 2024; Tredger, 2023). The paper is structured as follows: Section 2 gives a brief background on ethical hacking and the second part of the section provides a brief overview of the module. Section 3 provides a detailed research methodology for this study. Section 4 presents findings and discussion which include the course's strong points as well as potential areas for improvement. The conclusion is offered in Section 5.

2. Background

The concern regarding cybersecurity is rapidly growing in both public and private sectors. The increasing volume, velocity, and variety of data generated in cybersecurity analyses require well-equipped professionals to handle, analyze, and interpret these data (Zaman, Yi & Cheng, 2023; Ivanov & Das, 2020). In today's world, business professionals and public servants greatly need skills and knowledge in cybersecurity to combat the increasing cyber threats and issues. Creating suitable curricular materials and teaching methods could potentially help future cybersecurity professionals meet this demand (Wahsheh & Mekonnen, 2019; Al-Sherideh et al., 2023). According to the United States of America (U.S.) Bureau of Labor Statistics, the growth rate of jobs in information security is projected to be 37% from 2012 to 2022. At the same time, more than 209,000 cybersecurity jobs in the U.S. are unfilled every year. Cybersecurity education has been emphasized by several national organizations, which recognize securing cyberspace as critical (Nguyen, 2019; Faily, 2014; Bratus, Shubina & Locasto, 2010). The growing need for cybersecurity professionals in both the public and private sectors is a crucial task for higher education institutions. They must attract and educate the next generation of cybersecurity workforce and citizens who can contribute to national economic prosperity and security (Allison, 2023; Li et al., 2018; Levy, Ramim & Hackney, 2013). It is essential to prepare students for these challenges and improve cybersecurity education opportunities.

Ethical hacking involves identifying and correcting device flaws and vulnerabilities. It can be defined as a hacking mechanism without any harmful or destructive intent towards a network. Ethical hacking can also be described as a safety evaluation, training, or environment protection review for information technology (Sufatrio, and Chang, 2022; Yaacoub et al., 2021; Cangea, 2018). This method illustrates the risks encountered in an Information Technology (IT) environment and the measures to reduce those risks. The main goal of the ethical hacking service is to evaluate and provide a report to the owner on the security of the targeted systems and networks. Ethical hacking is conducted in conjunction with penetration testing techniques to assess security vulnerabilities (Wilson, 2022; Tabassum, Mohanan & Sharma, 2021; Messier, 2019). Various techniques are employed to obtain information, including information gathering, vulnerability scanning, exploitation, and test analysis (Luse & Shadbad, 2023). During training to become cybersecurity specialists, some of these concepts are discussed and expanded upon.

Module Background

Information Security in the WWW module at the University of Johannesburg (UJ), is a second-semester module from July–November. The module is taught over eleven (11) weeks and one (1) week for summative assessment. The contact (face-to-face) classes are in the evening for one hour and thirty minutes, once a week. The concepts covered are based on the internationally recognized Certified Ethical Hacker Study (CEH) Guide. The CEH study

guide is one of the distinguished course materials currently, as professionals with the CEH certification are well sought after both by private and public organizations.

The purpose of the module is to arm the students with fundamental knowledge and resources to shield an environment from known and potentially unknown dangers. In this module, students learn about the appropriate countermeasures that can and should be used to defend various online assets against threat actors. They also gain insight into the methods that these threat actors employ to subvert protection attempts. The goal is to protect not only the corporate environment but also the users interacting with the systems.

The following lectures (Table 1 below) were covered during the Information Security in the WWW module:

Table 1: Concepts covered in the Module

	Lecture Title	Brief Objective of the Lecture
Lecture 1	Introduction to Ethical Hacking	Background of ethical hacking and important terminology
Lecture 2	Footprinting & Scanning Networks	Introducing Footprinting and get understanding the information gathering methodology of hackers
Lecture 3	Enumeration & vulnerability analysis	Understand process of gaining complete access to the system by compromising the vulnerabilities identified in the first two phases
Lecture 4	Malware Threats	Understand types of malware threats and countermeasure techniques in preventing them
Lecture 5	System Hacking	Understanding privilege escalation techniques and techniques to create and maintain remote access to the system
Lecture 6	Sniffing	Discuss Active and passive sniffing, ARP poisoning and ethereal capture and display filters
Lecture 7	Reverse Engineering & SQL Injection	Understand the purpose of reverse engineering and the reverse Engineering Process. Understand the steps to conduct SQL injection and describe SQL injection countermeasures
Lecture 8	Social Engineering	Understand common types of social engineering attacks
Lecture 9	Cryptography	Give overview of Overview of cryptography and encryption techniques and describe public and private keys are generate
Lecture 10	Cheat Detection	Understanding Anti-Cheat, unethical means of winning and the impact of Cheating
National Hackathon	Cybersecurity hackathon	All students are to participate in the first-round of the National National Cybersecurity hackathon

Students who complete this course successfully should be able to: assess and measure threats to information assets; evaluate where information networks are most vulnerable, and critique security plans designed to protect information systems against attacks. Students should also be able to perform penetration tests into networks for evaluation purposes, develop an ongoing security strategy, and discuss the legal implications of ethical security circumvention.

3. Research Methodology

Through student perspectives, this study seeks to evaluate the Information Security in WWW module concepts. Specifically, it seeks to evaluate the content covered and extra activities such as participating in the first round of the National Cybersecurity Hackathon. To achieve the main aim of the study, the following sub-objectives were derived:

- Investigate and list concepts the participants understood.
- Investigate and list concepts the participants least understood.
- Identify areas of improvement

In this study, the researcher utilized a quantitative approach. In particular, the researcher employed a descriptive research design to analyze the participants' perceptions, opinions, or views on content and concepts covered in the Information Security in WWW module. The quantitative approach comprises studies that collect data using questionnaires to extrapolate findings from a sample to the entire population (Creswell & Creswell, 2017; Fowler, 2013). This study used the descriptive research design to answer the research questions in order to provide a clearer understanding of the concepts discussed in the Information Security in the WWW module. The

study was conducted at the University of Johannesburg and participants were registered students for the second semester of the 2024 academic year. The population under investigation are Information Security in the WWW honours module students. For the 2024 academic year, 47 students were registered for this module.

The selected data collection for this study is a survey, which is selected in accordance with the objectives of the problem under investigation (Tiala, 2022). The research instrument was designed using Google Forms. The research instrument was designed based on the result of reviewed related literature and studies and other sources. As a result, the instrument was an amalgamation of module evaluation questionnaires found in the body of knowledge (Rana et al., 2021; Connelly, 2014; Jones, 2012; Lewin, 2005). It was modified to suit the context of the study. The online questionnaire had both open-ended and closed questions that seek to get a better understanding of the concepts presented. The data collected was quantitative so therefore the data analysis was of a quantitative nature. The frequency distribution, percentage distribution, and weighted mean were calculated to offer the level of agreement and satisfaction.

4. Findings and Discussions

The instrument is composed of five sections (Section A – Section E). *Section A* is the invitation to participate in the survey and the consent form. *Section B* first gives the purpose of the module and then outlines the concepts covered in the module, and lastly assesses the concepts covered in the module. *Section C* uses a Likert-style rating to evaluate the concepts, then *Section D* allows participants to select concepts they most or least understood. *Section E* assesses the National hackathon cybersecurity activity.

Did the content covered meet the described purpose?

26 responses

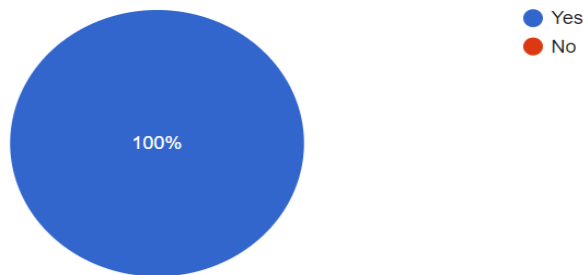


Figure 1: Participants' views on the described purpose

26 responses were received, out of 47 registered students (Figure 1 above). When the participants were asked if the content covered met the described purpose, all the participants agreed that the content met the described purpose. The findings section is sectioned based on the research sub-objectives.

4.1 Investigate and List Concepts the Participants Understood

The first sub-objective of this research was to investigate and list concepts the participants understood very well. As seen in Table 2 below, the participants used a Likert-style rating to evaluate each lecture, with 1 indicating least understood, 3 indicating understood, and 5 indicating very well understood.

Table 2: Concepts participants understood

	Lecture Title	1	3	5
Lecture 1	Introduction to Ethical Hacking	0%	23%	77%
Lecture 2	Footprinting & Scanning Networks	7%	15%	78%
Lecture 3	Enumeration & vulnerability analysis	0%	30%	70%
Lecture 4	Malware Threats	3%	3%	94%
Lecture 5	System Hacking	0%	19%	81%
Lecture 6	Sniffing	0%	23%	77%
Lecture 7	Reverse Engineering & SQL Injection	0%	23%	77%
Lecture 8	Social Engineering	0%	7%	93%

	Lecture Title	1	3	5
Lecture 9	Cryptography	0%	18%	82%
Lecture 10	Cheat Detection	0%	6%	94%
National Hackathon	Cybersecurity hackathon	0%	3%	97%

The rating for all the lectures ranged between 70% - 97%, meaning that students could understand and follow most of the concepts. The most popular lecture was the Cybersecurity hackathon where 97% of the participants indicated it was well understood, followed by the malware threat lecture with 94% of participants.

4.2 Investigate and List Concepts the Participants Least Understood

The second sub-objective of this research was to investigate and list concepts the participants least understood. Figure 2 below presents the responses from the participants when they were asked to indicate lectures they least understood.

Select lecture(s) you think were difficult to understand.



19 responses

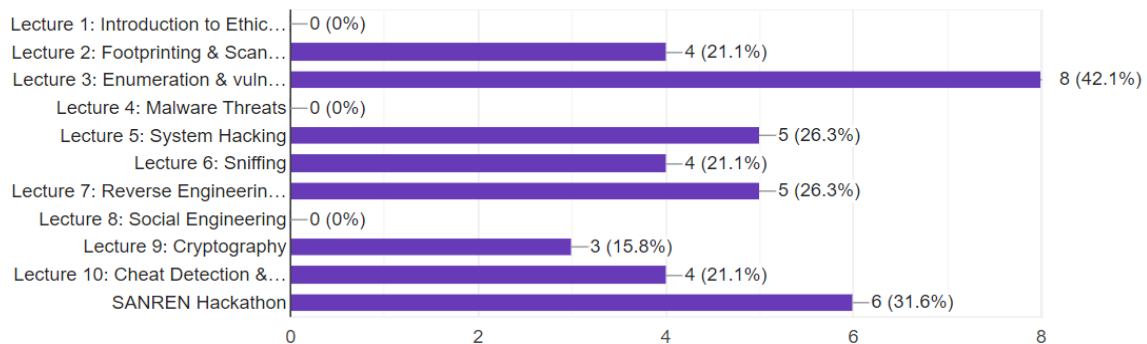


Figure 2: Concepts participants least understood

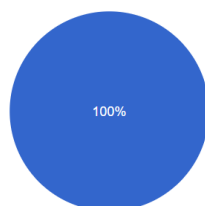
Some of the concepts that the participants indicated as least understood include the enumeration vulnerability analysis (42%), followed by 1st round of the Hackathon (32%), and then the system hacking and sniffing (26%) lecture. It is also noted that participants answered differently to both questions in Table 2 and Figure 2.

4.3 Identify Areas of Improvement

The final sub-objective of this research was to identify areas of improvement. The participants were asked if they enjoyed the module and 100% of the participants indicated they enjoyed the module (Figure 3) but 92% of the participants indicated that the time given for the module is not sufficient. Currently, the module is taught over a semester (6 months), which is eleven (11) weeks of contact (face-to-face) classes and one (1) week for summative assessment. The classes are in the evening for one hour and thirty minutes, once a week. Similar courses have been found to run for the same time or even shorter such as Demetrio, Lagorio, Ribaud, Russo, Valenza (2019) and Andreatos (2023).

Did you enjoy the module?

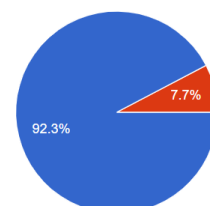
26 responses



Was time sufficient to cover all content?

26 responses

Yes
No



Yes
No

Figure 3: Participants' views on overall module

The participants were asked what changes they would recommend to make the module more effective, the following answers were received (Figure 4).

What changes would you recommend to make this module more effective?

26 responses

More practical practice, while cutting down on content covered in prior years.
More practical practice
Weekly CTF practicals and recent tools and techniques for the phases of ethical Hacking
Add the practical part for the lectures.
practical classes demonstrating concepts
Add more practical activities.
More practical approach
Insert practical demos, get industry cybersecurity experts to give at least 2 lectures. Make the practical project more focused towards ethical hacking and penetration testing.

Figure 4: Participants' recommendations

The majority of participants have requested that the module be made more practical, with increased opportunities to exercise their theoretical knowledge. However, due to time constraints, there is limited time for practical work. One proposed solution is to explore similar modules that have successfully implemented practical components, such as Demetrio, Lagorio, Ribaud, Russo, Valenza (2019) and Andreatos (2023). The study observed that although most of the students did not have any prior knowledge or experience on cybersecurity and ethical hacking, the participants responded positively, indicating that they understood most of the concepts with very few participants who did not understand some concepts. This is similar to other studies such as Yaacoub et al. (2021), where participants were exposed to capture-the-flag exercises and ethical hacking principles.

5. Conclusion

The field of cybersecurity is currently experiencing a high demand for talented individuals, leading to a significant increase in educational programs and innovative teaching methods in recent years. These programs provide training for cyberwarriors on how to assess and measure threats to information assets, evaluate the most vulnerable points in information networks, and critique security plans designed to protect information systems against attacks. This research evaluated the Information Security in WWW module concepts presented to honours students at a university in SA. It aims to assess the covered content and additional activities, such as participating in the initial round of the National Cybersecurity Hackathon. The results indicate that all participants had a good understanding of the covered content. The most popular lecture was the Cybersecurity hackathon, which the participants found well understood, followed by the lecture on malware threats. Some of the concepts indicated as least understood by the participants include enumeration vulnerability analysis, the first round of the Hackathon, and the system hacking and sniffing lecture. There was a conflict in ideas as depicted above, with some participants understanding the hackathon and others not comprehending it. Most of the participants indicated that they enjoyed the module and agreed that the content met the purpose described. Some of the changes recommended include increasing the time for the module, and that the module be made more practical, with increased opportunities for hands-on exercises to better understand the theory. The number of participants were a limitation to this study, as it restricts the researcher from generalizing the findings. This study is ongoing, the findings from each of the surveys could be compared and further conclusions could be drawn from there. Additionally, subsequent surveys will collect demographic data, where this can be part of the findings. This study can also be improved by utilizing a mixed methods research that combines both qualitative and quantitative data for data triangulation to offer more validity and reliability.

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Leveraging Cultural Intelligence in Pre-Service Teachers: An Imperative for Socially Just Pedagogies

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Abstract: “The number one predictor of success in today’s borderless world is cultural intelligence.” – David Livermore. To live and work in harmony in today’s globalized society, like emotional intelligence, cultural intelligence is a conversation that cannot be ignored. Cultural intelligence is the difference between individuals who succeed in today’s multicultural, globalized world and those who fail. Teacher education institutions must be agents and catalysts for cultural intelligence. Since teachers continue to work with an increasingly diverse student population, the integration of culturally responsive curricula and culturally responsive teaching practices into teacher education is imperative to ensure socially just pedagogies. The purpose of this research is to analyse the level of cultural intelligence of pre-service teachers through a critical pedagogical lens, to identify gaps in the different dimensions of cultural intelligence and to make recommendations about how teacher education curricula may be differentiated to improve the level of cultural intelligence thus nurturing socially just pedagogies. A qualitative strategy was employed for this study. The target population of this study constituted preservice teachers. Data was collected using both a survey-type questionnaire and semi-structured interviews. The findings of the study based on the survey indicated that the majority of the respondents rated themselves as having high levels of cultural intelligence; however, individual interviews suggested that students displayed a relatively low level of cultural intelligence. It is therefore recommended that teacher education institutions reimagine their curricula to ensure that cultural intelligence is deliberately embedded into the design of their programme offerings to ensure the promotion of socially just pedagogies.

Keywords: Cultural intelligence, Critical pedagogy, Culturally responsive teaching, Socially just pedagogies, Teacher education institutions

1. Introduction

Intelligence quotient (IQ) which is a measure of a person’s reasoning ability was the dominant type of intelligence in preceding centuries. IQ tests were used to gauge how well an individual can use information and logic to answer questions or make predictions (One Central Health, 2021). However, more than twenty years into the 21st century we have witnessed the emergence and pervasiveness of many types of intelligence, such as Gardner’s multiple intelligences, emotional intelligence, leadership intelligence, social intelligence, successful intelligence and cultural intelligence (Ang, Ng & Rockstuhl, 2020). The current century has witnessed unprecedented interconnectedness and globalization which increased intercultural interactions. This era of interconnectedness inaugurated the concept of cultural intelligence (CQ) since increased cultural interactions increased the probability of cultural misunderstandings, tensions, and conflicts. Cultural intelligence is not an innate human propensity but a learnt behaviour. Therefore, education and schooling play a significant role in leveraging cultural intelligence.

The purpose of this study is to leverage cultural intelligence in pre-service teachers by firstly analysing their levels of cultural intelligence and secondly based on the findings providing recommendations to teacher education institutions about how to increase the levels of cultural intelligence of their students and in equal measures promote socially just pedagogies.

2. Problem Statement and Rationale

Teachers are expected to advocate for their learners by promoting socially just pedagogies through pluralism and the acceptance of cultural diversity. The aim of socially just pedagogies is to foster individuals who are capable of nurturing social change. To nurture social change teachers must prepare their learners to live and work in culturally diverse communities. Therefore, teachers must be culturally intelligent and apply culturally responsive teaching (CRT) competencies to create a safe, inclusive and tolerant learning environment where diversity is respected (Osman & Hornsby, 2018; Karatas, 2020). A high level of cultural intelligence in teachers will result in culturally responsive teaching. Therefore, it is important to identify gaps in the different areas of cultural intelligence in pre-service teachers and to make recommendations to teacher education institutions about how the teacher education curriculum may be differentiated to improve the level of cultural intelligence of our pre-service teachers. Therefore, the research question is encapsulated as follows:

- What are the levels of cultural intelligence in pre-service teachers and how can teacher education institutions improve the level of cultural intelligence of pre-service teachers?

3. Conceptual and Theoretical Framework

The concept of cultural intelligence (CQ) was first introduced by Earley and Ang in their Stanford University Press Book published in 2003 (Ang, Van Dyne, & Tan, 2011). CQ is defined as the capability of an individual to function effectively in culturally diverse settings and is a type of intelligence necessary for adaptation to a new cultural environment. Research indicates that individuals who thrive in intercultural environments exhibit higher levels of CQ and can easily and effectively adapt their views and behaviours across cultures than individuals who display lower levels of CQ (Ang et al., 2020; Sousa et al., 2023). According to researchers, Sousa et al. (2023) CQ capabilities are developed through certain precursors which can be individual or situational. Possible precursors may be factors such as international experience, personality traits and skills, formal training programs or experiential learning programmes (Sousa et al., 2023).

Sternberg, Wong & Kreisel (2021) underscores the importance of cultural intelligence. First, the ubiquitous presence of intercultural interactions results in a lack of understanding of each other's values as individuals, groups or communities, rendering cultural intelligence the most fundamental type of intelligence needed for a sustainable world (Sternberg et al., 2021). Second, notwithstanding how cultural intelligence affects our interactions with people of different cultures, it gives us a more lucid perspective of our own cultures. Interactions with other cultures enable us to seek out more viable or desirable options from other cultures and dispel preconceived beliefs and stereotyping perpetuated by our own culture. This could include, for example, growing up in a culture that shows general disrespect for women. A third reason is that although people are born with certain propensities, tacit knowledge is acquired, and cultural intelligence is teachable and can be learnt from experience or through instruction about how to interact better with people of diverse cultures. Sternberg et al., 2021).

To measure CQ, Dyne, Ang & Koh (2009) developed a four-dimensional construct supported by the 20-item Cultural Intelligence Scale (CQS). The scale allows the assessment of each dimension level of CQ, which helps to identify more specifically which characteristics require greater investment to increase the CQ level. The four dimensions are metacognitive, cognitive, motivational and behavioural (Dyne, Ang & Koh, 2009). Metacognitive CQ focuses on how a person makes sense of intercultural experiences by reflecting on the processes individuals use to acquire and understand cultural knowledge. Cognitive CQ examines an individual's understanding of how cultures are similar and different and their knowledge structures and mental maps about cultures. It encompasses knowledge about economic and legal systems, norms for social interaction, religious beliefs, aesthetic values and language in different cultures. Motivational CQ is an intrinsic value that propels individuals to learn about and function effectively in cross-cultural settings. Behavioural CQ focuses on a person's capability to adapt verbal and nonverbal behaviour to different cultures (Sousa et al. 2023). Tuleja (2019) further affirms the extension of the original CQ theory by Dyne, Ang & Koh (2009) which takes into consideration the experiential aspect of what one learns and re-learns after reflecting on the experience. Four factors of CQ have been identified which include CQ strategy, knowledge, motivation, and behaviour.

Social justice involves exploring the social construction of unequal hierarchies that result in a social group having access to power and privilege. Pedagogies that foster an awareness and agency for social justice are embedded in socially just principles and aim to form citizens who advocate for justice for all people. Socially just pedagogies move beyond the ideal or abstract to the concrete eradicating the one-way relationship between teacher and student. Socially just pedagogies acknowledge that students come to the classroom with a history, background or narrative that influences their academic development. A caring classroom evokes openness, trust and confidence (Karatas & Han, 2022; Klaasen, 2020).

Researchers, policymakers, and educators have ardently called for the development and enhancement of educators' cultural competency that is inclusive of transformative and justice-oriented curricula in schools. Culturally competent teachers who interrogate transformative and justice-oriented curriculum and pedagogy will create classroom spaces that are engaging, supportive, and healing, that offer multiple and even competing perspectives, and that showcase the rich diversity and complexity of our world (Hamdan & Colom, 2022). Culturally responsive pedagogies raise student achievement for all cultural groups, ensuring that all students are given the encouragement and support to realise their educational potential regardless of their social, economic or cultural background or individual needs (The Education Hub, 2019).

This study is supported by Freire's theory of critical pedagogy. Freire defines critical pedagogy as a critical approach to education, highlighting the importance of having learners engage actively in their learning process and being able to find and develop their own opinions and positions (cited in Uddin, 2019). Advocates Burbules, Berkand and Simon (in Pishghadam & Meidani, 2012) contend that critical pedagogy is founded on notions such

as emancipatory knowledge and communication. The goal of critical education is to educate students to critically appropriate forms of knowledge that exist outside of their immediate experience, to take risks, to struggle with ongoing relations of power and to envisage versions of a future world (in Pishghadam & Meidani, 2012). Masood and Haque (2021) add another dimension to the definition of critical pedagogy by contending that critical pedagogy is a critical teaching and learning approach that requires teachers and learners to construct knowledge together challenging the existing power dynamics in traditional classrooms.

4. Methodology

Since qualitative research is less structured than a quantitative study and the social inquiry in qualitative research relies primarily on non-numeric data in the form of words, including all types of textual analyses such as content, conversation, discourse, and narrative analyses (Merriam, 1998 and Jackson II, Drummond and Camara, 2007), the qualitative design suited this study. The research paradigm for this study is located within the theoretical framework of critical pedagogy. This study examines the epistemological elements of critical pedagogy. The critical pedagogy paradigm used in this study leans towards intuitive and authoritative epistemology since data was collected relying on the beliefs and intuitions of pre-service teachers (Kivunja & Kuyini, 2017).

Participants were selected using purposive sampling from private higher education institutions (PHEIs) located in two different provinces in South Africa, namely the Eastern Cape and Gauteng. Fourth-year Bachelor of Education (B.Ed) students formed the core component of participants. These students represented diverse races and religious and cultural demographics. Participants were emailed a consent letter detailing the purpose of the research. Participants acknowledged the ethical considerations of the study and gave consent to participate in the research by signing the consent form or completing the Microsoft Survey.

The two types of data collection methods used in this study were the structured questionnaire and semi-structured one-on-one interviews. The structured questionnaire consisted of closed-ended questions based on the 20-item, Four Factor Cultural Intelligence Scale (CQS) designed by the Cultural Intelligence Centre (2011). The CQS focuses on CQ strategy, CQ knowledge, CQ motivation and CQ behaviour. The questionnaire consisted of twenty questions that attempted to explore the levels of cultural intelligence in fourth-year B.Ed. students. The opinions of the respondents were recorded on a 4-point Likert scale. A total of 158 students responded to the questionnaire. The focus of this study is on pre-service teachers, therefore biographical data such as geographical location, belief systems or religion and racial group classifications were purposefully not factored into this study. Fourth-year B.Ed students were selected from each province for the semi-structured interviews to elicit their views concerning cultural intelligence. The semi-structured questions gave us the flexibility to prompt students to add information they believed to be relevant to the research. Interviews were conducted online using TEAMS. All interviews were recorded and transcribed.

The results obtained from the questionnaire are presented in a table to show the distribution analysis. Descriptive statistics was applied to interpret the results which were further interpreted with conceptual theoretical frameworks presented. Thematic analysis was used to analyse the data obtained from the semi-structured interviews. Codes generated from the data were examined for interesting and significant patterns and were formulated into 5 main themes which are understanding cultural intelligence, perceptions of peers' level of cultural intelligence, knowledge of cultural diversity, motivation to learn about other cultures and confidence to engage in culturally responsive teaching. For this study, the eight participants are labelled P1 to P8.

5. Findings and Discussions

Table 1: Percentage of responses from the questionnaire

Statement	Strongly disagree (%)	Disagree (%)	Agree (%)	Strongly agree (%)
1. I am conscious of the cultural knowledge I use when interacting with people with different cultural backgrounds.	0.6	2.5	57.6	39.3
2. I adjust my cultural knowledge as I interact with people from a culture that is unfamiliar to me.	0.6	7	71.5	20.9
3. I am conscious of the cultural knowledge I apply to cross-cultural interactions.	0	4.5	75.9	19.6

4. I check the accuracy of my cultural knowledge as I interact with people from different cultures.	0	14.6	62.7	22.7
5. I know the legal and economic systems of other cultures.	6.3	49.4	39.9	4.4
6. I know the rules (e.g., vocabulary, grammar) of other languages.	8.9	41.8	44.9	4.4
7. I know the cultural values and religious beliefs of other cultures.	1.9	24.1	69.6	4.4
8. I know the marriage systems of other cultures.	3.2	39.2	55.1	2.5
9. I know the arts and crafts of other cultures.	0.6	41.8	55.1	2.5
10. I know the rules for expressing non-verbal behaviours in other cultures.	1.3	42.4	52.5	3.8
11. I enjoy interacting with people from different cultures.	0.6	0	41.2	58.2
12. I am confident that I can socialize with locals in a culture that is unfamiliar to me.	0.6	8.9	55.1	35.4
13. I am sure I can deal with the stresses of adjusting to a culture that is new to me.	1.3	8.8	67.7	22.2
14. I enjoy living in cultures that are unfamiliar to me.	2.5	24.1	55.7	17.7
15. I am confident that I can get accustomed to the shopping conditions in a different culture.	1.9	17.7	67.7	12.7
16. I change my verbal behaviour (e.g., accent, tone) when a cross-cultural interaction requires it.	8.2	31.6	51.3	8.9
17. I use pause and silence differently to suit different cross-cultural situations.	1.9	28.5	62.6	7
18. I vary the rate of my speaking when a cross-cultural situation requires it.	1.9	20.9	69	8.2
19. I change my non-verbal behaviour when a cross-cultural interaction requires it.	2.5	20.9	70.9	5.7
20. I alter my facial expressions when a cross-cultural interaction requires it.	7	24.7	62.7	5.6

As presented in the table above, the majority of the respondents either agreed or strongly agreed with all of the statements except 2 statements (5 and 6), where they either disagreed or strongly disagreed. These percentages of disagreement indicate a low level of cultural knowledge. However, the predominant high percentages of agreement indicate that the pre-service teachers who responded to the survey have mostly a high level of cultural intelligence enabling them to create strategies for inter-cultural interactions and make sense of cultural similarities and differences. Although the above survey indicates that pre-service teachers are curious and eager to learn about different cultures and can act and respond appropriately in culturally diverse contexts based on the four dimensions which are CQ strategy, CQ knowledge, CQ motivation and CQ behaviour, the findings do not align with the responses gleaned from the semi-structured individual interviews which are presented under the five themes identified. The results from the survey are discussed in conjunction with the findings from interviews under each emergent theme.

Theme 1: Understanding of Cultural Intelligence

None of the eight pre-service teachers interviewed had a cohesive and lucid understanding of cultural intelligence. This is highlighted by the following responses:

P2: I think cultural intelligence is like how your culture plays a role in certain things that you do in your daily life.

P4: I kind of view it as not necessarily having an in-depth understanding of individual cultures, but rather than just having more of a broad basic spectrum knowledge.

This finding contradicts the findings from the survey where most students agreed with statements based on the four dimensions of CQ. Therefore, findings from the survey allude to the assumption that pre-service teachers may have a false sense of CQ knowledge. For pre-service teachers to leverage the level of their cultural intelligence they must have a distinct comprehension of CQ. Tuleja (2019) and Suharli et al. (2018) support this statement by affirming that a cohesive understanding of CQ will enhance their ability to function skilfully in a

cultural context different from their own. Karatas & Han (2022) further argue that a distinct comprehension of CQ will not only enable pre-service teachers to empathize and work well with learners, but will also ensure that they can acknowledge differing values, beliefs, attitudes, and behaviours to anticipate, act, and react in appropriate ways to prepare their learners to live and work in a culturally diverse community and global world. An enhanced understanding of cultural intelligence will evoke the importance of socially just pedagogies in pre-service teachers and increase their awareness of hierarchies based on race, class, gender, and sexuality (Karatas & Han, 2022). An improved understanding of CQ necessitates the dialogical approach of critical pedagogy. Dialogue is necessary for education to create interaction between teachers and students and between students and other students and build students' critical thinking capabilities (Uddin, 2019).

Theme 2: Perceptions of peers' level of cultural intelligence

The majority of the participants in the interviews believed that their peers displayed low levels of cultural intelligence and had limited understanding and knowledge to engage in insightful or meaningful discussions.

P6: I would say not really. Maybe more towards the African culture.

P7: No. You know, if they wanted to try and learn about different cultures, they could have done that. But then, because everyone is just in their own bubble, everyone is just in their own world.

Responses from the interviews indicated that pre-service teachers believed that their peers lacked the insight to provoke appropriate cultural experiences from individuals or groups due to diminished levels of cultural competencies. This belief aligns with statements 5 and 6 of the survey where pre-service teachers mostly disagreed that they know the economic systems and language rules of other cultures. However, the survey also indicates that over 70% of students believe that they know the cultural values and religious beliefs of other cultures. This highlights the disconnect between the findings of the survey and the interviews suggesting that pre-service teachers believe that they have a high level of CQ, however, when individually prodded with probing questions they believe that their peers have a low level of CQ. Hamdan & Colom (2022) emphasise leveraging cultural competencies in teachers since these competencies enable the use of critical-thinking skills to interpret how cultural values and beliefs influence conscious and unconscious behaviour and equip them to successfully teach students who come from cultures other than their own. In addition, cultural competencies in pre-service teachers interrogate peculiar personal and interpersonal awareness and sensitivities which involve the mastering of skills that underpin effective cross-cultural teaching (Hamdan & Colom, 2022).

Cultural competencies in pre-service teachers also engage critical pedagogy which is associated with transformative learning and critical learning. While critical learning uses authentic problem-solving and place-based learning to develop empathy, critical thinking, and civic responsibility among students; transformative learning challenges and changes an individual's beliefs, attitudes, and behaviours through critical reflection and discourse (Rivers et al., 2015). Therefore, critical and transformational learning is crucial and relevant in ensuring that education focuses on socially just pedagogies and positions pre-service teachers to integrate socially just pedagogies and cultural competence into classroom practice (Leibowitz & Naidoo, 2017).

Theme 3: Knowledge of cultural diversity

Although responses to the survey implied a high score on CQ knowledge, once again the interviews proved to be contradictory. Compared to the high percentages of agreement that the survey generated, interview participants were unable to coherently explain the difference between race, religion, nationality and ethnicity. Most of the participants shared that they would not be able to explicitly explain these concepts to their learners. 6 out of the 8 participants were unable to confidently answer the question: What race group will a Muslim lady belong to? Participants' knowledge of cultural or religious celebrations was limited to their religions or cultures. The knowledge displayed about celebrations and religious observations of other cultures was scanty or inaccurate. The following summarised responses affirm these findings. *"I struggle with it myself still, so I would really have to go do a bit more research on it to be able to explain it to the children. They belong to like either Indian or coloured, but in my opinion, they should have their own race group because they don't necessarily identify as either. I am aware of like Eid and those kind of celebrations, but I'm not like properly educated on them."*

Advocates of CQ Livermore & Van Dyne (2015) and Sternberg et al. (2021) argue that pre-service teachers who have inadequate CQ knowledge will not efficiently adjust to the shifting expectations of their culturally diverse learners since they do not have reference points and a repertoire of strategies and behaviours to orient themselves when they encounter unfamiliar perspectives. Therefore, they will not be able to interpret and make

sense of confusing situations in culturally diverse settings. However, with enhanced CQ knowledge, they will have the ability to encounter new cultural situations with a discerning mental frame, adjust to the challenges of culturally diverse teams, enjoy intercultural interactions, and embrace the value of adjusting to the novelty of different cultural perspectives (Livermore & Van Dyne, 2015; Sternberg et al., 2021). Karatas & Han (2022) further affirms that since cultural intelligence is an important capability in a multicultural world teachers should be aware of and be sensitive to the cultural development of all students in their classrooms. High levels of CQ will initiate social justice education. This type of education encourages students to take an active role in their education and supports teachers in creating democratic and critical educational environments (Karatas & Han, 2022).

Theme 4: Motivation to learn about other cultures

The questions that generated theme 4 revolved around engaging with different cultures to develop an understanding of that culture, interacting voluntarily with different cultures on a social basis and educating yourself about different cultures to ensure that you are culturally sensitive and inclusive. These questions align with motivational CQ. The following responses hinge on the premise that pre-service teachers do not have high levels of motivation to learn about other cultures.

P1: I don't really interact with anybody besides like my little group, but if I do interact with them, I do try and understand how they interpret certain things to how I interpret it.

P5: So, I would like ask my classmate if they're from different tribes like which tribe where you are from, what colour do you guys wear, and what's your traditional colour?

P3: The way I educated myself is for example, if I were to see a person from a different culture and I did not understand what was happening, I'm going to go to Google and learn.

While the survey indicates that pre-service teachers embrace the four factors of CQ identified by Tuleja (2019), individual interviews point towards limited motivation to learn about other cultures. It may be assumed that pre-service teachers responded to the survey at face value and did not apply the required critical thinking. Tuleja (2019) proffers that the difference between teachers who succeed in today's multicultural, globalized world and those who fail is leveraging the four factors of CQ. CQ strategy would enable pre-service teachers to create strategies for intercultural interactions. It includes contemplating assumptions, deciphering actions, and adjusting perspectives. CQ knowledge would develop pre-service teachers' knowledge about the world and aid them in making sense of cultural similarities and differences by creating mental maps that guide us to recognise and acknowledge what is unfamiliar (Tuleja, 2019). CQ motivation will instil curiosity and desire to learn about different cultures. CQ behaviour would equip pre-service teachers with the capabilities to act and respond appropriately in culturally diverse contexts (Tuleja, 2019). Leveraging CQ demands transformative learning which is a tenet of critical pedagogy. Transformative learning explains how adult learners make sense of their experiences and how social and other structures influence the way they construe that experience (Christie et al., 2015).

Theme 5: Confidence to engage in culturally responsive teaching

Most interview participants expressed a sense of confidence in teaching a class with learners of different cultural backgrounds. This sense of confidence aligned with the findings of the survey. This confidence mainly stemmed from their teaching experience in multicultural classrooms. However, teaching in a diverse cultural setting is dissimilar to engaging in culturally responsive teaching. Karatas (2020) asserts that CRT competencies are elevated when teachers develop an acute awareness of their prejudices and assumptions about cultural differences. Culturally responsive education considers the cultural knowledge, past experiences, reference framework and performance styles of ethnically diverse students. It is an approach that empowers students intellectually, socially, emotionally and politically and contributes to students' academic success, cultural competence and critical awareness. An important part of teachers' comprehensive professional development is CRT applications. Therefore, teacher education institutions must ensure that prospective teachers gain CRT competencies by making culturally responsive teaching the centre of teacher training and not as an extension of teacher training programs (Karatas, 2020).

Osman and Hornsby (2018) further argue the idea of the classroom as a dialogical space, a concept that embodies critical pedagogy. This dialogical space enables teachers and students alike to explore and build understanding around the issue at hand without silencing particular voices. Socially just pedagogies are about developing and fostering critical thinking to enable people in such conditions to exercise critical agency to

transform contemporary orders based on social justice. It is about being propelled by a passion to create a just society (Giroux, 1983 cited in Osman & Hornsby, 2018). Therefore, culturally responsive teaching is essential to promote socially just pedagogies and critical pedagogy

6. Recommendations and Conclusion

It is significant to note that the key findings from the survey contradict the findings from the interviews. Findings from the survey indicate that pre-service teachers have a high level of cultural intelligence while the findings from the interviews indicate a low level of cultural intelligence. This may be attributed to the fact that the interviews allowed the researcher to delve deeper into the questioning and ask follow-through questions that forced the participants to engage in meta-cognitive thinking. To perpetuate this meta-cognitive thinking about cultural intelligence and meet the agenda for delivering socially just pedagogies, teacher education institutions do not have the luxury of assuming that cultural competence will be incidentally acquired. Teacher education curricula have to be redesigned to deliberately include learning experiences that will leverage cultural intelligence. These learning experiences must be inclusive of strategies integrating culturally responsive teaching. These interrogations will require further research both of a quantitative and qualitative nature.

Livermore (2011) concludes that having a high CQ is not about exhibiting flawless behaviour in cross-cultural settings but rather embodied by people with a strong sense of their own cultural identity. Individuals who are genuinely interested in learning about other cultures and those who have an integrated view of the world and appreciate both similarities and differences among people have a high CQ (Livermore, 2011). The imperative for teacher education is to develop teachers who are genuinely interested in learning about other cultures and have an integrated worldview by leveraging cultural intelligence.

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Beyond Content: A Trauma-Informed Framework for Academic Writing Evaluation

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Abstract: The paper proposes a novel framework for assessing student academic writing integrating an understanding of trauma into the evaluation process. This framework emphasises the importance of recognising linguistic markers in student writing that may indicate underlying psychological distress, such as post-traumatic stress disorder (PTSD). Traditional higher education academic assessments often overlook these markers, focusing on content quality and adherence to formal writing standards. This oversight could lead to missed opportunities for early intervention, particularly in educational settings where students do not openly disclose their mental health challenges. Building on trauma-informed pedagogy, this study explores how Natural Language Processing (NLP) models can be leveraged to identify linguistic markers associated with poor mental health, such as PTSD, anxiety, and depression, within students' academic writing. By analysing writing patterns like non-linear narrative structures, obsessive thoughts, and disjointed syntax, we argue that NLP can offer an essential tool for early detection of trauma-related challenges. Such markers are often overlooked in traditional grading systems, which prioritize form and rhetoric. A case study using student writing samples demonstrates how changes in rhetorical fluency and writing quality can correlate with a documented decline in mental health. The results of NLP analysis reveal a progressive decline in coherence, lexical diversity, and thematic focus, which align with known linguistic markers of trauma. These findings underscore the potential of NLP to serve as an early-warning system, alerting educators to the need for intervention and support. Despite the promise of these methods, current NLP models face limitations in linguistic diversity, reproducibility, and population bias. Therefore, we advocate for the development of more inclusive models built on ethical frameworks that consider the socio-rhetorical contexts of student writing. Additionally, large and secure datasets are required to ensure representativeness, with attention to student privacy concerns. Ultimately, this paper calls for higher education institutions to adopt trauma-sensitive evaluation frameworks that integrate academic and emotional well-being, ensuring more equitable and compassionate assessments.

Keywords: Trauma-Informed pedagogy, Natural language processing model, Linguistic markers, Rhetoricity, Higher education

1. Introduction

Academic writing is often seen through the lens of "writtenness" which refers to the linguistic materiality of text and the value placed on the communication of content rather than the content itself (Turner, 2019). The marking criteria in most universities give significant value to the communication of ideas, argument, structure and presentation (see Table 1) which are consistent with the conventions of writing (Bhambra, 2018) but there is limited recognition of the intellectual effort required to produce what is culturally considered "good" writing (Turner, 2018). This effort includes not just having ideas but being able to effectively communicate them in writing, a skill that interacts with and enhances intellectual understanding.

Academic writing must meet a certain standard to enable others to effectively critique the work (Grannell, 2022). However, expectations of clear and polished writing may overlook significant external factors affecting a student's ability to meet these standards. For example, poor academic writing has been attributed to inadequate prior education (Hardy & Clughen, 2012, p.45), inability to read complete texts, thus misrepresenting meaning (Ismayilli Karakoc et al., 2022), lack of critical thinking skills (Altinmakas & Bayyurt, 2019) and personal failure to identify and thus adopt discipline-appropriate writing practices (French, 2018). However, there has been little consideration of external influencing factors such as ongoing traumatic life events (Markowitz, 2022).

This paper aims to examine how the conventional assumptions surrounding writing practices might lead to missed opportunities for student support. "Is the essay easy to read?" is equated to clear, rational thought. This ideology has its roots in the enlightenment period and continues to shape expectations of academic writing, often disadvantaging those who do not conform to these established norms in the academic space (Turner, 2018). We argue that the value of the text should not just lie in the content it communicates but also in the communication of that content, which is a reflection of the intellectual labour. Therefore, the criteria for evaluating academic writing should not be limited to assessing quality; a more nuanced approach is necessary.

Tables 1: Academic writing grading rubric used in most UK Russell group universities (Grannell, 2022)

	Fail	3 rd	2:2/ Pass	2:1/ Merit	1 st / Distinction
Content – Is the student addressing the set questions/ topic?	0-1-2-3-4-5-6-7	8-9	10-11	12-13	14-15-16-17-18-19-20
Argument – How much depth is there to the points being made?	0-1-2-3-4-5-6-7	8-9	10-11	12-13	14-15-16-17-18-19-20
Evidence – Is the student supporting statements with reference to the relevant literature?	0-1-2-3-4-5-6-7	8-9	10-11	12-13	14-15-16-17-18-19-20
Originality – Is the student saying anything different/ interesting?	0-1-2-3	4	5	6	7-8-9-10
Referencing – Are they referencing appropriately/ consistently?	0-1-2-3	4	5	6	7-8-9-10
Presentation – Is the essay easy to read/well structured?	0-1-2-3-4-5-6-7	8-9	10-11	12-13	14-15-16-17-18-19-20

Grade A	Exceptional Clarity, Cogency, Consistent Fluency
Grade B	Clear Focus and Clarity in Writing, Appropriate Style, Fluency
Grade C	Effective Clarity, Acceptable Style Though Not Fully Consistent
Grade D	Poorly Organised, Under Focused, Inappropriate Style

In this study narrative discourse of a student's academic writing over a period of five months has been analysed by Natural Language Processing (NLP) software. Findings were mapped to evidence of linguistic markers of poor mental health established in research studies. From this, we propose a framework for identifying when the quality of academic writing might be indicative of a poor mental state rather than intrinsically poor writing ability, something which is often overlooked. The proposed framework for academic trauma informed pedagogy provides a novel lens which we argue should be adopted by academics. The framework is described and the merits and challenges of using NLP to implement it in academia are discussed.

2. Literature Review

The conservative and elitist promotion of correct language usage, traces back to historical prescriptivism of the ideology of correct usage, particularly in the context of academic writing, often serving as a tool for maintaining social hierarchies (Bhambra, 2018). This prescriptivist approach has historically been linked to broader social and political values, often stigmatising those who do not conform. Academic writing guidelines are deeply rooted in values that perpetuate an ethos of fear and negative evaluation around language, where deviations from the "correct" usage are seen as indicative of poor education or intelligence (Golden, 2020). The English language has become synonymous with knowledge, no longer seen merely as a language.

It has been recognised by sociolinguists that prescriptions of what's right in the use of language serve a social function rather than having any intrinsically creative linguistic merit. Certain grammatical forms and structures in writing are judged as 'correct' while others are stigmatised as 'vulgar' (Turner, 2019). Perception of language can have multi-faceted social consequences because a student's writing can reflect wider socio-rhetorical contexts (Paltridge and Phakiti, 2015). Having an absolutist injunction in assessing their expression hinders rather than opens up contexts for discussion. Distinctions between correctness and error are densely packed with social indexicalities. Writing 'errors' are quickly seen as a sign of poor education, a lack of intelligence, or a "sloppy" mind (Turner, 2019). However, just as rigid standards in writing can exclude diverse cognitive and emotional experiences, traditional educational frameworks fail to account for the complex realities of students, especially those struggling with mental health issues and trauma (Molinari, 2022).

2.1 Impact of Trauma on Student Mental Health and Rhetoricity in Educational Settings

"Trauma-informed" is the latest educational buzzword for politicians, policymakers, administrators, teacher educators, and teachers (Bohannon, 2019). This newfound attention is a reaction to decades of policy and practice grounding formal education in cognitive learning targets and standards-aligned skills. Realising that social and emotional dimensions have long been ignored, there is now, finally, attention paid to broader conceptions of young people's lived experiences (Grannell, 2022). The importance is now on understanding

trauma and the role of pedagogy in mitigating it; the affordances, limitations and different framings of trauma-informed pedagogy, and how teachers' pedagogies can mitigate trauma and respond to people's experiences (Smith and George, 2023).

Trauma can be understood as an emotional response to a distressing event that can cause long-lasting effects on a person's mental and physical health (Smith and George, 2023). It can affect people of any age. Identifying early predictors of poor mental health and trauma is crucial for effective treatment and prevention efforts. However, obtaining these predictors is challenging and methodologically limited due to the wide variability in psychological responses following exposure to traumatic events (Grannell, 2022).

The impact of trauma and the process of recovery are not randomly distributed. Many survivors show a high degree of resilience and ultimately (and sometimes quickly) return to normal lives whilst others develop psychological disorders, such as Post Traumatic Stress Disorder (PTSD) and Dissociative Amnesia (Markowitz, 2022). Researchers have suggested that emotions are catalysts for goals (Henshaw, 2022), the implication being that emotional responses can impact the goals that students set for themselves. At any age, students exposed to traumatic experiences demonstrate emotional and behavioural difficulties that dramatically interfere with their ability to engage in educational and personal experiences (Molinari, 2022). The challenges can have a negative impact on self-esteem, coping skills, educational performance, self-regulation, critical thinking, self-motivation, and the ability to build healthy student-educator relationships. Poor mental health and other people's responses to it can impact one's perceived rhetoricity in the college classroom (Kleim et al., 2018).

There has been a lack of existing research on how poor mental health interacts with a student's most essential tool in a classroom – their ability to communicate (Schwartz, 2005). Rhetorician Catherine Prendergast's "rhetorical disability", (the idea that the neurodivergent are constructed as nonrhetorical) (Schwartz, 2005) debates the necessity to understand the barriers to rhetoricity that college students who have endured a traumatic event face. Those who have endured a traumatic event in their lives become rhetorically disabled when others negatively respond to their nonlinear experience of time, their inability to maintain formulaic decorum, and stigma that exists around poor rhetorical communication. Educators should become cognisant of how the decorum of their classrooms disable students with a past history of trauma, as well as how to broaden that decorum in a way that supports the rhetoricity of those same students.

We must question the assumptions underlying what is considered valid knowledge and how it is evaluated. There is a need to broaden the scope of academic assessment to include non-traditional forms of knowledge and expression (Henshaw, 2022), recognising that students' academic work is influenced by a variety of factors beyond their control. For instance, trauma, mental health issues, and socio-economic challenges can all significantly impact a student's ability to perform well in a traditional Eurocentric academic setting (Markowitz, 2022). Educators should be aware of underlying issues, such as trauma or mental health challenges, that may affect a student's academic performance.

In the context of academic misconduct, a students' academic struggles are often seen as personal failures rather than broader institutional structural issues. Institutional procedures for handling academic misconduct lack sensitivity to underlying mental health or trauma-related issues (Marshall et al., 2017). Instead of offering support or intervention, the focus remains on penalising behaviour that deviates from expectations. This narrow focus on rule enforcement overlooks the broader context of the student's life, contributing to institutional trauma (Bhambra, 2018). The institutional reliance on punitive measures (e.g., academic probation, failing grades, misconduct charges) can exacerbate feelings of failure and shame in students, particularly when these responses are seen as disproportionately harsh or insensitive to personal circumstances. This punitive approach reflects an institutional failure to adopt trauma-informed methods of addressing student challenges (Rude, Gortner and Pennebaker, 2004).

2.2 Creating a Trauma-Informed Educational Space

The need to challenge and rethink traditional educational frameworks that often overlook the diverse and complex realities of students, especially those with poor mental health, brings into attention the historical and structural inequities that continue to shape educational institutions. Educational institutions need to move towards an equitable approach that takes into account the full spectrum of a student's experience, rather than judging them solely on their ability to conform to pre-existing academic norms (Hopkins, 2023a). Recognising the catastrophic impact trauma can have on individuals and communities, international organisations are now beginning to address the issue; e.g. some global mental health agencies have taken on the charge of

developing trauma prevention and recovery programs (Margaroli et al., 2023). The primary goal of these initiatives is in establishing traumatic stress as a major health issue worldwide and creating a framework for international interventions focusing on efforts that enable and empower individuals and communities to move forward with their lives.

University or college-level students experience a multitude of stressors, poor mental health problems and sometimes trauma. However, such experiences do not necessarily occur during the academic semester when students are encountered by professors, making them less visible to both the student and their instructors. Hence, past traumas may go unrecognised because they are not immediately apparent in the academic setting, despite their potentially long-lasting effect. There is a need for a trauma informed educational space, therefore, which:

- Realises the impact of trauma, understands potential paths for recovery.
- Recognises the signs and symptoms of trauma in students, teachers, and staff.
- Responds by integrating knowledge about trauma into its policies, procedures and practices, seeks to actively resist re-traumatisation. (Smith and George, 2023)

To provide a structured approach to implementing trauma-informed practices in educational settings, frameworks have been developed to guide institutions in understanding and responding to trauma in a systematic way. For example, the Missouri Model (Rude, Gortner and Pennebaker, 2004) scribes the continuum of becoming trauma-informed, from trauma-aware, building consensus around the principles of creating a trauma-sensitive staff able to recognise the signs and symptoms of trauma and the importance of building resilience. A trauma-sensitive staff motivates an intentional growth process for every student academically, socially, emotionally, and behaviourally. To recognise trauma, it is important to acknowledge two fundamental truths:

- All behaviour communicates needs.
- Needs determine brain states.

Being trauma-sensitive requires being able to identify needs-based behaviours, whilst understanding that the responses to trauma are individualised and may manifest in many different ways. Trauma-sensitive staff should also be able to recognise how their own behaviours can affect students. They must consciously avoid negative reactions when faced with vulnerable decision points to foster a safe and predictable learning environment. Teachers who model neutralising routines (Marshall, 2017) in their classrooms recognise the importance of building resilience in themselves and their students.

A holistic approach to assessment would recognise that students are not just intellectual beings but are also affected by emotional, psychological, and socio-economic factors. For example, a student who has experienced trauma may exhibit a decline in academic performance that is directly related to their mental health struggles. Rather than simply penalising the student for this decline, a holistic approach would involve recognising that there might be other root causes and providing appropriate support. Educators should be attuned to the signs of distress in students' work, such as changes in writing style or citation accuracy, as indicators that something deeper might be affecting their academic performance. By taking these factors into account, educators can offer a more compassionate and just evaluation of students' work.

Institutional rigidity is evident in the inflexibility of deadlines, attendance policies, and procedural requirements that do not accommodate the needs of students facing trauma. Strict adherence to these policies can exacerbate mental health issues (Hopkins, 2024), especially when accommodations are hard to access or there is stigma around seeking help or past trauma from having sought help. Inflexibility in coursework, exam formats, and grading rubrics perpetuates trauma for students who need alternative ways to demonstrate their knowledge and skills (Henshaw, 2022). Students suffering from trauma-related cognitive difficulties may struggle to produce linear essays but might excel in oral presentations or creative projects. Institutions that rigidly enforce traditional assessments overlook these alternatives, perpetuating a one-size-fits-all approach that fails to account for diverse student needs (Hopkins, 2023b).

2.3 Natural Language Markers

Natural language markers derived from individuals' spontaneous word use have recently received increased scientific attention. Use of certain words in individuals' writing or speech has been related to psychological aspects of their personal health and psychopathology. Recent research in NLP has demonstrated that it can provide indicators of psychopathology, particularly for Depression, PTSD, Suicide, and Psychosis (Wu et al.,

2023). Machine Learning (ML) or Deep Learning (DL) models could identify risk characteristics using written communications resulting in low-cost and low-effort identifiers. The growth of the need for medical deep learning models is because of the fivefold increase in the number of publications on mental illness detection using machine learning and deep learning methods over the last 6 years (Malgaroli et al., 2023). In spite of this, there are no unified datasets or gold-standard methods to compare publications. Authors use different diagnostic tools and data sources to build NLP models that often lack interpretability. Nevertheless, they present an opportunity to predict which students are at higher risk of mental health issues by identifying patterns in their academic behaviour and interactions with institutional platforms.

Academic assessment criteria and styles have experienced little change over the years despite increasing pressure for equity and inclusivity. This paper calls for educators and academic institutions to recognise these inequities and to take them into account when assessing students' academic writing. A student's poor academic writing may not simply be a reflection of their ability or effort but could be influenced by systemic disadvantages that need to be addressed. In this paper we advocate for holistic and contextual approaches to education and student assessment, moving beyond a narrow focus on content quality and traditional academic metrics, and instead considering the broader context in which a student's work is produced. Through case study analysis, we present an example of how academic work can be affected by trauma and how it can be possible to identify patterns in a student's written work that may indicate a need for additional mental wellbeing support. We propose a framework for the potential identification of patterns and suggest ways in which it could be implemented using AI and NLP in particular.

3. Methodology

Three pieces of coursework submitted by one student over a period of time from October 2021 through to February 2022 were analysed using an NLP model (Chat GPT4). Chat GPT was asked to critique the academic aspects of the assignments. Specifically, Chat GPT was asked to critique the writing style, language patterns, and the underlying research and academic nuances (see Figure 1). The aim was to assess whether AI could detect chronological changes in the student's writing that might indicate underlying psychological distress. Explicit written permission was obtained from the student to use their work. In the letter the student described a decline in their mental health during the time period in question and provided medical evidence to support this.

Table 2: Linguistic markers of poor mental health in academic writing (Markowitz, 2022), (Marshall et al., 2017) (Rude, Gortner and Pennebaker, 2004) (Quillivic et al., 2024)

Mental health problems	Manifestation in writing	Classification of symptom
Obsessive thoughts, common in anxiety and PTSD	Manifests in writing as repetitiveness or a focus on specific themes or ideas, regardless of their relevance to the main topic.	Cognitive dysfunction
Flashbacks, nightmares, or traumatic memories.	Leads to a non-linear narrative style, where the writer jumps between past and present without clear transitions. The writer's rhetoric perspective shifts unexpectedly as a reflection of cognitive dissonance	Cognitive dysfunction
Insomnia and changes in appetite	Impact the writer's energy levels reducing productivity and affecting the overall quality of the research.	Hyperarousal and Physiological dysregulation
Trauma	Leads to a restricted use of vocabulary, due to difficulty in finding the right words, or an overly complex use of language as a way to overcompensate or distract from the underlying issues.	Hyperarousal and Physiological dysregulation
PTSD	Sufferers have fragmented and disorganised language patterns. During trauma exposure or re-experiencing trauma, individuals with PTSD often exhibit reduced activity in their brains Broca's area and the left frontal cortex. This results in difficulty producing language, which is essential for forming coherent sentences in academic writing.	Affective dysregulation
Anxiety and Depression	Leads to challenges in maintaining clarity, coherent structure and effectively communicating complex ideas. The individual would then have trouble organising thoughts logically, leading to disjointed or fragmented sentences. Lexical diversity, increase in affective language, negative sentiment.	Affective dysregulation
Anxiety	Leads to missed deadlines, lack of thoroughness in researching or citing sources impacting the credibility and rigour of the work.	Affective dysregulation
Issues with concentration	Affects the ability to focus on detailed research and development of a thorough analysis. Making it hard to stay on topic. Causing frequent digressions or an inability to develop ideas thoroughly.	Cognitive dysfunction

Results from the NLP analysis were mapped to linguistic markers of PTSD, anxiety and depression (Table 2) to determine if there might be a visible relationship between the NLP findings, the student's account and evidence of their deteriorating mental health.

4. Results

Feedback given by the NLP model on all three pieces of coursework is shown in Figure 1. It revealed a progressive decline in the student's rhetorical communication skills and overall writing quality over time, a pattern that aligns with documented linguistic markers of PTSD, anxiety and depression (Table 2). Although correlation does not inherently imply causation, there is clinical evidence suggesting that significant changes in a student's writing style such as those mentioned in the figure indicate underlying mental health challenges, warranting further attention from educators.

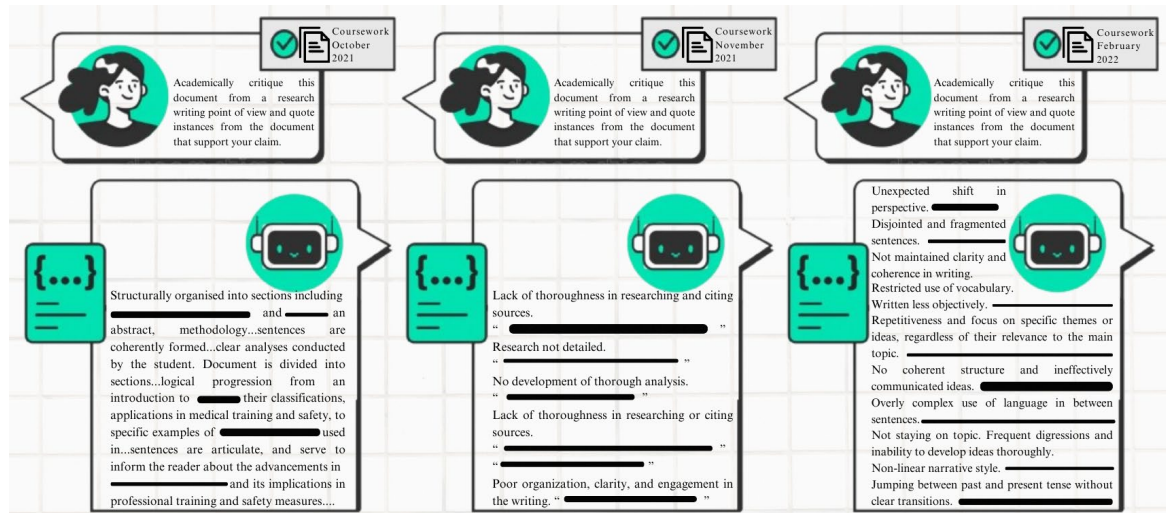


Figure 1: Visual representation of conversation with the NLP model

Figure 2 shows the timeline during which the student studied at university. The timeline shows the relationship between the start of the student's study, their experience during university and the submission of their coursework.

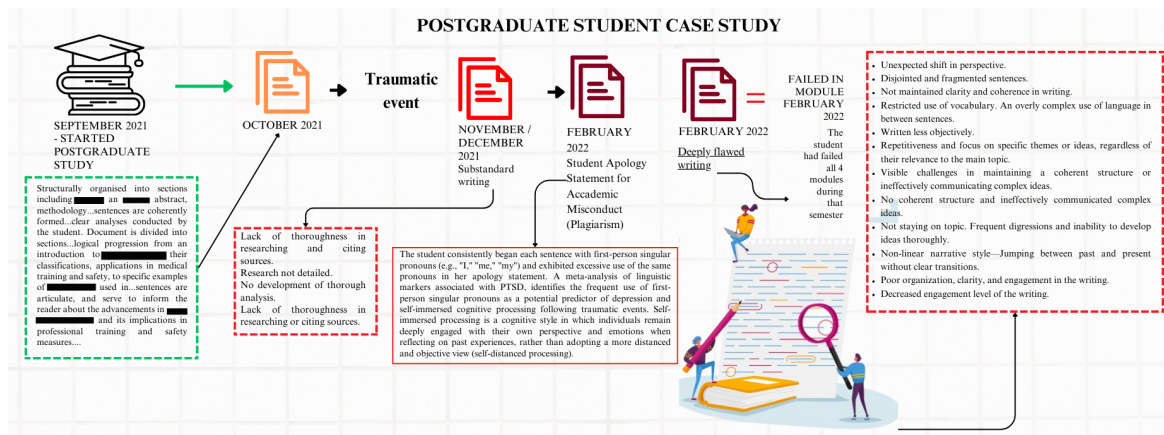


Figure 2: Student academic submission timeline and textual analysis of the academic submissions

The linguistic markers that were identified by ChatGPT are shown in Figure 1. Based on Table 2, these markers have been prioritised to show how they might be used to initiate investigation on the part of the academic.

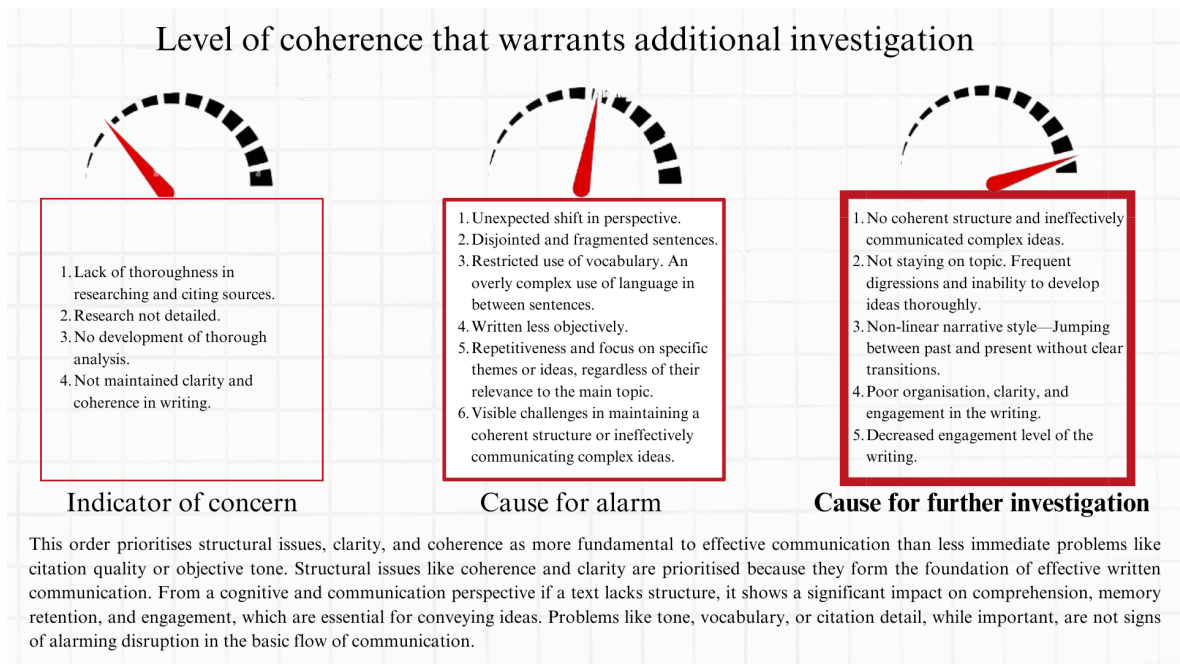


Figure 3: Progressive increase of linguistic markers of trauma in students' academic writing

4.1 Trauma Informed Pedagogy Framework

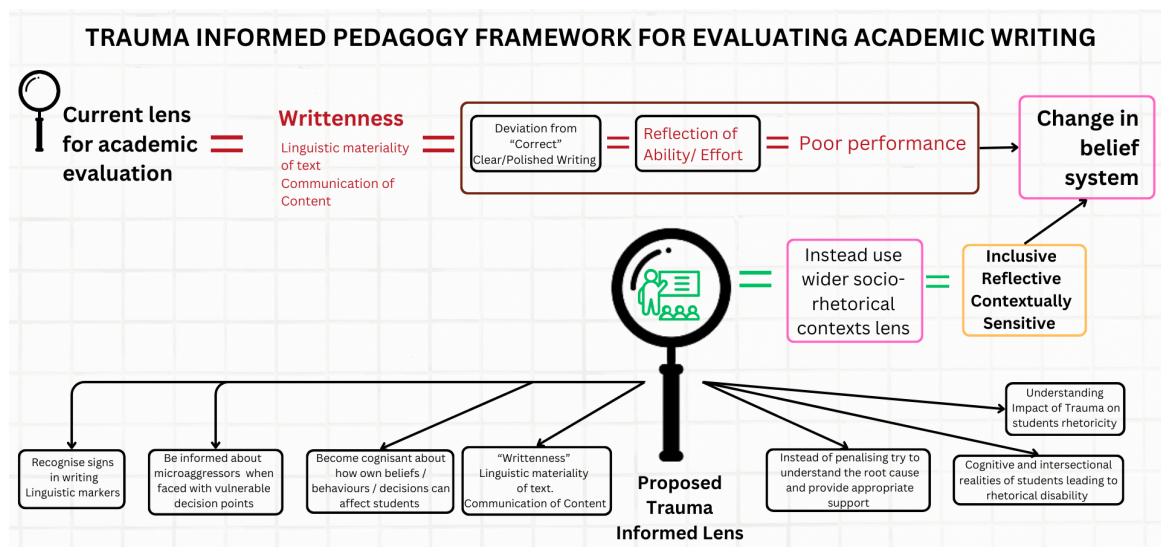


Figure 4: Framework for Trauma Informed Pedagogy

Figure 4 shows the proposed trauma informed pedagogy framework whereby the current academic lens through which student work is viewed should be extended to incorporate a wider perspective and understanding than simply writtenness. Educators need to be trained to recognise the signs of trauma in student writing and to consider these in an appropriate context that includes their own biases. Using a wider, socio-rhetorical context for their lens should ultimately enable them to respond with sensitivity and support rather than penalise. This contextual sensitivity encourages reflection and increased inclusivity.

The implementation of this framework is not without challenges. We propose that NLP software could be used to alert academics to potential difficulties being experienced by their students. However, the current landscape of research on mental illness detection using machine learning methods is fragmented, with a lack of standardised datasets and methods. This fragmentation makes it difficult to compare findings across studies and apply them consistently in educational settings. Moreover, the notion of "writtenness", which emphasises the importance of the writing process itself rather than the content alone, complicates the task of evaluating student work through an academic lens.

The reductive biomedical model of trauma locates the problem to be solved within the learners themselves (Pyscher & Crampton, 2020). It is imperative to understand this approach as one possible framing, considering that the way a problem or issue is framed delineates a range of possible solutions. The thinking flowing from this framework argues that learners who do not succeed in school fail as a result of the traumas they have experienced; if educators pay attention to trauma and self-regulation, children will excel and achieve. A trauma-informed pedagogical lens can interrupt what has come to be known as the school-to-prison-pipeline, and offer necessary support to students. Within this framing, the “problem behaviours” of students can be adapted into more positive coping mechanisms, and this focus on self-regulation will lead to academic and social success (Pyscher & Crampton, 2020).

Trauma-informed approaches have the potential to offer supportive learning opportunities for students when grounded in sociocultural understandings of trauma, its causes, and its effects. We argue that there must be renewed attention paid to sociocultural factors, particularly through a focus on student’s meaning-making around traumas they have experienced as well as their experiences of enacted trauma-informed pedagogies. As language instantiates culture and narratives are shared within and shaped by cultural contexts, a focus on students’ narratives can help shift trauma-informed pedagogy from a focus on a deficit-laden individual learner to a focus on students’ experiences and ecologies (Pyscher & Crampton, 2020).

It is important to emphasise that faculty members, tutors, and institutional staff are not solely responsible for the oversight of students in distress. Due to privacy protection regulations such as the General Data Protection Regulation (GDPR), there is limited interdepartmental access to student information. Academic staff do not have full visibility of a student’s educational patterns or past academic performance, unless the student is deemed a harm to themselves or others. This fragmentation of information, coupled with the compartmentalised nature of academic work assessment which is conducted by a range of faculty members, teaching assistants, and other evaluators makes it challenging to recognise potential signs of distress, particularly when assignments are reviewed in isolation. There are also frictions within academic institutions regarding the evaluation of student writing. These frictions often arise from differing perspectives between those who teach writing (writing instructors or tutors) and discipline-based academics (subject matter experts or professors). This division can lead to misunderstandings and conflicts over how student writing should be assessed, particularly when it comes to balancing content with form, viewing these elements as indicators of intellectual rigor and competence. This focus on form can lead to an overemphasis on surface-level issues at the expense of understanding the student’s broader context and the challenges they may be facing.

4.2 Developing an NLP Model

Text analysis of student chat interactions from digital learning platforms would offer valuable insights into student sentiment and mental health concerns during their academic journey. However, ethical considerations must guide the use of such systems. Personal identifiers should be anonymised to protect privacy while enabling meaningful analysis. Clear communication with students about how their data will be used is essential, with informed consent being a key prerequisite. Furthermore, analysis models should be rigorously evaluated to ensure they are free from biases that could result in unfair targeting or misinterpretation of student needs. While AI is increasingly integrated into higher education systems for educational purposes, only a small percentage of institutions view it as a tool for long-term institutional medical intervention development.

The advancement of NLP in education, particularly for mental health interventions, requires large, secure datasets that balance privacy with the need for data accuracy and representativeness. Given the potential for reidentification of even de-identified transcripts, privacy concerns remain significant. Nonetheless, the development of ethical frameworks and guidelines, particularly in terms of meta-learning and the creation of large corpora, will be essential (Malgaroli et al., 2023). Beyond healthcare, advances in areas like social media studies and electronic health records demonstrate the potential for NLP in mental health research. Continued collaboration between educators, developers, and mental health professionals will be essential to developing methods that capture the sequential, context-dependent nature of interventions required (Quillivic et al., 2024). NLP methods show promise in supporting large-scale text analysis for tasks such as information extraction, sentiment analysis, emotion detection, and mental health surveillance. This collaboration, supported by secure datasets, fairness checks, and a common language, has the potential to revolutionise the assessment and treatment of mental health conditions in educational contexts (Zhang et al., 2023).

Detecting mental illness from text is being framed as a text classification or sentiment analysis task, where NLP techniques can be leveraged to automatically identify early indicators of mental illness, supporting early

detection, prevention, and treatment. The advantage of supervised learning lies in the model's ability to learn patterns from labelled data, ensuring better performance. Researchers have already developed a deep multi-task method that models emotion recognition as the primary task and depression detection as the secondary task (Quillivic et al., 2024) (Figure 5).

One of the primary challenges emerging in the educational domain is the increasing use of AI by students to enhance their academic writing. By leveraging AI to generate assignment content or correct their writing deficiencies, students are submitting work that is not entirely their own. This practice complicates the detection of linguistic markers indicative of poor mental health, as the AI-generated text masks the students' authentic writing patterns. As a result, identifying signs of mental distress becomes significantly more difficult, hindering early intervention and support efforts in educational contexts.

Reinforcement learning has also been applied to depression detection, enabling the model to focus more on relevant information by selecting indicator posts. This can also be done for detecting signs of trauma in students AI assisted academic writing by applying reinforcement learning to symptom detection wherein the model would be trained to identify and focus on the most relevant or informative data (indicator posts) related to trauma, while minimising attention to less useful or noisy data (Reinforcement learning would work by providing the model with feedback on its decisions—rewarding it for selecting posts that are strong indicators of Trauma and penalising it for choosing irrelevant or misleading data. Then instead of analysing every piece of text equally, the model would learn to prioritise specific patterns, phrases, that are more likely to indicate Trauma symptoms, improving the model's efficiency and accuracy. This approach would help refine the detection process, allowing the model to better distinguish between useful signals and irrelevant noise in large text datasets.



Figure 5: Proposed NLP method

Automated systems could provide a holistic view of student academic performance by integrating data from multiple modules and student records as shown in Figure 6. This would enable faculty and staff to raise alerts, offer academic advising, monitor student engagement, and refer students to appropriate resources through a unified, virtual system (Wu et al., 2023). NLP models, which have been used to assess clinical presentations, responses to interventions, and therapeutic dynamics, could address some of these challenges. However, current models face limitations such as linguistic homogeneity, limited reproducibility, and population bias, underscoring the need for more inclusive and reproducible approaches when developing an NLP model.

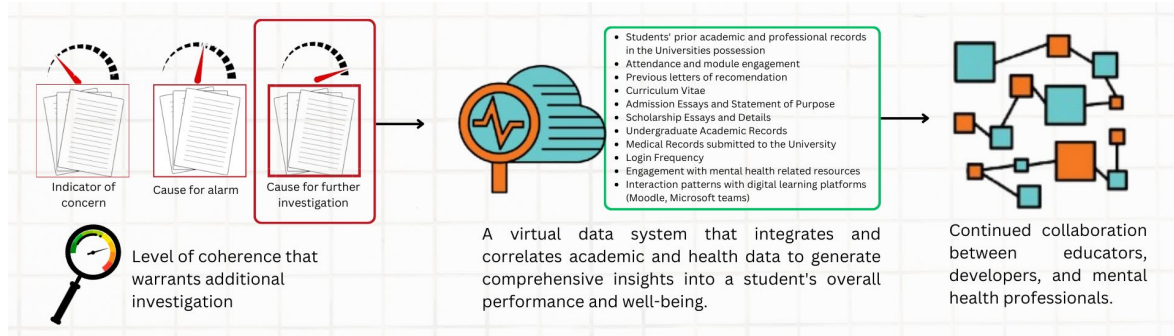


Figure 6: Proposed Virtual system

5. Discussion

To foster an optimal learning environment, we need to pay attention to emotions and how the learner is feeling, as learning cannot take place in the absence of emotion. The brain chooses which aspects of its perceptions to pay attention to, and how to make decisions about them, by assigning emotional importance to them (Imad, 2022). The educator's tone, the lesson, the assessment—all of these are external perceptions that the brain has to process, and it will process them according to the emotional state they produce. Emotions play the centre role in every human experience, especially affecting the learning experience (Imad, 2022).

Emotions and distress can present themselves through changes in language styles and patterns and these can be used as markers to detect the presence of distress (Markowitz, 2022). We have proposed a framework that expands the lens of traditional academic evaluation and considered the use of NLP to support this in academia.

Trauma-informed pedagogy does not require that the educator has training in social work or clinical psychology. Educators are not meant to diagnose or treat their students. Trauma-informed pedagogy does not mean that there are no rules, and students can “get away” with anything. It instead provides students with clear frameworks to follow, as the brain naturally thrives on structure. Trauma-informed pedagogy is not synonymous with lowered academic expectations. On the contrary, using the lens of trauma-informed education allows educators to challenge students academically to reach their full potential while being

responsive to their individual needs. Using a trauma-informed lens not only benefits students who have experienced trauma, but also improves the learning of all students, as it would inevitably create a supportive, safe, and predictable learning environment enhancing engagement and emotional regulation for all. Since the focus of any teaching practice would shift to creating a sense of trust and security in the classroom, it would reduce anxiety and distractions allowing students to focus on their academic growth. Trauma-informed strategies foster inclusivity and adaptability, enabling diverse learning needs to be met, improving outcomes for all students, not just those with a history of trauma.

Teaching through a trauma-informed lens was warranted before the pandemic and is relevant even more now (Imad, 2022).

This framework underscores the importance of a holistic view of student development—one that integrates academic and emotional well-being. The significance of this framework lies in its ability to address the often-overlooked link between mental health and academic performance. Traditional academic assessments focus primarily on content, often neglecting the linguistic markers that may signal a student's struggle with trauma. This oversight can lead to missed opportunities for intervention, particularly in higher education settings where students may not voluntarily disclose their mental health challenges. By systematically analysing written work for indicators of PTSD such as disjointed structure, non-linear narratives, and repetitive focus on certain themes educators can gain insights into a student's mental state and provide necessary support.

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Enhancing Student Engagement Through Problem-Based Learning: A Case of the Built Environment

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Abstract: In the rapidly evolving field of the Built Environment, traditional teaching approaches often fall short in preparing students for the complex, real-world challenges they will face in their professional careers. Problem-Based Learning (PBL) has emerged as a powerful pedagogical approach that promotes active learning and student engagement by encouraging learners to collaboratively solve real-life problems. This study explores the impact of PBL on student engagement within the Built Environment at the institutions of higher learning in particular the University of Technologies. The purpose of this research is to investigate how PBL can be effectively implemented to enhance active learning and foster deeper student engagement. This study adopted a qualitative research approach employing a systematic literature review (SLR) methodology, focusing on academic sources published between 2010 and 2024. The gathered data was synthesized using thematic analysis, wherein major themes and patterns were identified within the literature. Key themes such as collaborative learning, critical thinking, and real-world application were identified. The findings reveal that PBL not only increases student engagement but also enhances critical thinking and problem-solving skills, which are essential for success in the Built Environment sector. The study also highlights challenges, including the need for facilitator training and the development of appropriate assessment strategies to support the successful implementation of PBL. The implications of this study are significant for educators and administrators in higher education. By integrating PBL into the curriculum, the University of Technology can better prepare its students for the demands of the modern workforce, fostering a learning environment that promotes both academic excellence and practical skills development. This research contributes to the growing body of literature on active learning in higher education and provides a framework for implementing PBL in the Built Environment department, with potential applicability across other disciplines.

Keywords: Collaborative learning, Critical thinking, Curriculum innovation, Higher education, Real-world application

1. Introduction

The built environment is a critical sector where professionals are required to integrate technical expertise with the ability to solve complex, real-world problems. Traditional lecture-based teaching methods in higher education have been increasingly criticized for their failure to adequately prepare students for the dynamic and interdisciplinary nature of this field (Baeten et al., 2016; Bovill, 2020). These conventional approaches often lead to passive learning, where students are less engaged and more focused on memorization rather than application and critical thinking (Reeve and Tseng, 2011; Tadesse et al., 2021).

Active learning strategies, such as Problem-Based Learning (PBL), have emerged as effective methods to enhance student engagement and improve learning outcomes. PBL is a student-centered pedagogy that places learners in real-world problem-solving scenarios, encouraging them to collaborate, think critically, and apply knowledge in practical contexts (Barrows, 2018; Dolmans et al., 2016). This approach has been shown to significantly enhance not only student engagement but also their retention of knowledge and development of critical skills (Galand et al., 2019; Xie and Derakhshan, 2021).

In the context of the built environment, where interdisciplinary collaboration and problem-solving are paramount, PBL offers a particularly relevant and effective teaching strategy (Mulder et al., 2022). However, despite the recognized benefits of PBL, its adoption within built environment education remains inconsistent. Many institutions still rely heavily on traditional lecture-based methods that do not fully engage students or prepare them for the complexities of professional practice (Walker et al., 2019; Wijngaards-de Meij and Merx, 2018).

This study seeks to explore the impact of PBL on student engagement within the Built Environment department at the University of Technology. By conducting a systematic literature review and thematic analysis, this paper examines the effectiveness of PBL in enhancing active learning and provides actionable insights for educators looking to integrate PBL into their curricula. The findings are intended to guide educators and administrators in implementing strategies that better prepare students for the complex challenges of careers in the built environment.

2. Literature Review

2.1 Overview of Active Learning

Active learning has gained prominence in higher education as a strategy that significantly improves student engagement and learning outcomes compared to traditional lecture-based approaches. Active learning involves instructional methods that engage students in the learning process directly, encouraging them to participate in discussions, problem-solving, and higher-order thinking activities (Freeman et al., 2014). These methods include collaborative learning, case-based learning, peer teaching, and Problem-Based Learning (PBL), among others. The effectiveness of active learning has been well-documented, with studies indicating that students in active learning environments demonstrate better understanding and retention of material, increased motivation, and improved critical thinking skills (Prince, 2004; Deslauriers et al., 2019).

Research by Theobald et al. (2020) highlighted that active learning not only improves academic performance but also helps reduce achievement gaps among students from diverse backgrounds. This is particularly relevant in fields like the built environment, where students must integrate technical knowledge with practical problem-solving skills. The incorporation of active learning strategies is essential to prepare students for the complexities of real-world scenarios they will encounter in their professional lives (Machemer and Crawford, 2007). However, the transition from traditional to active learning methods poses challenges, including the need for faculty development and changes in institutional culture (Michael, 2006).

2.2 Problem-Based Learning (PBL) in Higher Education

Problem-Based Learning (PBL) is one of the most prominent active learning strategies employed in higher education. Originating in medical education, PBL has since been adopted across various disciplines due to its effectiveness in promoting deep learning and student engagement (Dolmans et al., 2016). PBL involves students working in small groups to solve complex, real-world problems, with the instructor acting as a facilitator rather than a traditional lecturer (Barrows, 2018). This approach encourages students to take ownership of their learning, develop critical thinking skills, and apply theoretical knowledge to practical situations (Hmelo-Silver, 2004).

The effectiveness of PBL has been demonstrated in numerous studies. For instance, Loyens et al. (2015) found that students engaged in PBL environments exhibit higher levels of intrinsic motivation and better learning outcomes compared to those in traditional settings. Additionally, research by Walker and Leary (2009) revealed that PBL is particularly effective in enhancing students' problem-solving abilities and preparing them for the interdisciplinary challenges of the modern workforce. However, the implementation of PBL also presents challenges, including the need for significant faculty training, the development of appropriate assessment methods, and the adaptation of curricula to support this learning approach (Ertmer and Simons, 2006; Bendermacher et al., 2023).

2.3 Challenges and Opportunities in Built Environment Education

The built environment is a field that inherently requires interdisciplinary knowledge and practical problem-solving skills. However, traditional educational methods in this field have often been criticized for their inability to fully prepare students for the complexities of professional practice (Mulder et al., 2022). Built environment education has historically relied on lecture-based instruction, which tends to focus on the transmission of technical knowledge rather than the development of critical thinking and problem-solving skills (Walker et al., 2019).

PBL offers a promising alternative by aligning educational practices with the needs of the built environment sector. By engaging students in real-world problem-solving activities, PBL helps them develop the skills necessary to address the complex challenges they will encounter in their careers (Wijngaards-de Meij and Merx, 2018). However, the adoption of PBL in built environment education is not without its challenges. These include resistance to change among faculty, the need for extensive curriculum redesign, and the requirement for resources to support group work and project-based activities (Moghayedi et al., 2021).

Despite these challenges, the opportunities presented by PBL in built environment education are significant. PBL can enhance students' ability to integrate technical knowledge with practical application, improve their collaboration and communication skills, and better prepare them for the interdisciplinary nature of the built environment sector (O'Connor et al., 2021). Furthermore, PBL aligns well with the growing emphasis on sustainability and innovation in the built environment, providing students with the skills needed to address these critical issues (McLaren et al., 2020).

2.4 Theoretical Framework

The theoretical underpinnings of PBL are rooted in constructivist learning theories, which emphasize the active role of learners in constructing their own knowledge (Piaget, 1970; Vygotsky, 1978). Constructivism posits that learners build new understandings based on their experiences and interactions with the world, making it particularly relevant to PBL, where students engage in problem-solving activities that require them to apply and integrate knowledge (Jonassen, 2014). PBL also draws on the theory of social constructivism, which highlights the importance of collaboration and social interaction in the learning process (Vygotsky, 1978).

Another key theoretical framework that supports PBL is experiential learning theory, developed by Kolb (1984). Experiential learning theory emphasizes learning as a process that involves concrete experience, reflective observation, abstract conceptualization, and active experimentation. PBL aligns with this theory by providing students with opportunities to engage in real-world problem-solving, reflect on their experiences, and apply their learning in new contexts (Kolb and Kolb, 2005).

Cognitive load theory also plays a role in understanding the effectiveness of PBL. This theory suggests that learning is most effective when the cognitive demands placed on learners are balanced with their capacity to process information (Sweller, 2010). PBL, by engaging students in meaningful, context-rich problems, helps manage cognitive load by breaking down complex tasks into more manageable components, thereby enhancing learning outcomes (Kirschner et al., 2006).

3. Methodology

3.1 Search Strategy

To explore the impact of Problem-Based Learning (PBL) on student engagement within built environment education, a Systematic Literature Review (SLR) was conducted. The SLR process was designed to ensure a comprehensive and unbiased synthesis of existing research on the topic. Following the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines (Moher et al., 2009), a structured search strategy was developed to identify relevant studies.

The literature search was conducted across multiple academic databases, including Scopus, Web of Science, ERIC, and Google Scholar, covering studies published between 2004 and 2024. The search terms used included combinations of keywords such as "Problem-Based Learning," "PBL," "student engagement," "built environment education," and "higher education." Boolean operators (AND, OR) were utilized to refine the search results. The initial search yielded 342 articles. These articles were screened removal of duplicates.

3.2 Inclusion and Exclusion Criteria

To ensure the relevance and quality of the studies included in the review, specific inclusion and exclusion criteria were established. The inclusion criteria were: (1) studies published in peer-reviewed journals, conference papers, or book chapters; (2) studies focused on PBL and student engagement within higher education, with a particular emphasis on built environment disciplines; (3) studies providing empirical data or substantial theoretical contributions; and (4) publications available in English. Exclusion criteria included: (1) studies that did not directly relate to PBL or were outside the context of higher education; (2) studies that focused on educational contexts without clear implications for the built environment; and (3) non-peer-reviewed articles, such as opinion pieces or editorials.

Following the application of these criteria, the initial pool of 342 articles was narrowed down to 84 articles for full-text review. Ultimately, 32 studies met the inclusion criteria and were selected for the final analysis. These studies were systematically reviewed to identify recurring themes and key findings related to the implementation and impact of PBL on student engagement.

3.3 Data Extraction and Synthesis

Data extraction was systematically conducted using a standardized data extraction form to ensure consistency across all included studies. Once the data were extracted, a thematic synthesis was performed to identify and analyze patterns across the studies. Thematic analysis, as described by Braun and Clarke (2006), was used to code the data and identify recurring themes related to the implementation and impact of PBL on student engagement.

The analysis process involved multiple stages: first, a descriptive synthesis of the findings from each study was conducted; second, thematic analysis was used to identify recurring themes; finally, these themes were

synthesized to draw conclusions about the overall impact of PBL on student engagement. The findings from the thematic analysis informed the discussion of the implications for built environment education and provided a foundation for the recommendations made in this study.

4. Findings and Discussion

4.1 Thematic Findings

The thematic analysis of the selected studies revealed several key themes related to the implementation of Problem-Based Learning (PBL) in Built Environment education. The primary themes identified were collaborative learning, critical thinking, and real-world application.

Theme 1: Collaborative Learning:

Collaborative learning emerged as a cornerstone of the Problem-Based Learning (PBL) approach, particularly within Built Environment education. The essence of PBL lies in students working together in small groups to solve complex, real-world problems (Barron and Wells, 2013). This collaborative aspect of PBL not only encourages peer-to-peer interaction but also enhances the learning experience by fostering a shared understanding of the subject matter. Through collaboration, students are exposed to diverse perspectives and ideas, which broadens their thinking and deepens their comprehension of the material (Mulder et al., 2022).

The reviewed studies consistently highlighted that students engaged in PBL environments develop stronger communication and teamwork skills. For instance, Walker and Leary (2009) noted that students in PBL settings were more likely to engage in meaningful discussions, offer constructive feedback to peers, and collectively brainstorm solutions to problems. This collaborative process helps students to articulate their ideas clearly and consider alternative viewpoints, which is critical in the Built Environment sector where projects often involve interdisciplinary teams (Masrinah et al., 2019).

Moreover, collaborative learning within PBL settings enhances social learning, where students learn from each other's experiences and expertise. This peer-learning dynamic creates a supportive learning environment that boosts student confidence and motivation. For example, Galand et al. (2019) found that students who participated in collaborative PBL activities were more engaged and performed better academically compared to those in traditional, individual-based learning settings. The opportunity to work closely with peers also helps students develop interpersonal skills that are essential for professional practice, such as conflict resolution, leadership, and adaptability (Noor and Nurhayati, 2024).

Theme 2: Critical Thinking:

Critical thinking is another vital outcome of PBL, as it requires students to go beyond rote memorization and engage deeply with the content. In PBL settings, students are challenged to analyze information, evaluate evidence, and make informed decisions, which enhances their critical thinking abilities. The process of solving real-world problems in PBL requires students to consider multiple solutions, assess the feasibility of each option, and justify their choices based on logical reasoning and evidence (Dolmans et al., 2016).

The studies reviewed indicate that PBL environments are particularly effective in cultivating critical thinking skills because they mimic the complexities of real-world scenarios where there is often no single correct answer. Loyens et al. (2015) observed that students in PBL courses developed a stronger ability to critically assess the validity of different sources of information and to synthesize knowledge from various disciplines (Razak et al., 2022). This skill is particularly important in the Built Environment sector, where professionals must navigate complex projects that require the integration of technical knowledge, ethical considerations, and practical constraints (Lauridsen, 2012; Masek, 2012).

In addition, PBL encourages students to reflect on their own learning processes, which further enhances critical thinking. By engaging in self-reflection and group discussions, students learn to question assumptions, recognize biases, and develop a more nuanced understanding of the subject matter. Moghayed et al. (2021) found that students who participated in PBL were more adept at identifying gaps in their knowledge and seeking out additional resources to fill those gaps, which is a key aspect of critical thinking.

Theme 3: Real-World Application:

One of the most significant advantages of PBL is its emphasis on real-world application. In PBL settings, students are presented with problems that are directly relevant to their future careers, which helps them see the practical value of their education. This connection between classroom learning and real-world practice enhances student

motivation and engagement, as they understand that the skills and knowledge they are developing will be directly applicable in their professional lives (O'Connor et al., 2021).

The studies reviewed highlighted that PBL's focus on real-world problems helps students develop practical problem-solving skills that are essential in the Built Environment sector. For example, McLaren et al. (2020) found that students who engaged in PBL activities were better prepared to handle the complexities of real-world projects, such as managing budgets, working within regulatory frameworks, and addressing sustainability concerns. By working on authentic projects, students gain hands-on experience that bridges the gap between theoretical knowledge and practical application (Kokotsaki et al., 2016).

Furthermore, PBL allows students to simulate professional roles and responsibilities, which provides them with valuable insights into the demands of their chosen careers. In a study by Wijngaards-de Meij and Merx (2018), students who participated in PBL projects reported a greater understanding of the interdisciplinary nature of Built Environment work and felt more confident in their ability to collaborate with professionals from other fields. This real-world application of knowledge not only enhances student learning but also better prepares them for the workforce, where they will be expected to apply their skills in complex, dynamic environments (Noor and Nurhayati, 2024).

To illustrate the impact of PBL on student engagement, Table 1 provides a summary of the key findings from the reviewed studies.

Table 1: impact of PBL on student engagement

<i>Themes</i>	<i>Impact on Student Engagement</i>	<i>Supporting Studies</i>
<i>Collaborative Learning</i>	Increased peer interaction, enhanced teamwork and communication skills	Mulder et al. (2022); Galand et al. (2019); Bendermacher et al (2023); Masrinah et al (2019); Noor and Nurhayati (2024).
<i>Critical Thinking</i>	Development of analytical skills, ability to evaluate and justify solutions	Dolmans et al. (2016); Loyens et al. (2015); Allison and Pan (2011); Lauridsen (2012); Masek (2012); Bendermacher et al (2023); Masrinah et al (2019); (Razak et al., 2022)
<i>Real-World Application</i>	Higher motivation, improved retention of knowledge, relevance to professional practice	O'Connor et al. (2021); McLaren et al. (2020); Kokotsaki et al. (2016); Noor and Nurhayati (2024).

4.2 Interpretation of Findings

The findings from this study indicate that Problem-Based Learning (PBL) significantly enhances student engagement within the Built Environment education sector by promoting collaborative learning, fostering critical thinking, and facilitating real-world application. These outcomes are particularly noteworthy because they address the core competencies required in the Built Environment field, such as teamwork, analytical thinking, and practical problem-solving. The collaborative nature of PBL encourages students to engage deeply with their peers, which not only enhances their understanding of the subject matter but also mirrors the collaborative environment they will encounter in their professional careers (Noor and Nurhayati, 2024). This alignment between educational practice and professional demands is critical in preparing students for the workforce, where they must be able to communicate effectively, work within interdisciplinary teams, and navigate complex projects (Mulder et al., 2022).

Moreover, the emphasis on critical thinking within PBL is of particular importance given the complexity and multifaceted nature of Built Environment projects. Professionals in this field are often required to make decisions that involve balancing technical, environmental, and social considerations. The PBL approach, by challenging students to critically evaluate information, consider multiple perspectives, and justify their decisions based on evidence, helps to cultivate the analytical skills necessary for such decision-making. This development of critical thinking is not merely an academic exercise; it has practical implications for how students will approach real-world problems in their future careers (Masrinah et al., 2019). The ability to think critically and make informed decisions is essential for success in the Built Environment sector, where the consequences of poor decision-making can have significant impacts on project outcomes, client satisfaction, and sustainability (Dolmans et al., 2016; Moghayed et al., 2021).

In addition to enhancing critical thinking, PBL's focus on real-world application helps bridge the gap between theoretical knowledge and practical skills. This is particularly relevant in-Built Environment education, where students must be able to apply what they learn in the classroom to real-world scenarios (Allison and Pan, 2011).

By engaging with authentic problems that professionals in the field face, students gain hands-on experience that is directly applicable to their future careers. This experiential learning not only increases student motivation and engagement but also helps them develop a deeper understanding of the complexities involved in Built Environment projects (Razak et al., 2022). The findings suggest that students who participate in PBL are better equipped to handle the challenges they will encounter in the workplace, as they have already practiced applying their knowledge in realistic contexts during their studies (O'Connor et al., 2021; McLaren et al., 2020).

Furthermore, the study highlights that the benefits of PBL extend beyond individual student outcomes to impact the broader educational environment. The active, student-centered nature of PBL fosters a more dynamic and interactive classroom atmosphere, where students are encouraged to take ownership of their learning. This shift from passive to active learning not only enhances student engagement but also transforms the role of the educator from a transmitter of information to a facilitator of learning. This transformation is particularly important in the context of Built Environment education, where the ability to adapt to changing conditions and work collaboratively with others is critical. By adopting PBL, educators can create a learning environment that better reflects the realities of professional practice, ultimately leading to more effective preparation for students entering the workforce (Walker and Leary, 2009; Wijngaards-de Meij and Merx, 2018).

4.3 Comparison With Existing Literature

The results of this study are consistent with existing research on the benefits of PBL in higher education. Previous studies have similarly found that PBL enhances student engagement, critical thinking, and practical skills (Barrows, 2018; Hmelo-Silver, 2004). However, this study adds to the literature by specifically focusing on the Built Environment sector, highlighting the unique advantages of PBL in preparing students for the interdisciplinary and practical demands of this field. While some studies have noted challenges in implementing PBL, such as the need for facilitator training and the development of appropriate assessment strategies (Dolmans et al., 2016), the overall benefits for student engagement and learning outcomes are well-supported.

4.4 Implications for Practice

The findings of this study have several practical implications for educators and institutions in the Built Environment sector:

- ***Facilitator Training:*** Successful implementation of PBL requires that facilitators are adequately trained to guide student learning without taking over the problem-solving process. Institutions should invest in professional development programs that equip educators with the skills needed to facilitate PBL effectively (Moghayedi et al., 2021).
- ***Curriculum Design:*** Integrating PBL into the curriculum requires a shift from traditional lecture-based instruction to more student-centred approaches. This may involve redesigning courses to include PBL modules that align with industry practices and real-world challenges (O'Connor et al., 2021).
- ***Assessment Strategies:*** Developing appropriate assessment methods is crucial for evaluating student performance in PBL settings. Assessments should focus not only on the final product but also on the process, including collaboration, critical thinking, and problem-solving skills (Dolmans et al., 2016).

4.5 Challenges and Limitations

Despite the positive outcomes associated with PBL, there are challenges and limitations to its adoption in Built Environment education. Resistance to change among faculty, the need for extensive curriculum redesign, and the resource-intensive nature of PBL are significant obstacles (Walker et al., 2019). Additionally, the effectiveness of PBL can be limited by inadequate facilitator training and the lack of appropriate assessment tools (Bendermacher et al., 2023). Future research should explore strategies to overcome these challenges and further investigate the long-term impact of PBL on student outcomes in the Built Environment sector.

5. Conclusion

The present study provides a comprehensive examination of the impact of Problem-Based Learning (PBL) on student engagement within Built Environment education. Through a systematic literature review and thematic analysis, the study identified that PBL significantly enhances student engagement by promoting collaborative learning, fostering critical thinking skills, and facilitating real-world application of knowledge. These findings underscore the effectiveness of PBL as an educational approach that aligns closely with the demands and complexities of the Built Environment sector. Additionally, the study highlighted the challenges associated with implementing PBL, including the need for effective facilitator training and the development of appropriate

assessment strategies, offering valuable insights for educators and institutions aiming to adopt this pedagogical method.

Despite the substantial benefits observed, there is a need for further research to deepen the understanding of PBL's long-term impact on student outcomes in Built Environment education. Future studies could explore the effectiveness of PBL across different cultural and institutional contexts, as well as its influence on students' professional competencies and career readiness over time. Investigating the integration of technology-enhanced PBL, such as virtual simulations and collaborative online platforms, may also provide insights into innovative ways to overcome existing implementation challenges and enhance learning experiences. Moreover, comparative studies between PBL and other active learning approaches could help delineate the specific conditions and contexts under which PBL is most effective.

The broader implications of adopting PBL in higher education are significant, extending beyond immediate educational outcomes to influence the development of a skilled and adaptable workforce. By engaging students actively in the learning process and equipping them with essential problem-solving and collaborative skills, PBL prepares graduates to navigate and address the complex challenges inherent in the Built Environment and related sectors. This pedagogical approach also contributes to fostering a culture of lifelong learning and adaptability, qualities that are increasingly important in today's rapidly changing professional landscapes.

In conclusion, PBL represents a transformative approach to higher education that aligns closely with the needs of the modern workforce. By promoting active engagement, critical thinking, and practical problem-solving skills, PBL equips students with the competencies necessary to succeed in their careers and contribute meaningfully to their fields. As higher education continues to evolve, the adoption of PBL and similar active learning strategies will be crucial in ensuring that students are not only prepared for the challenges of today but are also capable of shaping the future.

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Blended Learning Dependability and Perceived Usefulness: The Mediating Role of Organisational Commitment

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Abstract: To survive in the tight global higher education markets, universities must embrace new technological changes which can transform their education. The use of Information and Communication Technologies (ICTs) has become an integral part and a driver of the development agenda of many universities. Blended learning (BL), integrating face-to-face instruction with online components using Learning Management Systems (LMS), has emerged as a prominent educational model, offering flexibility and enhanced learning experiences in higher education settings. This study reports the adoption of BL among academics at the University of Botswana (UB) before the arrival of COVID-19. Even though technological changes such as BL are recognized as strategic tools used by many organizations, including universities, not much attention has been given to attitudinal behaviours such as Organizational Commitment (OC) despite their contribution to the successful technological adoption. This paper proposes a conceptual framework to explore the perceived usefulness of BL mediated by OC among academics at the UB. The study uses Socio- Technical Systems theory (STS), positing that instructors' perceptions of the usefulness of blended learning are influenced by both individual factors and organizational contexts. The study adopted an explanatory sequential mixed methods approach, involving a quantitative phase in which data was collected using a questionnaire in an online survey, followed by a qualitative case study that involved semi-structured face-to-face interviews. A multiple regression model for determining the mediating role of OC was developed. In the mediation model, OC fully mediated the relationships between Learning Management System Dependability (LMSD) and Perceived Personal Usefulness (PPU) and Perceived Usefulness to Students (PUS). The study used SPSS for its quantitative data analysis and adopted thematic analysis for its qualitative strand as a comprehensive process that allows for identification of numerous cross-references between the data and the research's evolving themes. The study contributes to the limited body of knowledge about the perceptions of BL of academic staff in a middle-income country, Botswana.

Keywords: University of Botswana, Blended learning, Perceived usefulness, Dependability, Organizational commitment, Mixed methods.

1. Introduction

An ever-evolving technology-rich environment has been cultivated as institutions identify and pursue strategies for increasing the use of digital learning tools in teaching and learning to meet students' high expectations (Oladiran and Uziak, 2009; Adekola, Dale and Gardiner, 2017). Delivery of education in these institutions is seen through LMSs that enhance the interaction between content, students and their lecturers beyond the classroom using visual components such as graphics, video and animation (Ismail and Salih, 2017). In short, LMSs are key enabling technology for "anytime, anywhere" access to learning content and administration. Individuals are also given the autonomy to decide where they want to learn, when they want to learn and how they want to learn. Today's students find it boring to listen to lecturers and fill in some worksheets manually in a classroom. Preference is given to other venues such as online learning, video games, home or workplace schooling or web communities and distance learning, all supported by media technologies (Dintoe, 2018).

Today's university learners, affectionately known as "millennials" have special needs (Wahab, Zain and Yunus 2018), they look forward to an engaging educational experience that allows them to explore, interact, collaborate in relevant, active, useful and fun filled ways that face-to-face and other traditional ways of teaching cannot offer. Many institutions of higher learning have therefore explored BL as a method where learners are responsible for their learning while teachers scaffold, coach, support and facilitate learning. LMS such as Blackboard and Moodle provide the opportunity to deliver satisfying BL approaches that combine ICT with various learning resources and delivery methods to provide efficient and seamless access to satisfying learning resources support communication and collaborative learning, as well as to enhance active, flexible and engaged learning that is accessible inside and outside the classroom (Wahab et al, 2018). UB as Botswana's flagship institution of higher learning has set itself out to adopt technology as an enabler with potential to achieve academic excellence to produce "competitive and productive workforce" (NDP 11, 2017: 117).

Even though a number of researchers (Batane and Motshegwe, 2012; Azar and Ciabuschi; 2017; Adekola et al 2017; Wahab et al, 2018; Gunawan, et al, 2023) recognize the importance of technological changes such as BL

as strategic tools used by many organizations to remain competitive, not much attention has been given to attitudinal behaviors such as OC and job satisfaction despite their contribution to the successful technological adoption. Even though OC has been viewed as an important factor to the success of organizational change (Nordin et al, 2013), previous studies have not specifically examined the link between BL as a specific technological change and OC. Similarly, the lack of theoretical or conceptual frameworks in past research dealing with the adoption of BL at UB leaves unanswered questions relating to its potential and what constitutes the determining factors of its adoption by academics. This paper therefore contributes to new knowledge by suggesting a model to explain behavioral intentions to adopt technology outside the influence of the COVID-19 crisis that forced academics to move from the traditional pedagogical approach to e-learning.

2. Literature and Research Model

2.1 Socio-Technical System Theory (STS)

Appelbaum (1997; 454) defines Socio-technical Systems theory as a system approach that focuses on the interdependence between and among people, technology and environment with the aim to optimize both the social and technical elements in organizations. The theory who some such as Baxter and Sommerville (2011) refer to as Systems theory was originally proposed by biologist Ludwig von Bertalanffy in 1928 (Batane and Motshegwe, 2013) and has been developed by many other theorists such as Eric Trist, Ken Bamforth and Frederick Emery (Appelbaum, 1997; Baxter and Sommerville, 2011) with the aim to guide work designing and employee involvement and has been adapted in various organizations. It views an organization as a system that has goals that it is intending to achieve using technology to gain competitive advantage and remain viable. The theory provides a model that helps to explain how the parts make up the unified whole and relate with one another to create a flexible customized model to fit the social network of the specific organization where a technological change such as BL is being introduced. This study aims to investigate how UB manages the use of technology in its teaching and learning. Appelbaum (1997; 452) argues that “STS theory is probably the most *extensive body of conceptual and empirical work underlying employee involvement and work design applications...*”, *that is used widely due to its generality and openness allowing easy use and continual improvement and revision.* The theory in this study is explored as a guide to understanding how the UB handles different aspects of the implementation of technology from the provision of technical resources to the ultimate outcomes produced because of technology use. The university is a unique institution in terms of location and culture in the local, regional and global educational system requiring that both its internal and external environments are explored to understand them.

2.2 Study Constructs

In this study, the working definition of blended learning (BL) is; the combination of web-based technologies into face-to-face learning sessions used together to present content across a group of diverse learners. Beliefs, perceptions and attitudes have been found to be critical in successful implementation of educational technologies (Lwoga, 2014). Hence this study assesses the relationship between perceptions and beliefs held by academics at UB as they adopt BL, testing whether this relationship is mediated by OC.

2.2.1 The dependent variables (Perceived Usefulness)

Perceived Usefulness (PU) is the most important predictor of behavioral intentions among the many variables that may influence the adoption of LMSs (Siregar, 2023). PU is the degree to which a person believes that using a particular technology would enhance his or her job performance. On the other hand, Lwoga (2014;9) defines Perceived usefulness as a perceptual indicator of the degree to which the stakeholder believes that using a particular system has enhanced his or her job performance, or his or her groups or organization performance. In this study, perceived usefulness relates to the degree to which academics believe that using the e-learning system shall improve the performance of their duties (named Perceived Personal Usefulness (PPU)) and improved the learning performances of students (named Perceived Usefulness to Students (PUS)). PU is often employed as an independent variable within most models that explain e-learning acceptance such as Technology Acceptance Model and Theory of Planned Behavior (Siregar, 2023). The current study similarly positions PU as a dependent variable but provides a new perspective and new insights by testing its influence in a model informed by STS theory.

2.2.2 The independent variable: Learning Management System Dependability (LMSD)

Technological change entails both hardware and software applications that support operations and decision making in the business (Alhomod and Shafi, 2013). The specific technological change that this study focuses on is BL achieved through Moodle and Blackboard LMSs that UB academics use in their teaching operations to supplement their face-to-face teaching. Dependability is one of the measures of user satisfaction (when the e-learning system offers what a user expected) which in turn has a significant positive relationship with continued use of LMSs. Lwoga (2014) suggest responsiveness, usability, availability, reliability, and adaptability are the desired characteristics of an e-learning system that enhance its dependability. In this study a dependable LMS (named Learning Management System Dependability (LMSD), is reliable, stable, secure, easy to use, adaptable and available for users all the time.

2.2.3 The mediating variable: Organizational Commitment (OC)

Organizational commitment (OC) is the degree to which an individual is involved in, and identifies with, an organization with a commitment to be a good worker, and to make maximum efforts in the interests of the organization (Suliman and Lles, 2000). This study adopts a multidimensional approach to the construct, that includes Affective Commitment (AC), Continuance Commitment (CC) and Normative Commitment (NC). The AC component of OC refers an employee's liking or psychological bond for an organization that comprises an affect for the social attachment to the organization, identification with the organization and involvement in the organization (Gunawan et al, 2023). CC assesses the intention to remain with the organization and engage in consistent lines of activities based on the individual's recognition or awareness of the rewards for staying and the cost associated with discontinuing the activity or leaving the organization (Indarti et al, 2017). Normative commitment represents the felt obligation to remain a member of an organization (Nordin et al, 2013; Indarti et al, 2017).

2.3 Proposed Study: The Mediating Role of Organizational Commitment

In the current study, the researcher isolates OC as a key ingredient that influences the successful implementation of BL as technological change initiative adopted by UB using Moodle and Blackboard LMSs. A mediator intervenes to explain the relationship between an independent and a dependent variable (Khan and Rasheed, 2015). Mediation explains how or why two variables are related. A variable may be termed as a mediator "to the extent that it accounts for the relation between the predictor and the criterion" (Baron & Kenny, 1986, p. 1176). A few studies are noted where organizational commitment is used as a mediator especially in the face of organizational change (Jiao and Zhao, 2013; Khan and Rashid, 2015; Garrido-Moreno, et al 2014; Gunawan et al, 2023). The relevance of such studies to the current study is also constrained because they were done outside educational settings (e.g Garrido-Moreno, et al 2014) are not technology related (Khan and Rashid, 2015; Gunawan et al, 2023) therefore, they cannot fully inform important considerations to make in determining acceptability of LMS in a university setting.

3. Methodology

3.1 Research Design

The researcher adopted a pragmatic worldview, suggesting that the pluralist approach enables the application of various methodological approaches (both quantitative and qualitative) to complement one another to generate rich data. The study adopted an explanatory sequential mixed methods approach, involving a quantitative phase in which data was collected using a questionnaire in an online survey, followed by a qualitative case study that involved semi-structured face-to-face interviews. The samples were drawn from academics at the UB's main campus located in Gaborone, the capital city of Botswana. A whole population sampling in which all academics received a link to the online survey instrument was used to collect data in the quantitative phase of the study. A total of 103 participants responded to the survey. Face-to-face interviews were conducted in the follow-up qualitative phase with 19 participants who were selected using convenience sampling. The study was conducted as a doctoral research project, and the data was collected before the onset of the COVID-19 pandemic.

3.2 Measurement of Variables

In the first, quantitative phase of the study, a questionnaire instrument with 100 questions, tagged UB_BL_adoption, was sent to participants via a SurveyMonkey link. The instrument was divided into five (5) sections. The first section consisted of 11 items measuring background information, including gender, age,

marital status, number of dependent children, citizenship, faculty, organizational tenure, employment status, educational level, rank and annual salary, each measured by 1 item. The second section measured three dimensions of OC; affective, normative and continuance commitment. Each dimension was measured with 6 items. The third section consisted of items measuring workload (6 items), work performance (2 items) and experience using blended learning (BL) (5 items). The fourth section measured perceived personal BL usefulness (10 items), perceived BL usefulness to students (7 items) and commitment to BL adoption (9 items) and requested respondents to compare blended learning and face to face learning (6 items) as well as indicate the challenges associated with BL adoption (6). The final section of the questionnaire requested academics to indicate the key factors influencing adoption of BL (20 items). The current study provides analysis relating to items on background information, perceived personal usefulness, Perceived usefulness to students, organizational commitment and the two items that formed the LMSD scale which were derived from the experience using BL scale. The UB_BL_adoption instrument was developed after reviewing literature to help in the framing of different questions that effectively covered the different aspects of the research questions. The items on the instrument included 18 items by Suliman and Lles (2000) measuring OC that have been validated by several research experts and checked for reliability. The items were changed to suit the context.

4. Results

Following data collection through a SurveyMonkey web-link, the responses were exported into the Statistical Package for Social Science (SPSS) 24 for analyses. Most items had loadings that were more than the minimum favorable level of 0.7. Perceived Personal Usefulness achieved 0.914, Perceived Usefulness to Students (0.899) and LMS Dependability (0.853). Even though the overall loading for the OC scale was 0.826, the loading for NC was only 0.496 as compared to those of AC (0.793) and CC (0.833) that were both favorable. A possible explanation for this case could be that suggested by Barclay, Higgins and Thompson (1995), that the loadings may be lower for an instrument developed under a specific context and applied in a different context. Out of the 103 respondents sampled, the majority were female (55.1%), more than half (53.8%) were aged between 40-54 years. Most of the respondents were married (73%), more than half (56.2 percent) were in possession of doctorate degrees, the larger majority (64%) had two, one or no dependent children and 76.4% were citizens of Botswana. Of the seven (7) university faculties, the majority (28.1%) were based in the faculty of Social Sciences and the majority were pensionable employees (63.5%).

4.1 Perceived Usefulness

The results on a 5-point Likert scale (ranging from (1) Strongly Agree, (2) Agree, (3) Neutral (4) Disagree (5) Strongly Disagree) showed that most respondents perceived BL to have personal usefulness for them. In 9 out of 10 items, the average of those who “strongly agreed” and those who “agreed” with the statements was 71.9% with some items having scores more than 80%. For example, a larger majority (86.5%) responded positively that “BL is a good source for teaching and learning” and another majority (84.3%) said that “they will continue using BL”. In addition, respondents were asked to specify their level of agreement with statements on the perceived usefulness of BL to their students. In general, the sub-scale achieved favourable responses to items such as “BL facilitates inside and outside classroom learning” and “BL provides learners with access to knowledge resources very easily” with combined scores of “strongly agree” and “agree” of (86.5%) and (82.0%), respectively. The thematic analysis of participant’s perceptions about BL yielded 110 units which produced twelve categories that were further grouped under 3 themes named (1) “advantages of BL” (2) “disadvantages of BL” and (3) “the future of BL”.

The data on the respondents’ perceptions of benefits of BL to students fell under the theme “Advantages of BL” and was made-up of four sub-categories: (1) independent learning and performance, (2) learning style and efficiency, (3) interaction and accessibility and (4) content delivery. Participants argued that students’ exposure to IT enhanced the skills that students acquired. Hence, they were able to learn on their own and contribute to a successful learning experience. The following words of one of the participants underline this view;

“The use of multimedia certainly breaks monotony associated with the lecturer-centered approach. When using the video clips, the students will be focusing of a certain scenario, and it makes the class very lively, and this is the stuff they can watch repeatedly at their own time”

Even though most participants were optimistic about the BL mode, some complained that the system at times caused inconveniences due to internet interruptions, limited infrastructural resources and malfunction of the system. Inadequate infrastructure, together with other problems, bandwidth and connectivity limitations

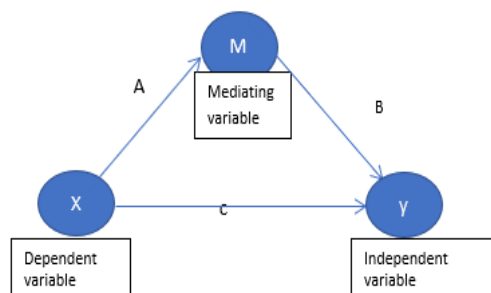
created unnecessary pressure and discouraged both participants and their students from using BL. Despite the highlighted disadvantages, participants were convinced that for BL should be given strategic consideration for UB to reach the goal of becoming a leading center of academic excellence in Africa and the world. Participants said that the tertiary landscape around the world is becoming more and more competitive and said that the UB should join the race given that, even locally there are many institutions that are being established which are already capitalizing on technology. UB as one of the biggest institutions in Botswana, should be looking to adopting BL to be able to compete with or lead other institutions and achieve its vision.

4.2 Learning Management System Dependability (LMSD)

LMSD, which captured respondent's experiences with BL teaching was measured using 2 items "I do not enjoy using e-learning environment for teaching purposes" which was reverse coded and "I believe using online instruction is useful for teaching". Results showed that 91% of the respondents either "agreed" or "strongly agreed" that they found online instruction to be useful for teaching while another 76.4% either "strongly disagreed" or "disagreed" to the reverse coded statement "I do not enjoy using e-learning environment for teaching purposes".

4.3 Mediation

The descriptive analysis revealed that academics at UB were highly committed to the university (OC 64.8%, AC 68.8%, CC 63.4% and NC 62.2%). Exploratory factor analysis using principal component method of analysis was used to determine correlations and factor clustering among variables in the OC scale and varimax rotation for all three scales (AC, CC, and NC) was done as suggested by Joiner and Bakalis (2006). The analysis produced a six-factor model, mostly from the AC scale (4 items) while the other dimensions, CC and NC scales had one item each. The criterion used for extraction was Eigenvalue of .3.5. The results justify the multi-dimensionality of OC as it pertains to the context of UB, hence the three dimensions were used for further regression analysis to test for the mediating role of OC on the adoption of BL as shown on figures 1 and 2 derived from (Baron and Kenny, 1986).



Figures 1: Model of mediation testing

The representations of the mediation relationship can be tested following the four steps proposed on figure 2 and displayed on figure 1 as guided by Baron and Kenny (1986). Several regression analyses are conducted, and significance of the coefficients is examined at each step by testing the relationships. Since the study consisted of two dependent variables and one independent variable, two linear regression analysis models had to be undertaken to test if;

- OC mediated the relationship between LMSD and PPU
- OC mediated the relationship between LMSD and PUS

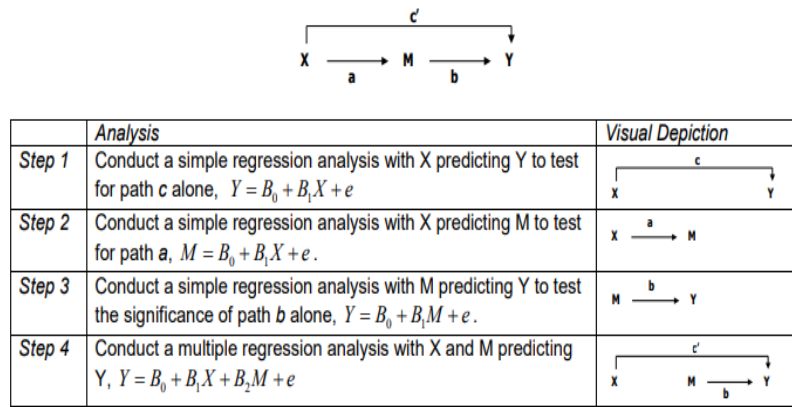


Figure 2: Mediation testing steps

The results of the first mediation test that examined OC as a mediator of the relationship between PPU and LMSD are presented on table 1. PPU has a statistically significant relationship ($\beta=0.748$, $p<0.05$) with the mediator variable (OC), lending support for the first condition of mediation. PPU further has a statistically significant relationship with the dependent variable, LMSD ($\beta=0.186$, $p<0.05$), lending support for the second condition of mediation. The mediator variable, OC has a statistically significant relationship with the dependent variable ($\beta=0.464$, $p<0.05$), lending support for the third condition of mediation. When using both OC and PPU as independent variables, the effect of OC, mediator (M) on LMSD is statistically significant hence supporting the mediation between PPU (X) and LMSD (Y). A reasonable R^2 value (44.0%) is noted suggesting that the mediation model (Step 4) is a good fit.

Table 1: Results for testing mediation of Organizational commitment between PPU and LMSD

Variable	Step1		Step 2		Step 3		Step 4	
	B	SE (β)	β	SE (β)	β	SE (β)	β	SE (β)
PPU (X)	0.748**	0.096	N/A	N/A	N/A	N/A	0.705	0.097
OC (M)	N/A	N/A	0.186**	0.092	0.464**	0.139	0.232**	0.111
F - Statistic	60.181		4.122		11.154		33.446	
R ² (Adj R ²)	0.412 (0.405)		0.046 (0.035)		0.114 (0.103)		0.440 (0.427)	

Note: Dependent Variable = Learning Management System ** $p<0.05$, N= 89

The second mediation test examined OC as a mediator of the relationship between PUS and LMSD. The results are presented on table 2. From the above table, PUS had a statistically significant relationship ($\beta=0.534$, $p<0.05$) with the mediator variable (OC), lending support for the first condition of mediation. PUS further had a statistically significant relationship with the dependent variable, LMSD ($\beta=0.058$, $p<0.05$), lending support for the second condition of mediation. The mediator variable, OC has a statistically significant relationship with the dependent variable ($\beta=0.464$, $p<0.05$), lending support for the third condition of mediation. When using both OC and PUS as independent variables, the effect of OC (M) on LMSD is statistically significant hence supporting the mediation of OC between PUS (X) and LMSD (Y). A reasonable R^2 value (34.3%) is noted suggesting that the mediation model (Step 4) is a good fit.

Table 2: Results for testing mediation of organizational commitment between PUS and LMSD

Variable	Step1		Step 2		Step 3		Step 4	
	B	SE (β)	β	SE (β)	β	SE (β)	β	SE (β)
PUS(X)	0.534**	0.099	N/A	N/A	N/a	N/A	0.510**	0.093
OC (M)	N/A	N/A	0.058**	0.083	0.464**	0.139	0.414**	0.121
F - Statistic	29.402		11.154				22.414	
R ² (Adj R ²)	0.343(0.327)		0.114(0.103)		0.114(0.103)		0.343(0.327)	

Note: Dependent variable LMS, p<0.05, N= 89

5. Discussion

Analysis of the results of this study concludes that the respondents hold highly positive perceptions regarding the future of BL at UB. However, a few of the interviews raised contrary views, arguing that BL was overrated since there was never any position of the university that supported its implementation as a proven solution to teaching and learning problems in the institution. It is common throughout the world that academics differ on their perceptions about the value attached to LMSs (Dintoe, 2018). Academics may see technological innovation as an influential change, with positive outcomes for their teaching while others may view it as inherently evil or an inappropriate distraction for learners, promoting disruption and cheating (Shraim and Crompton, 2015). The current study has highlighted several positive perceptions of using BL such as independent learning, improved performance, support of different learning styles, efficiencies, facilitating interaction and accessibility and content delivery. These results confirm those found in a variety of studies where BL was found to facilitate interaction (Wahab et al 2018) improved student performance allowed student centered learning (Page et al, 2017) and sharing of course material (Oladirian and Uziak 2009, Page et al, 2017). This study therefore recommends that the university puts structures such as mobile help desks in place to support academics to fully embrace technology as prescribed by STS theory guiding this study; any change in an organization's technological system is a precondition for the implementation of technological innovation that in turn requires changes in the administrative system to adjust to the demands created by the new technological system (Azar and Ciabuschi, 2017).

This study found that OC fully mediated the relationship between LMSD and both PPU and PUS. LMS dependability is about an e-learning system's ability to reliably provide effective, convenient and accessible systems to enhance the overall quality of the educational experiences of students without failure. The results of this study show that the more the participants view LMS as an enabling technology that they can depend on, the more they perceive it to be useful to them and their students and this relationship is enhanced by their commitment to the university. The findings indicated that if most of the participants think using e-learning would improve the quality of learning by their students, their job performance and help them accomplish their tasks faster, they will adopt it. Such results confirm UB's needs to constantly get evaluative feedback from BL users to improve its technical systems. Batane and Motshwegwe (2013) argue that there are four main elements that make up STS theory which are: inputs, transformation processes, outputs, and feedback. Feedback comes from the human resources carrying out the processes in a system, to understand the impact of the technology that is being adopted, allow modification if necessary and make further considerations of the strengths and weaknesses of each element of the system.

6. Conclusion

This study can assist UB and other educational institutions in Botswana and beyond to make sound and informed ICT and BL investment decisions for the future, especially after COVID 19 has proved the importance of preparedness. The results of the study show a good general impression of the BL system that has been created both for the participant's own benefit and for the benefit of their students. A study of the perceptions of the students themselves could yield different results. The identification and acknowledgement of the perspectives of students could lead to more usable or desirable e-learning systems because as argued by Dintoe (2018), all stakeholders should be included as 'successes for one group does not imply 'success' for another group. A similar prescription is made by STS theory that the different parts, connections, patterns and

relationships in an organization or system should be brought together in a unified whole to be able to guide any meaningful change in an organization (Batane and Motshegwe, 2012). On the fully mediated relationship between LMSD and both PPU and PUS by OC, the findings of this study point to the importance of considering attitudinal behaviors such as OC as they contribute to the successful adoption of technology. The results of this study confirm the views by Siregar (2023) that the success of new ICTs aimed at enhancing organizational performance is dependent on user perceptions and acceptance of such innovations. Committed employees ready to strive hard against innovations and complex technologies adopted every day are becoming an integral part of modern organizations. Retaining a committed workforce is key to the survival and prosperity of an organization (Suliman and Lles, 2000). This study concludes that e-learning was underutilized in the past at UB, however, the crisis of the COVID-19 pandemic forced the entire world to rely on it for education to take place. New research may reveal different results; however, the current study is important for revealing results that show the behavioral intents towards BL outside a crisis like COVID-19.

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Digital Integration Insights: Exploring Highlights and Challenges of Numeracy Lecturers in Higher Education

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Abstract: The pervasive influence of digital technology continues to bring about significant changes in higher education (HE). In the case of numeracy modules, lecturers find themselves at a crossroads of tradition and innovation. Here, they must navigate a complex terrain where students require support in foundational aspects of numeracy proficiency and the rapidly changing aspects of technological innovation to prepare them for the 4th and 5th Industrial Revolutions. The Technological Pedagogical Content Knowledge (TPACK) framework and the Substitution, Augmentation, Modification, and Redefinition (SAMR) model, along with Bloom's Digital Taxonomy and constructivist learning theories provide a valuable theoretical framework for this study to examine critical factors encountered in integrating digital technology and numeracy in the context of a South African private HE Institution. Employing a qualitative methodology, this study investigates the dynamic intersection between teaching and learning, assessment strategies, digital technologies, and numeracy education in the digital age. Fifteen semi-structured interviews explore lecturers' experiences navigating this intersection. Highlights and challenges when integrating digital technology into pedagogical strategies are identified and explored. Findings highlight the potential for integrated technologies to enhance students' analytical thinking and develop confidence in their ability to use digital tools. Contributing factors facilitating digital technology integration, such as innovative teaching strategies, active learning methodologies, and ongoing professional development, are identified. Numerous challenges to integrating technology exist, far surpassing the number of highlights, even in the presence of facilitating factors. Challenges are linked to the nature of numeracy modules, student engagement, infrastructure, skills, time limitations, and improper use of Artificial Intelligence (AI). There is a pressing need to continuously upskill lecturers and students for success in the digital age, and for a highly intentional approach to technology integration. This study will interest a range of academic stakeholders, including lecturers, information specialists, educational technologists, and teaching and learning specialists.

Keywords: Digital technology, Numeracy education, Pedagogical strategies, Technological Pedagogical Content Knowledge (TPACK) framework, Substitution Augmentation Modification Redefinition (SAMR) model

1. Introduction and Background

In the dynamic landscape of higher education (HE), integrating digital technologies into pedagogical practices is imperative, especially in preparing students for both the 4th Industrial Revolution (4IR) and the 5th Industrial Revolution (5IR) (Oke and Fernandes, 2020; Schwab, 2016). Developing technologies such as Artificial Intelligence (AI), the Internet of Things (IoT), and advanced data analytics are further transforming pedagogical practices (Iqbal, et al., 2024). The digital age does, however, present both significant challenges and opportunities for higher education institutions (HEIs). In the case of numeracy modules, where educators strive to enhance students' numeracy proficiency amid rapid technological advancements (Amin and Mizra, 2020), the Technological Pedagogical Content Knowledge (TPACK) framework offers a comprehensive approach to integrating technology, pedagogy, and content knowledge, ensuring that digital tools enhance teaching practices effectively (Mishra and Koehler, 2006). Additionally, the Substitution, Augmentation, Modification, and Redefinition (SAMR) model further complements the TPACK framework by providing a structured method for integrating technology into teaching strategies from basic substitution to the redefinition of learning activities (Puentedura, 2006).

Further to understanding technology adoption, it is also necessary for lecturers to respond to the transformation of education through digital technologies, from Web 1.0 to Web 4.0, which has shifted teaching strategies. While numeracy content has remained stable, the roles of lecturers and students have evolved towards collaborative knowledge creation (Alaghbari, 2021; Amin and Mizra, 2020; Firat and Firat, 2021). To this end, Bloom's Digital Taxonomy and constructivist learning theories provide structured approaches for designing meaningful learning experiences that leverage technology in alignment with teaching and learning (T&L) principles.

This study focuses on integrating technology within the facilitation of numeracy modules such as Accounting, Financial Management, Statistics, and Economics, within a South African private HEI (PHEI). It emphasises the need to align digital tools with effective teaching strategies and institutional frameworks. Despite advancements, there is a need for greater insight into the effective use of digital technology in numeracy

education. Through the lens of the TPACK framework and SAMR model, Bloom's Digital Taxonomy, and social constructivism, this study explores the experiences and challenges faced by numeracy lecturers, the digital tools and platforms they are using to construct knowledge and scaffold cognitive thinking skill development and offers insights into effective strategies for integrating technology for enhanced numeracy education.

2. Evolution of Pedagogy Through Digital Technology

In the evolution of pedagogy through digital technology, shifts in the digital landscape and educational frameworks have been pivotal (Schrum & Levin, 2013). During the 1990s and early 2000s, traditional pedagogy emphasised rote memorisation and instructivism, with educators as primary knowledge sources (Alaghbary, 2021). This era relied on textbooks, teacher-led activities, and static Web 1.0 pages, where students played passive roles (Levin and Scrum, 2013). From the late 2000s, the advent of Web 2.0 facilitated collaborative learning through social media and user-generated content, aligning with constructivist pedagogy (Hartshorne and Ajjan, 2009; Matthias, 2009). By the mid-2010s, Web 3.0 introduced personalised learning via data analytics, emphasising networked learning environments (McLoughlin and Lee, 2008; Miranda et al., 2014). Looking ahead to Web 4.0, immersive simulations and smart classrooms are poised to transform content delivery (Jagatheesaperuma et al., 2024). Concurrently, Bloom's Taxonomy has been adapted, with the 2001 revision reordering cognitive skills and emphasising action-oriented verbs (Anderson et al., 2001). Churches' 2008 introduction of Bloom's Digital Taxonomy further tailored cognitive processes for digital learning integration (Churches, 2008).

3. The Digital Context of South African Private Higher Education

As the 4IR develops into the 5IR, technologies such as Artificial Intelligence (AI), robotics, and the Internet of Things (IoT), are driving transformative changes in academic practices and student learning experiences (George and George, 2020). Higher education institutions are increasingly compelled to incorporate digital technologies into their teaching methodologies to align with their mandate of preparing technology-enabled citizens for Industry 5.0 (UNESCO, 2021). Numeracy educators are realising the importance of utilising digital tools to enhance students' foundational numeracy skills, furthering their readiness for future employment opportunities (Bates, 2015). In South Africa, HEIs play a pivotal role in achieving the objectives of the National Development Plan (NDP) 2030, which seeks to eliminate poverty and inequality by 2030 (South African Government, 2024). This plan emphasises the educational and socio-economic disparities prevalent in the country, often amplified by unequal access to digital technologies particularly in the current technological environment (Assan & Thomas, 2023). The integration of digital technology into T&L strategies is essential to address this disparity by providing students with exposure and fostering the development of critical technological competencies. This integration does not, however, occur without challenges (Zawacki-Richter et al., 2019). In the context of South African PHEIs, a significant hurdle to be addressed is the lack of government funding which is made available solely to public Universities.

4. Opportunities and Challenges

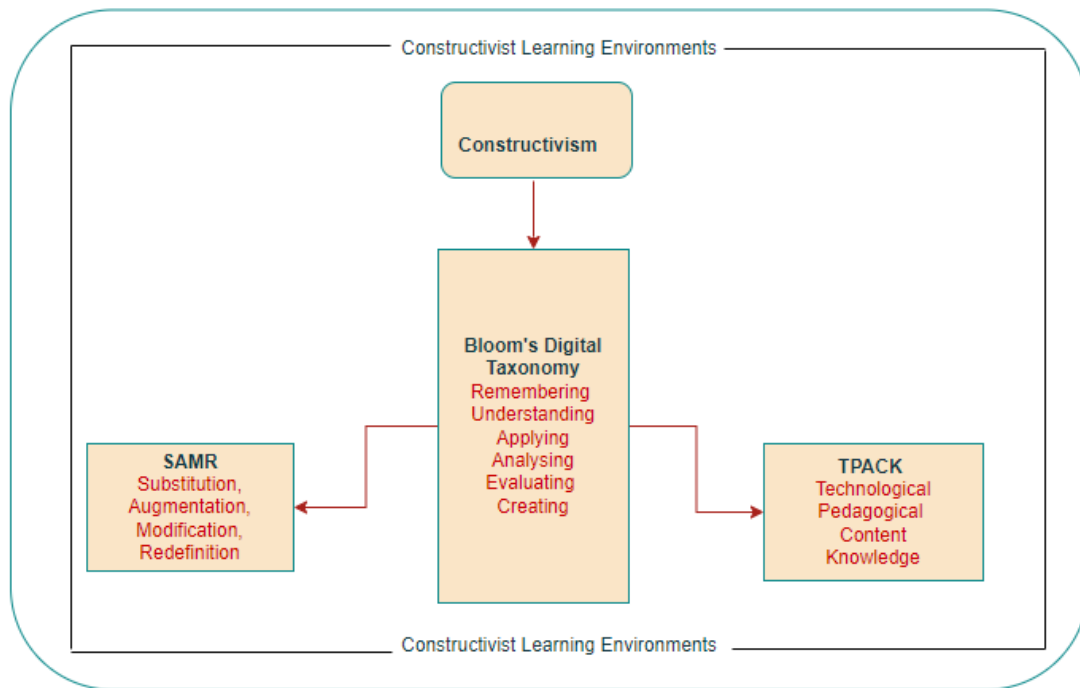
Digital technology in HE presents significant opportunities, including enhanced accessibility, asynchronous learning, and personalised teaching through adaptive technologies and open educational resources, contributing to achieving SDG 4 (UNESCO, 2021; Zheng, 2017). However, challenges such as the digital divide and socioeconomic disparities in technology access persist, particularly in South African contexts (Arfzal, 2023; Oyedemi, 2021). Addressing these challenges requires improving digital literacy and infrastructure and overcoming cultural resistance among educators (Ghavifekr and Rosdy, 2015). Moreover, ethical concerns regarding data security and the responsible use of AI technologies must be prioritised (Mitchell, 2009). Higher education institutions must proactively manage these complexities to integrate digital technologies effectively (Reddy-Moonsamy and Naidoo, 2022).

5. Theoretical Framework

This study is grounded in the TPACK framework, the SAMR model, Bloom's Digital Taxonomy, and constructivist learning theory. The PHEI where this research was conducted uses Bloom's revised taxonomy and social constructivism as part of its T&L philosophy. The TPACK framework emphasises integrating technological, pedagogical, and content knowledge, highlighting their complex relationship to support effective teaching (Mishra and Koehler, 2006). The SAMR model categorises technology integration into four levels: Substitution, Augmentation, Modification, and Redefinition, aiding educators in enhancing and transforming educational practices (Puentedura, 2006). Bloom's Digital Taxonomy aligns cognitive processes

with digital tools, providing a structured approach for designing technology-enhanced learning experiences that promote higher-order thinking skills (Churches, 2006). Constructivist learning theory, which suggests that learners construct knowledge through experiences and interactions, underpins this study by emphasising active, student-centered learning environments (Vygotsky, 1980). By integrating TPACK, SAMR, Bloom's Digital Taxonomy, and constructivist principles, this study considers the intentional integration of educational strategies, digital technologies, and cognitive skills within a social constructivist context.

The inclusion of both Bloom's Digital taxonomy and the social constructivist context to the abovementioned frameworks is reflected in Figure 1. Note that, as the study is independent of age and gender, no moderating variables are included in the analysis. The study also does not aim to quantify relationships between the models depicted.



Author's creation, 2024.

Figure 1: Theoretical framework

6. Methodology

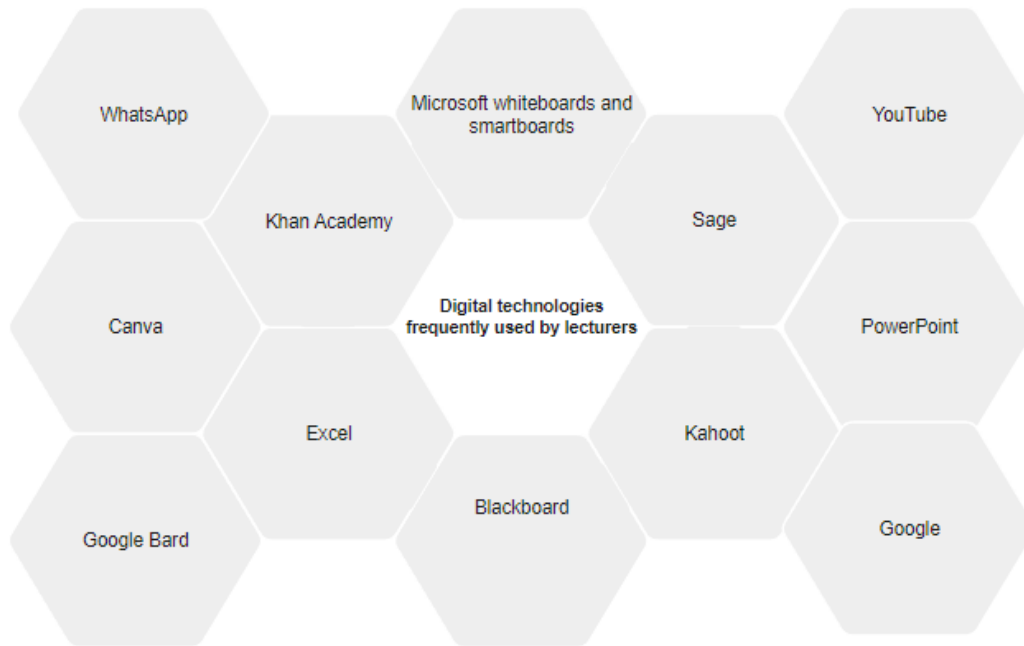
This study utilised an interpretivist exploratory approach to explore the challenges and insights experienced by lecturers when implementing technology-enabled strategies within their numeracy modules in a South African PHEI. Employing a qualitative research design, the researchers conducted 15 semi-structured online interviews via Microsoft Teams. The target population consisted of lecturers facilitating learning on undergraduate numeracy modules in Higher Certificate and Bachelor of Commerce qualifications. The study used non-probability purposive sampling. Interviews were analysed using thematic analysis to identify trends in the integration of digital technology into T&L practice. For the purposes of this study, participants selected any one of their assigned modules and one group of students within that module as the basis for their responses. This study was conducted in accordance with all relevant ethical considerations. Approval was received by the Independent Institute of Education, in accordance with its ethics review and approval procedures R.000134. Participants were afforded 24 hours post-interview to retract the entire interview or specific segments thereof. This option was not exercised by any participants. Data recording, handling, and storage adhere to the provisions of the Protection of Personal Information Act (POPI Act).

7. Results and Discussion

A thematic analysis of the 15 interviews revealed 377 unique codes. These codes are discussed under the umbrella of 3 key themes: 1) Digital technology tools and pedagogical strategies, 2) Highlights and challenges of integrating digital technology in numeracy education, and 3) Enablers of effective technology integration.

7.1 Digital Technology Tools and Pedagogical Strategies

Participants in the study highlighted diverse uses of digital technology in T&L. Definitions and types of tools varied, with some considering basic tools like PDFs and Microsoft Office as digital technology, while others included more advanced tools like Smartboards and Kahoot. Usage fell into three main categories: resource storage, enhancing traditional teaching methods, and assessing student knowledge. The Blackboard LMS was widely used for materials and auto-graded assessments, with Excel and smart whiteboards replicating traditional methods effectively. Tools like Kahoot gamified learning, improving engagement and providing insights into student understanding. Online platforms such as YouTube and Khan Academy supplemented asynchronous learning. For assessments, informal methods predominated due to concerns over plagiarism risks with formal assessments using digital tools.



Author's creation, 2024.

Figure 2: Digital technology tools most frequently used by lecturers when facilitating numeracy modules

In addition to identifying the types of technologies used, participants were requested to reflect on Bloom's taxonomy and evaluate their use of digital technology against the cognitive levels, also called thinking skills. Lower-Order Thinking Skills (LOTS) refer to the student's ability to remember, understand, and apply knowledge (Alaghbari, 2021). Higher-Order Thinking Skills (HOTS) comprise the ability to analyse, evaluate, and create knowledge. As reflected in Table 1, lecturers noted that they integrate digital technology tools predominantly for LOTS rather than HOTS. Table 2 shows that only 20% of the participants reported utilising digital tools at the "Creating" cognitive level. Only a third of participants could employ these tools at the "Evaluating" and "Analysing" levels. Of the participants who reported using technology to develop HOTS, only 13.3% reported using digital tools at the highest cognitive level of "Applying".

Table 1: Use of digital technology and the cognitive levels of Bloom's Taxonomy (based on total participants interviewed)

Cognitive level	LOTS			HOTS		
Cognitive level descriptor	Remembering	Understanding	Applying	Analysing	Evaluating	Creating
Usage	100%	100%	100%	87%	53%	20%

Table 2: Frequency of usage of digital technologies at HOTS levels (based on the number of participants that reported using technology at these levels)

		Frequency	Per cent	Valid per cent	Cumulative per centage
Valid	Applying	2	13.30%	13.30%	13.30%
	Analysing	5	33.30%	33.30%	46.70%
	Evaluating	5	33.30%	33.30%	80.00%
	Creating	3	20%	20%	100%
Total		15			100%

A further crosstabulation of HOTS and the frequency with which digital technology is being used was conducted based on a 3-point Likert scale of Sometimes (1), Often (2), and Always (3), as depicted in Table 3. This revealed that the majority of participants (87%) agreed that digital technologies had a meaningful impact on the teaching and assessment of numeracy concepts, with the highest agreement occurring when technology is used at the level of “Evaluating” (33.3%). A small percentage of participants (7%) were either neutral in their responses or disagreed. This suggests a strong overall positive perception of the impact of digital technologies across various cognitive levels, particularly at higher-order thinking levels, to develop skills for evaluating and analysing knowledge. It can be concluded that, despite lecturers recording a lower frequency of use of digital technology at higher cognitive levels, there is a high degree of intentionality when technology is used at these levels.

Table 3: Blooms Cognitive Levels and Frequency of Use

Bloom level × Frequency of use (new)						
			Frequency of use (new)			
			Sometimes	Often	Always	Total
Blooms level	Applying	Count	0	2	0	2
		Total %	0.00%	13.30%	0%	13%
	Analysing	Count	1	2	2	5
		Total %	7%	13.30%	13.30%	33.30%
	Evaluating	Count	3	0	2	5
		Total %	20.00%	0%	13.30%	33.30%
	Creating	Count	2	0	1	3
		Total %	13.30%	0.00%	7%	20%
Total		Count	6	4	5	15
		Total %	40%	27%	33%	100%

A final theme identified in participant responses concerning digital tools and pedagogical strategies is that the use of digital technologies for teaching and assessment should only be used for defined learning aims and not incorporated purely for the sake of using these tools. The use of technology must be purpose-led and in alignment with the institution’s T&L philosophy.

7.2 Highlights of Integrating Digital Technology in HE Numeracy Modules

The integration of digital technology was generally viewed by participants as a positive factor in transforming traditional teaching methods, making learning more dynamic, accessible, and aligned with the skills required in dynamic professional environments. Specifically, two key themes emerged when participants were asked to indicate highlights associated with integrating digital technology into their T&L practices. A prominent theme was the enhanced confidence and empowerment among students regarding their technological abilities. Participants noted that students felt more competent and self-assured in using digital tools, which improved their immediate learning outcomes and enriched their skill sets in ways that are advantageous for their future careers. This empowerment is considered crucial in fostering a sense of autonomy and readiness for the technology-driven job market.

Another significant benefit identified was the efficiency and clarity that digital technology brings to the learning process. Specifically, participants appreciated the ability of digital tools to demonstrate the impact of changing a single value on complex calculations quickly and effectively. This immediate feedback loop was invaluable in helping students understand the underlying principles of numeracy, allowing for a more interactive and engaging learning experience. Additionally, this capability enhanced students' analytical thinking and problem-solving skills, as they could experiment with different variables and instantly see the results of their manipulations.

7.3 Challenges of Integrating Digital Technology in HE Numeracy Modules

Alongside the highlights of technology integration, participants did note many challenges experienced when using digital technologies for numeracy-related T&L. Challenges can be summarised into six key themes: 1) Challenges inherent in teaching numeracy subjects predominantly via technology, 2) Students' lack of interaction and participation, 3) Practical technological issues, 4) Skill set issues, 5) Lack of time, and 6) Use of AI.

A consistent theme across all participants was the difficulty of effectively teaching practical and application-based modules using technology to replace most or all synchronous time with students. In the contact mode, lecturers agreed that the step-by-step guidance provided in face-to-face interactions can be crucial for developing students' comprehension of key processes and concepts, developing students' confidence, and fostering engagement. In addition, while digital technologies such as interactive whiteboards and Microsoft Whiteboard were acknowledged as useful tools for enhancing in-person instruction, participants were clear that these technologies are only ever a support for, rather than a replacement of, skilled facilitation and direct personal engagement necessary in teaching numerical subjects. The hands-on nature of these subjects, coupled with the need for immediate feedback and nuanced instruction, makes intentional and synchronous teaching indispensable for learning. In terms of the online mode of study, lecturers noted that synchronous sessions hosted via Blackboard did provide an effective substitute for a physical classroom and are crucial for teaching numeracy subjects, supported by asynchronous learning material and or interactive digital tools.

Another prominent theme that emerged is that, while some student interactions improve when digital platforms such as WhatsApp groups are used for communication, student attendance and participation significantly decline when teaching is conducted online or recorded and made available as an online resource. Lecturers noted that the online nature of the work creates the perception amongst students that it is not as important to attend and engage in class. Ironically, while digital technology provides unprecedented opportunities for dynamic, active learning, it is also making it easier for students to become passive observers rather than active participants in the learning process. This passivity undermines the interactive and collaborative aspects of learning, which are crucial for deep comprehension and skills development. Consequently, lecturers expressed concern that the reliance on digital tools without robust T&L strategies could impede the effectiveness of learning, hindering critical student engagement and participation.

Lecturers further highlighted challenges associated with logistics or resourcing, as well as technological skills. Many students do not have reliable access to the necessary hardware and software, and those that do must often navigate poor or intermittent connectivity and frequent loadshedding (planned power outages). Lecturers also reported that students who do have access to devices such as laptops often do not always bring these to class, hampering their ability to participate when digital tools are used. This lack of necessary equipment and reliable infrastructure creates significant barriers to effectively integrating digital technology in T&L. In addition to logistical challenges, significant disparities in students' technological skills mean that lecturers are working with students who are highly proficient with digital tools and students who have little to no experience with these tools, in one classroom. This wide range of skill levels challenges lecturers who must ensure that all students benefit from digital technology. Addressing varying levels of digital literacy adds complexity to lesson planning and instructional delivery.

Time constraints further exacerbate these challenges. While digital technology offers numerous benefits, lecturers often lack sufficient time to thoroughly investigate the most beneficial technologies and integrate them effectively into the syllabus. Additionally, experimenting with new digital tools can require more class time than simply following traditional methods of facilitation. In addition, lecturers noted health challenges stemming from the extensive use of technology such as eye strain, headaches, and fatigue. AI tools, such as ChatGPT, have also introduced new challenges. Lecturers reported issues with plagiarism and improper use of AI by students, who often rely on these tools to complete assignments rather than learn how to use them appropriately. This misuse of AI can result in students having a false sense of the level of their numeracy

knowledge, which can lead to difficulties during exams when they are unable to rely on these tools. The inappropriate use of AI, therefore, undermines the learning process, as students are not engaging with the material meaningfully.

All participants highlighted the importance and benefits of using digital technology in their teaching and learning strategies but also identified the significant challenges associated with its effective use. Regarding the use of digital technologies for assessments, participants reported this to be less beneficial for assessment of learning because of the practical nature of the modules. The more traditional methods of sit-down tests and exams have been found to be more beneficial.

7.4 Enablers of Effective Technology Integration

Participants were asked to share their experiences and perceptions of factors enabling the integration of digital technology into T&L. A key theme that emerged was the need for ongoing professional development and skills development for lecturers and students. Most lecturers expressed confidence in their abilities to use digital technologies, noting that frequent use has significantly enhanced their confidence. However, they also acknowledged the need for continuous training to improve their skills and adapt to new technologies. Lecturers indicated that institutional support in selecting appropriate resources and providing training would be greatly beneficial.

Additionally, the importance of collaboration between lecturers and students was highlighted. Lecturers pointed out that many students possess expert knowledge in certain valuable digital tools, suggesting that a collaborative approach could enhance the learning experience. The respondents also emphasised the institution's crucial role in facilitating the use of digital tools by ensuring the availability of reliable hardware and software for digital learning. While there was recognition of the support received from the institution, respondents noted a specific need for the focused development of tools tailored to numeracy education. This includes ensuring that the digital infrastructure is robust enough to support the specific demands of numeracy T&L.

7.5 Intentional Integration of Digital Technology for Teaching and Learning

Table 4 shows key findings through the lenses of the TPACK framework and the SAMR model. It highlights the types and levels of digital tool integration, their alignment with Bloom's Taxonomy, and the enablers and challenges faced by the participants. This analysis highlights how basic and advanced tools contribute to different levels of cognitive engagement and pedagogical efficiency, highlighting the importance of thoughtful integration and institutional collaboration.

Table 4: Key findings in the context of the TPACK framework and SAMR model

Key Findings	TPACK Framework	SAMR Model
Types of technological tools and their integration levels	Basic tools such as PDFs and Microsoft Office demonstrate limited integration with pedagogy and curriculum knowledge, aligning more with traditional teaching methods. Advanced tools such as Smartboards and Kahoot support interactive learning, requiring more deliberate integration.	Basic tools such as PDFs and Microsoft Office align with substitution while more advanced tools like Smartboards and Kahoot support interactivity, aligning with augmentation and modification
Bloom's Taxonomy	The lack of integration of technology at the HoTS levels highlights the challenges in successfully merging technological tools with pedagogical strategies aimed at developing higher-order thinking skills.	The limited use of digital tools at the HoTS levels signifies difficulty in reaching the modification and redefinition stages of the SAMR model, therefore resulting in challenges in transforming thinking processes
Enablers and Challenges	Effective use of digital technology requires balancing TPACK elements (technology, pedagogy, and content knowledge) and addressing challenges related to technology integration, such as skill disparities and logistical issues.	Enablers of effective integration align with achieving modification and redefinition, challenges such as technology substitution and engagement issues highlight the need to progress beyond basic SAMR levels.

Author's creation, 2024.

8. Recommendations

The findings of this study highlight the necessity for ongoing professional development for lecturers and sustained collaboration among peers. Lecturers should receive targeted training on discipline-specific tools to effectively balance innovation with traditional pedagogical approaches. They require support in exploring tools tailored for numeracy education and guidance in seamlessly integrating these tools into their teaching practices. Additionally, there is a critical need for further research and guidance in intentionally selecting tools and crafting technology-enhanced T&L strategies that promote higher-order thinking skills. Lecturers would benefit from assistance in maintaining a hybrid teaching style that deliberately incorporates technology. Furthermore, fostering collaborative communities among colleagues can significantly enrich pedagogical practices. To enhance student engagement with content and technology, institutions must invest in infrastructure to support students lacking access to technology. Comprehensive digital literacy training should accompany these efforts to support all students effectively. Further investigation is needed to develop effective engagement strategies and to gather learner feedback on their preferences and usage patterns. In addition, institutions should conduct workshops that emphasise the ethical considerations essential for the responsible use of technology tools in education, thereby preventing misuse. The study highlights the need for continuous support for lecturer development, collaborative practices, and ethical integration of technology, which are crucial for advancing educational outcomes in HE settings.

9. Conclusion

This study explored the highlights and challenges of integrating digital technology in numeracy education within a South African PHEI setting. Through thematic analysis, it became evident that while lecturers widely utilise digital tools to augment traditional teaching methods and enhance student engagement, significant challenges such as practical application in online settings, challenges with student interactions and digital literacy persist. Addressing these challenges necessitates ongoing professional development for lecturers, holistic institutional support for infrastructure and digital literacy, and collaborative efforts to tailor tools to numeracy education needs in alignment with institutional T&L strategies. Future research should focus on refining engagement strategies, gathering comprehensive learner feedback, and promoting ethical technology use to enhance educational benefits and foster holistic student development in an increasingly digital environment.

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Quality Evaluation Tools For Learning Objects: A Case Of Engineering Tuition in an ODL Setting

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Abstract: This research investigates the application of Learning Objects (LOs) in enhancing the delivery of educational content through multimedia approaches, particularly within the contexts of Open Distance Learning (ODL) and engineering education. The quality of LOs employed in these settings is critical, as it can significantly impact student comprehension, influencing both successful qualification completion rates and attrition rates within specific fields of study. The study aims to evaluate whether the current criteria used to assess LOs are sufficient and appropriate for the teaching and learning (T&L) of engineering disciplines. A technology scorecard for various LO technologies is developed, and the assessment is conducted using the Learning Object Review Instrument (LORI) criteria. The findings from this assessment are then analysed against the Engineering Council of South Africa (ECSA) module outcome criteria to determine whether the existing LORI criteria are suitable for measuring the acceptable quality levels of LOs in engineering T&L. The research adopts a qualitative methodology, with the establishment of a technology scorecard being a key component. The study's outcomes will reveal whether the LORI criteria are adequate and appropriate for assessing the quality of LOs in engineering education. If inadequacies are identified, the research will highlight these gaps and propose recommendations for addressing them. Ultimately, the study aims to establish a new, refined framework for assessing the quality of LOs in engineering T&L contexts.

Keywords: LORI, LO, Engineering, Technology scorecard, ODL

1. Introduction

The technology scorecard will systematically evaluate various educational technologies, particularly those utilized in industrial engineering (IE) tuition. The evaluation criteria applied within the scorecard are derived from the Learning Object Review Instrument (LORI), a framework specifically designed for the assessment of Learning Objects (LO). The scorecard focuses on key issues addressed by LORI, applying these criteria to assess the effectiveness of the technologies in question. Significant challenges exist in the evaluation process, primarily due to the inherent difficulty in developing a universal review tool. Thus, it is essential to balance assessment validity to ensure comprehensive evaluation. Similar to LORI, the scorecard is based on broadly interpreted dimensions that aim to support and emphasize the strengths, weaknesses, opportunities, and threats (SWOT) associated with the technologies evaluated. Evaluation methods are rarely chosen without considering the specific context (Georgiou & Roessner, 2000), and LORI represents a globally recognized, unbiased approach to LO assessment. The general dimensions of the scorecard encompass the functionalities of the technologies, captured through thematic categories and corresponding evaluation scores, which are represented by specific indicators. For example, when evaluating a particular technology, the indicator will reflect a value (ranging from 1 to 5, as stipulated by Krauss and Ally (2005) for LORI) that quantifies the significance of a particular attribute of the technology as defined by the theme. This research seeks to address the question: Are the current criteria employed in the Learning Object Review Instrument (LORI) adequate and appropriate for assessing the quality of Learning Objects (LO) used in industrial engineering teaching and learning within an Open Distance Learning (ODL) environment?

The research objectives are as follows:

- To evaluate the effectiveness of the LORI criteria in assessing Learning Objects specifically used in Industrial Engineering education within an ODL environment.
- To develop a technology scorecard to classify various LO technologies used in engineering teaching and learning.
- To compare the results of the LO assessment against the Engineering Council of South Africa (ECSA) module outcome criteria to determine alignment with engineering educational standards.
- To identify any gaps in the LORI criteria concerning engineering-specific Learning Objects.
- To provide recommendations for refining the LORI criteria or developing a new assessment framework to ensure the adequacy and appropriateness of LO quality assessment for engineering education.

2. Literature Review

The literature review conducted for this study synthesizes insights from various scholarly articles to inform the development of a technology scorecard and the selection of evaluation criteria. Among the various frameworks considered, the Learning Object Review Instrument (LORI) emerged as particularly suitable for the task due to its comprehensive and well-established criteria. The evaluation process outlined in this study is grounded in a systematic approach that emphasizes key aspects such as accessibility, operability, and support. These dimensions are crucial for ensuring that the technologies assessed can be effectively utilized in educational settings, particularly within the context of Industrial Engineering (IE) and Open Distance Learning (ODL). To maintain consistency across evaluations, the criteria used in the scorecard were adapted from LORI, as suggested by Krauss and Ally (2005), to create a more uniform assessment tool. The variables and criteria chosen for this scorecard are operationalized by asking targeted questions that facilitate the assessment of risks associated with the strengths, weaknesses, opportunities, and threats (SWOT) confronting the technology in question (McGrath & McMillan, 2004). The evaluation criteria are rooted in the behaviourist model of learning, similar to the LORI framework, which is based on the theory of stimulus and response (Krauss & Ally, 2005). This theoretical foundation aligns with the focus on measurable outcomes and observable behaviours, which are central to both behaviourist pedagogy and effective technology assessment. Moreover, to address the diverse learning needs of students and to enhance the learning experience, a variety of resources including digital technologies are integrated into the assessment framework. These resources employ a mix of media and methods, allowing for adaptability to different educational contexts and the accommodation of learner differences (Akkpınar, 2008). However, it is important to acknowledge that the scorecard, while valuable, is not an exhaustive evaluation tool. It is not based on rigorous scientific evidence, and it does not account for potential human errors, as its assessments are largely dependent on the subjective opinions of users (Hodges & Repman, 2011). In recent years, the integration of digital technologies in education has gained momentum, particularly in engineering and distance learning environments. For instance, Martin et al. (2020) underscore the importance of adaptability and usability in educational technology assessments, highlighting the need for frameworks like LORI that can be tailored to specific contexts. Similarly, Sanchez et al. (2019) argue for the inclusion of user experience (UX) as a critical component in evaluating educational technologies, reinforcing the emphasis on accessibility and support in technology assessments. Cheng et al. (2018) have extended this framework by integrating cognitive and constructivist elements into the evaluation process, thereby enhancing its applicability across diverse educational settings. Their work demonstrates that a multi-dimensional approach, which includes behaviourist, cognitive, and constructivist perspectives, provides a more holistic assessment of educational technologies. Moreover, to address the diverse learning needs of students and to enhance the learning experience, a variety of resources including digital technologies are integrated into the assessment framework. However, it is important to acknowledge that the scorecard, while valuable, is not an exhaustive evaluation tool. It is not based on rigorous scientific evidence, and it does not account for potential human errors, as its assessments are largely dependent on the subjective opinions of users (Hodges & Repman, 2011). Wang & Kang (2022) caution that subjective biases and the lack of empirical validation can limit the effectiveness of such tools, suggesting that future research should focus on developing more objective and evidence-based evaluation methods.

3. Methodology

3.1 Research Design

This study employs a qualitative research design, integrating a literature review and the development of a technology scorecard to evaluate Learning Objects (LO) used in Industrial Engineering (IE) and Open Distance Learning (ODL) environments. The research is exploratory, focusing on the applicability and adequacy of the Learning Object Review Instrument (LORI) criteria in assessing educational technologies. The methodology includes a detailed examination of existing literature, the selection and adaptation of evaluation criteria, and the application of these criteria through a structured scorecard.

3.2 Development of the Technology Scorecard

Based on the insights gained from the literature review, a technology scorecard was developed to assess the quality of Learning Objects in IE and ODL settings. The scorecard was designed to evaluate key dimensions such as accessibility, operability, and support, following the criteria outlined in the LORI framework. To ensure consistency, the LORI criteria were adapted, as suggested by Krauss and Ally (2005), to better fit the context of this study. The scorecard was further refined to include questions that assess the SWOT (Strengths, Weaknesses, Opportunities, Threats) of each technology, as per the methodology proposed by McGrath and McMillan (2004).

3.3 Application of the Scorecard

The developed scorecard was applied to various educational technologies used in IE and ODL environments. Each technology was evaluated against the modified LORI criteria, with specific attention given to the behaviourist learning model, which underpins the LORI framework. The evaluation process involved assigning scores to each technology based on predefined indicators, which measure the significance of attributes such as accessibility, operability, and support. Scores were assigned on a scale of 1 to 5, in line with the scoring system recommended by Krauss and Ally (2005).

3.4 Data Analysis

The data collected through the application of the scorecard were analysed to determine the adequacy and appropriateness of the LORI criteria in assessing the quality of Learning Objects in IE and ODL settings. The analysis involved comparing the evaluation scores with the Engineering Council of South Africa (ECSA) module outcome criteria to assess alignment with engineering educational standards. Any gaps identified in the LORI criteria were documented, and recommendations for refining the criteria or developing a new assessment framework were formulated. In order to factor in a wide variety of averages an inclusive range is developed and applied. The range divides the scores from meet or exceeds (3.0) to excellent (5.0) into six categories. It was highlighted in the discussion that some the technologies assessed above could actually score higher once proficiency in using the tool is achieved. Therefore the experimentation time can disadvantage the technology rating in that it is scored a 3.5 but it can actually be a scored a five. This is due to the ability of the user to navigate through the technology in the early stages of the experiment. When ranking is spread over a wider average most the technologies assessed above are upgraded to a higher score, as depicted below.

Table 1: Rating scale description (Cochrane, 2005)

Rating	Comments
4.5 – 5.0	Excellent
4.0 – 4.5	Very Good – Definite recommended
3.5 – 4.0	Good – will be recommended to use again
2.5 – 3.5	Adequate – meets minimum stds
2.0 – 2.5	Difficult – likely would not apply
2.0	Difficult - Does not meet minimum standards
1.0	Unsatisfactory - Not worth using

The technologies evaluated in this scorecard encompass a range of tools and platforms across different categories. These include content curation tools such as Content Gems and List, Web 2.0 tools like Diigo and Edmodo, disruptive technologies represented by MOOCs, mobile technologies exemplified by PDA, and asynchronous technologies such as Google Classroom. Additionally, the scorecard assesses synchronous technologies, specifically audio clips, digital game-based learning platforms, exemplified by educational games, learning management systems (LMS) like A-Tutor, and multimedia tools such as podcasts.

The scorecard uses eight themes, weighing equally and they are explained below.

Content Quality: Veracity, accuracy, balanced presentation, ideas, and appropriate level of detail. A learning resource is of no use if it is well designed in all other respects, but its content is inaccurate or misleading (Leacock & Nesbit, 2007). Quality is defined, in this case, as content validity, potential effectiveness as a teaching tool and ease of use.

Learning Goal Alignment: Alignment among learning goals, activities, assessments, and learner characteristics. Frequently a learning and assessment mismatch is found, especially in instances where students are tested in in concepts that are remotely related to the course activities (Leacock & Nesbit, 2007). Improving instructional alignment between teaching and assessment can boost student achievement. Goal alignment provides a more efficient heuristic approach suitable for digital resources at a moderate level of granularity (Leacock & Nesbit, 2007).

Feedback and Adaptation: Adaptive content or feedback driven by differential learner input or learner modelling. Generating effective feedback and adapting to learner characteristics have been understood as

important goals for educational technology, this goal is partly motivated by the belief that adaptive teaching strategies are the key to reproducing very high achievement levels (Leacock & Nesbit, 2007).

Motivation: This aspect of technology affects the amount of effort that the user is willing to invest in working with the technology. Motivation is a function of value one places on a technology (Leacock & Nesbit, 2007).

Presentation design: Design of visual & auditory information for enhanced learning and efficient mental processing. Presentation design refers to the quality of exposition in technology or digital resources and it applies to all expository media (Leacock & Nesbit, 2007). Much of the science behind presentation design follows from the properties of human working memory, as addressed in cognitive load theory (Leacock & Nesbit, 2007).

Interaction Usability: Ease of navigation, predictability of the user interface, and quality of the interface help features. Usability has been recognized as a critical issue in software quality because usability efforts focus on error prevention (Leacock & Nesbit, 2007). To reduce the effort learners must invest in learning the technology; usable designs build on learner's prior knowledge of common interface patterns and require recognition (Leacock & Nesbit, 2007).

Accessibility: Design of controls and presentation formats to accommodate disabled and mobile learners. There is an apparent widespread disregard for accessibility among developers of educational software (Leacock & Nesbit, 2007), a survey of major providers of instructional software found that there was no access provision in most products (Leacock & Nesbit, 2007). Therefore, people with a disability are disadvantaged.

Reusability: Ability to use in varying learning contexts and with learners from differing backgrounds. When a technology is designed for a diverse use, it is more likely that it is reusable. Reusability includes a consideration for the needs of diverse learners for example, those with different backgrounds, abilities and disabilities (Leacock & Nesbit, 2007).

3.5 Limitations

The study acknowledges that the technology scorecard is not an exhaustive evaluation tool. It is based on a qualitative assessment and relies on the subjective opinions of users, which may introduce bias. Furthermore, the scorecard does not account for human error, and its findings should be interpreted with caution.

4. Discussion

The technology scorecard provided a comprehensive evaluation of various Learning Objects (LOs) across multiple criteria relevant to engineering education within an Open Distance Learning (ODL) context. Each LO was assessed on dimensions critical to effective teaching and learning, including content quality, learning goal alignment, feedback and adaptation, presentation design, interaction usability, motivation, accessibility, and reusability. The average scores reflect the overall performance of each LO, offering insights into their strengths and weaknesses.

Table 2: Technology scorecard

5 = excellent 4 = very good 3 = adequate 2 = difficult 1 = unsatisfactory	Content-Gems	List	Diigo	A-Tutor	PDA	Classroom	Edmodo	Pot-cast	MOOC
Content Quality : Veracity ,accuracy , balanced presentation ideas, and appropriate level of detail	4	3	4	4	3	3	3	3	4
Learning Goal Alignment: Alignment among learning goals, activities, assessments, and learner characteristics	2	2	4	4	3	4	4	2	4

5 = excellent 4 = very good 3 = adequate 2 = difficult 1 = unsatisfactory	Content-Gems	List	Diigo	A-Tutor	PDA	Classroom	Edmodo	Pot-cast	MOOC
Feedback and Adaptation: Adaptive content or feedback driven by differential learner input or learner modelling	4	3	5	3	3	3	4	1	3
Presentation Design: Design of visual & auditory information for enhanced learning and efficient mental processing	2	2	4	3	3	3	4	2	3
Interaction Usability : Ease of navigation, predictability of the user interface, and quality of the interface help features	3	3	4	4	3	4	4	3	3
Motivation: amount of effort	4	4	5	4	4	4	4	4	4
Accessibility : Design of controls and presentation formats to accommodate disabled and mobile learners	3	3	3	3	2	3	3	2	2
Reusability : Ability to use in varying learning contexts and with learners from differing backgrounds	4	4	5	4	4	4	4	5	5
Average Score	3.25	3.0	4.25	3.62	3.13	3.5	3.75	2.75	3.5

The assessment of content quality, which emphasizes the veracity, accuracy, and balanced presentation of ideas, yielded generally favourable results. Most LOs scored well in this area, with Content-Gems, A-Tutor, and MOOC each receiving a score of 4, indicating a high level of content quality. However, List and PDA lagged slightly behind with scores of 3, suggesting adequate but potentially improvable content accuracy and detail. The results suggest that while the content across most LOs is reliable and well-presented, there may be room for enhancing the depth and precision of content in some cases. Learning goal alignment, which assesses the coherence among learning objectives, activities, assessments, and learner characteristics, showed more variability. A-Tutor and MOOC achieved high scores (4), demonstrating strong alignment. In contrast, Content-Gems and List scored a low 2, highlighting potential misalignments that could hinder effective learning. These discrepancies indicate that some LOs may not be adequately tailored to meet the specific goals and needs of learners in an engineering education context, which could impair the effectiveness of the learning experience. In terms of feedback and adaptation, Diigo and A-Tutor stood out with a top score of 5, indicating excellent provision of adaptive content or feedback driven by learner input. This capability is crucial for personalizing the learning experience and ensuring that it meets the diverse needs of students. However, the poor performance of Pot-cast, with a score of 1, underscores a significant gap in its ability to provide meaningful, adaptive feedback. This lack of adaptability could result in a less engaging and effective learning experience for students, particularly in a field as dynamic as engineering. The design of visual and auditory information, essential for enhanced learning and efficient cognitive processing, was another area where variability was evident. A-Tutor again performed well, with a score of 4, suggesting that it offers a well-designed user experience that supports learning. Conversely, Content-Gems and List both scored 2, indicating potential difficulties in the presentation design that could hinder efficient

learning. These results suggest that while some LOs are effectively leveraging design principles to enhance learning, others may need to refine their visual and auditory elements to better support student comprehension and retention. Interaction usability, which measures the ease of navigation and the quality of the user interface, showed that most LOs are generally user-friendly, with scores ranging from 3 to 4. However, Pot-cast, with a score of 3, indicates adequate but not optimal usability, suggesting that improvements could be made to enhance user interaction. This is particularly important in an ODL setting, where the ability to navigate learning materials seamlessly can significantly impact student engagement and success. Motivation, assessed by the level of effort required from students, was consistently rated high across most LOs, with scores of 4 or 5. This suggests that the LOs are generally effective in engaging students and encouraging them to invest the necessary effort to achieve their learning goals. The uniformity in high motivation scores implies that the LOs are well-designed to sustain student interest and commitment, which is essential for successful learning outcomes in an ODL environment. Accessibility, focusing on the design of controls and presentation formats to accommodate disabled and mobile learners, showed mixed results. While most LOs scored around 3, indicating satisfactory accessibility, PDA and Pot-cast both scored 2, pointing to potential limitations in accommodating diverse learners. This is a critical area for improvement, as accessibility is paramount in ensuring that all students, regardless of their physical or technological constraints, have equal opportunities to engage with and benefit from the learning materials. Reusability, which measures the ability of an LO to be used in varying contexts and with learners from different backgrounds, was one of the highest-scoring categories, with several LOs, including Diigo, Pot-cast, and MOOC, receiving top scores of 5. This indicates that these LOs are versatile and can be effectively employed in multiple educational settings, enhancing their value and utility in diverse learning environments. However, PDA and Pot-cast's slightly lower scores in other areas suggest that while they are reusable, their overall effectiveness might be compromised by other factors. The average scores, which ranged from 2.75 to 4.25, provide a general indication of each LO's performance. Diigo and A-Tutor emerged as the top performers with scores of 4.25 and 3.75, respectively, reflecting their strengths across most evaluation criteria. On the other hand, Pot-cast and PDA scored lower overall, with 2.75 and 3.13, highlighting areas where significant improvements could be made to enhance their effectiveness as educational tools in engineering ODL contexts. All the technology tools chosen and assessed have a high motivation factor, which means the amount of effort that the user is willing to invest in working with the technology is high, this is a positive attribute for the technology because motivation is a function of value one places on a technology. Note that the reusability of technologies is high. Reusability includes a consideration for the needs of diverse learners for example, those with different backgrounds, abilities and disabilities (Leacock & Nesbit, 2007). PDAs have a consistent score across all themes in the scorecard, whereas podcast have the lowest score in the report. It must be noted that lowest score of the podcast does not rule out the use of multimedia podcast in learning, this is because the multimedia podcast are highly reusable and therefore desirable in teaching and learning. The consistent scoring of PDAs is attributed to a wide spread of the technology and the fact that most users have gone through the learning curve in using the technology, there is some comfortability in using the technology. In terms of the product life cycle, the PDAs are at the maturity level. The scorecard is an objective and quantitative assessment tool. All themes carry equal weight, and the indicators reflect the same scoring for all themes. It is a major finding to note that accessibility scored low amongst most technologies, but it is not surprising for there is an apparent widespread disregard for accessibility among developers of educational software, and in a survey of major providers of instructional software, it was found that there was no access provision in most products (Leacock & Nesbit, 2007). A very distinctive pattern of high scores is experienced with Web 2.0 technologies, i.e. Diigo and Emdodo. This supports the notion that Web 2.0 technologies have developed and have become accepted enough that transition to new ones is the next apparent move (Alexandra, 2006). One significant limitation of the scorecard is that scoring does not consider the effect of unfamiliarity with a particular technology application. The fact that when experimenting with the technology for the first few times, it is difficult, but once the user has gained proficiency in the application of the technology tools, then scoring can be upgraded to a 4 or 5. This lag in application proficiency is the time taken through a learning curve. Unless this biasness is factored out by widening the rating range or by any other statistical decision making method, rating and scoring will be skewed and might not reflect the true picture as intended in the scorecard.

A-Tutor is an open-source web-based Learning Management System (LMS) designed for the development and delivery of online courses. This system allows instructors and administrators to install or update the software within minutes, create custom themes for aesthetic modifications, and extend its capabilities through various feature modules. Educators can efficiently compile, package, and disseminate web-based instructional content, import pre-packaged materials, and facilitate online courses. Students benefit from an accessible, adaptive, and social learning environment, making A-Tutor a suitable LMS due to the inherently social nature of educational

experiences (Kolowich, 2012). Its open-source foundation renders A-Tutor a cost-effective solution for both small and large organizations involved in content creation and web-based course delivery. Comprehensive assistance is available via documentation, support functions, or community forums. A-Tutor is utilized across multiple contexts, including online course management, continuous professional development for educators, career advancement, and academic research. The software is distinguished by its accessibility features, which are particularly beneficial for visually impaired and disabled learners and meets educational software evaluation criteria established by The American Society for Training and Development (ASTD). A-Tutor has international usage and has been translated into over fifteen languages, with support for more than forty additional languages under development. Initially released in late 2002, A-Tutor emerged from research conducted by the developer, which highlighted the inadequate accessibility of existing online learning systems for individuals with disabilities. The findings indicated that popular LMSs of the time did not meet basic accessibility guidelines, hindering full participation for visually impaired students and failing to support a holistic educational experience (Batson, 2012). The authoring tool within A-Tutor includes a web service for evaluating content accessibility according to various international standards. Additionally, the tool is designed to be accessible itself, enabling blind learners to create content. A-Tutor's design supports adaptability across various teaching and learning scenarios, with key features including customizable themes, privilege management systems, tool modules, and group functionalities. The theme system allows administrators to modify the system's appearance and layout to meet specific needs. The privilege system enables instructors to assign tool management rights to specific course members, such as assistants or tutors with limited control. A-Tutor's design prioritizes accessibility, incorporating features to support users of assistive technologies and conforming to international accessibility standards. The IMS/ISO Access for All support enables learners to customize the environment and content to their specific needs. At the University of South Africa (Unisa), a distance education institution employing a blended learning approach, A-Tutor will be implemented in an engineering module with 500 students. The module operates on a semester basis, with registration occurring biannually. The student demographic is diverse, ranging from 18 to 55 years, including both employed individuals and recent high school graduates. Students will need internet access, which Unisa provides through its ad hoc centres across South Africa. Assignments, tutorials, and course communications will be managed via A-Tutor, requiring students to download the LMS onto their computers, PDAs, and smartphones. Upon completion of the semester, all grades and assignment marks will be transferred to SAKAI for formal communication with students. The social learning aspects of A-Tutor are anticipated to facilitate student enrolment in the module, although current limitations include the lack of course material development for mobile devices.

Diigo is a tool designed to streamline the management of online information, addressing inefficiencies in browsing, researching, annotating, storing, organizing, and sharing digital content. This tool enhances productivity by offering features for effective reading and annotation, personal cloud-based library creation, webpage archiving, feedback provision, information organization, and collaboration. Users, ranging from individuals to teams, benefit from Diigo's functionalities, which include: annotation tools, Cloud-Based Library, Webpage Archiving, Feedback and Attention, Information Organization, Sharing Capabilities, and Collaborative Features. At Unisa, Diigo will be implemented in an engineering module with 500 students. The module operates on a semester basis, with registration occurring twice a year. The diverse student demographic, ranging from 18 to 55 years, will use Diigo to complement the SAKAI LMS. Traditional instruction will remain on SAKAI, while Diigo will enhance research and information management for the course.

Massive Open Online Courses (MOOCs) are self-paced, freely available online courses offered by leading universities. MOOC platforms, such as edX, facilitate technology-enhanced teaching and learning through a streamlined registration process and well-organized course materials. MOOCs typically feature video lectures, online discussion forums, and asynchronous Q&A platforms. Participants often form self-selected groups based on background or interest outside the MOOC platform, utilizing social media tools like Google Hangout and Facebook for additional collaboration (Kirschner, 2012). MOOC platforms offer anonymous course evaluations for participant feedback. MOOCs, such as the Analytics Edge, demonstrate the potential for global adult learning by accommodating large numbers of participants and scaling educational architecture. Given that the SAKAI LMS does not support MOOC functionality, an external LMS like Moodle or A-Tutor is required. Moodle, in particular, is recommended for its compatibility with SAKAI and document format consistency. At Unisa, MOOCs will be applied in an engineering module with 500 students, operating on a semester basis with biannual registration. The student demographic is diverse, ranging from 18 to 55 years. Students will need internet access, provided by Unisa's ad hoc centres across South Africa. The MOOC LMS will handle assignments, tutorials, and course communications, requiring students to download the LMS onto their computers, PDAs, and smartphones. At semester end, grades and assignment marks will be transferred to SAKAI for formal communication.

5. Conclusion

The findings from the technology scorecard suggest that while several LOs are well-suited for use in engineering education within an ODL framework, there are notable gaps, particularly in areas such as learning goal alignment, presentation design, and accessibility. Addressing these gaps will be crucial for ensuring that the LOs not only meet the quality standards required for effective teaching and learning but also support the diverse needs of students in this field. The variability in scores across different LOs underscores the importance of carefully selecting and possibly customizing LOs to align with the specific demands of engineering education, thereby optimizing student outcomes and reducing attrition rates. While the current assessment criteria provide a useful framework for evaluating LO quality, the results suggest that further refinement may be necessary to fully capture the unique requirements of engineering T&L in an ODL context. Future research should focus on developing and validating more targeted assessment tools that address these specific needs, ensuring that LOs effectively support the educational goals of both instructors and students in engineering disciplines. This paper provided an accurate and in-depth overview of the nine technologies, many of which were used for the first time and therefore new and unfamiliar. At the beginning, the capabilities of these technologies were not known and navigation through each of them was a daunting task but at the end, all of them were found adequate, good and excellent in application. The task of reviewing how these technologies can be applied in education led to an in-depth understanding of the attributes of each of the technologies and therefore an understanding of how they can benefit learners in an educational setting. Various rating were assessed and reviewed but the LORI criteria were found adequate to evaluate the technologies. The criteria include eight themes and an evaluation rating scale of 1 –to- 5. The widening of the rating scale range, proved to be able to reduce the effects of biased evaluation due to unfamiliarity to the capabilities of the technologies, and therefore different or more criteria could have been added to the evaluation score card. Based on suggestions of the various literature that encouraged an inclusion of system requirements, operability, interactivity, learner support and control, fun factor and achievement.

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Harnessing AI for ISCED Labelling of ODL Courses

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Abstract: At the University of Bologna, one of the pioneers of higher education in Europe and the institution that inspired the name of the Bologna Process, courses are labelled according to the International Standard Classification of Education (ISCED), a statistical classification of vocational fields. In Open and Distance Learning (ODL), where the number of programmes is high in parallel with the number of learners, determining the fields of courses taught is crucial not only for measurement and evaluation processes but also for a detailed examination of statistical information in processes such as enrolment and graduation. Processes such as data classification according to specific categories can be rapidly carried out with the help of artificial intelligence (AI) and can be utilised in administrative processes. This study investigated whether ChatGPT-4, one of the AI applications, could classify 1135 courses taught at Anadolu University's Open Education System (AUOES), which is part of the Bologna Process, according to ISCED fields, considering the content of the courses. In this study, document analysis was applied to the data analysis. According to the results, the highest number of courses in AUOES were in business, administration, and law (386), while the fewest courses were in education (27). These results indicate that courses related to white-collar professions are taught frequently and are influenced by the programmes at AUOES. This study suggests that AI can be used in administrative processes and to classify courses according to ISCED fields. Categorising all courses according to ISCED or a similar standard could enable the analysis of courses in vocational fields. Determining the fields of courses according to certain standardisations in ODL could allow the courses, and consequently, the books and materials, to be handled by subject matter experts. Decision-makers in ODL could plan the teaching of courses in line with needs by considering the employment situation in vocational fields when launching new programmes or updating course lists. Researchers could investigate the accuracy of AI's processes in administrative tasks and gather the opinions of subject matter experts, opening up new avenues for further research and exploration in the field of AI in education.

Keywords: Higher education, Open and distance learning, Courses, ISCED, Artificial intelligence

1. Introduction

Although there are various claims about where, when, and how higher education began, people have shared their experiences since the first day they interacted. Over time, with the proliferation of places of worship in different cultures worldwide, communities began to receive education in structures similar to higher education in various fields. With the establishment and spread of universities, competent lecturers in specific fields started delivering courses within programmes to enable individuals to specialise. This process has become institutionalised today, with particular standards accepted and implemented by institutions regarding the content of courses taught in programmes and how the courses should be conducted. While different countries have varying standards for the execution of higher education, in European Union countries, the European Credit Transfer System (ECTS) criteria and the Bologna Process are considered important references for determining specific standards for conducting higher education activities. In 1997, in harmony with the Convention on the Recognition of Qualifications concerning Higher Education in the European Region, the Lisbon Recognition Convention was signed, representing a collective decision to recognise education obtained from European countries. With the Bologna Declaration, as part of the Bologna Process, standards encompassing the recognition of secondary education degrees, higher education, student mobility, lifelong learning, and the European Credit Transfer System for course credit counting were established (Kehm, 2010).

Open and Distance Learning (ODL) is also considered an effective method to increase higher education within the scope of lifelong learning. The oldest example of the world's first open and distance education is the delivery of weekly lessons via postal service in Boston, USA. It continued to be provided through various communication tools influenced by technology. The first electronic distance education began over the radio in the 1920s. In the 2000s, the widespread adoption of the Internet and technological developments enabled many educational institutions to offer distance education services and allowed students to access information easily through technological devices (Clark, 2020). By the 2020s, various studies on integrating artificial intelligence applications into ODL have emerged. Particularly with the rapid development of generative artificial intelligence, the size and diversity of synthetic data produced have increased, bringing various debates. However, when generative artificial intelligence is controlled correctly, it holds significant potential for accelerating academic, administrative, and managerial tasks (Bozkurt, 2024). Easy and understandable AI-supported systems provide practical benefits in rapidly executing processes (Pulist, 2022).

In Turkey, Anadolu University conducts higher education activities in a dual mode. It has facilitated the proliferation of higher education since 1982 through its open education system, consisting of associate and bachelor's degree programmes of the Open Education, Economics, and Business Faculties. Anadolu University's Open Education System (AUOES) has over one million registered students and conducts higher education activities in Turkey and abroad with nearly 100 offices (Koçdar et al., 2024). Anadolu University offers support services for registered student candidates and graduates under the name AOSDESTEK. Non-academic support services are provided online through applications like Ticket (Ask a Question), Frequently Asked Questions, and AI-supported Virtual Assistant available in AOSDESTEK (Anadolu University, 2023). However, although studies are being conducted for academic or administrative processes, there is not yet an AI-based system.

The management should consider academics' opinions regarding curriculum changes, but the support of administrative staff and field experts is essential (Law, 2024). However, the effective use of developing technology has become inevitable for institutions like AUOES, which have over a million students and teach thousands of courses in an academic year. Collaborating with machines according to specific standards can provide benefits in this context. European higher education institutions are adopting internationally standardised platforms to disseminate information about their programmes, going beyond traditional course lists, objectives, and outcomes in information packages aligned with the Bologna Process. The International Standard Classification of Education (ISCED), the standard used to determine which occupational fields the higher education institutions will be included in, was initially created to produce a statistical overview of study programmes following primary, secondary, and higher education. Later, following the Bologna Process in higher education, a new implementation was published in 2011. In the latest expanded ISCED codes, the first two digits represent broad fields. The newest version of ISCED, called ISCED-F, is provided below (Silvestru et al., 2018).

- 00. Generic programs and qualifications
- 01. Education
- 02. Arts and humanities
- 03. Social sciences, journalism, and information
- 04. Business, administration, and law
- 05. Natural sciences, mathematics, and statistics
- 06. Information and Communication Technologies (ICTs)
- 07. Engineering, manufacturing, and construction
- 08. Agriculture, forestry, fisheries and veterinary
- 09. Health and welfare
- 10. Services

By leveraging AI with ISCED data, institutions can provide workforce insights and employment opportunities connected to specific professional fields and can consider their programmes and even courses in this context. The University of Bologna sets a significant example by determining the ISCED fields of programmes and courses (Mondok, 2015). This process allows for tracking data related to professional fields at a micro level.

Although it is not precisely known when the idea of artificial intelligence first emerged, the foundations of AI were laid in real life in 1950 with Alan Turing's Turing Test through questions like "What if we asked machines questions?" and "Can machines think?" (Negnevitsky, 2005). The event that started artificial intelligence as a discipline is considered to be the Dartmouth Summer Research Project in 1956. McCarthy's proposal for automata to self-organise the external environment and adapt to it is known as the beginning of the project (Kline, 2011). Since 2020, generative artificial intelligence has rapidly gained momentum, becoming a powerful tool with solid data generation capabilities that can learn independently from complex data. Pre-trained AI language models that learn abstract information from raw data have extensive data generation capacities. One of the latest Natural Language Processing (NLP) models, OpenAI's ChatGPT, is among the most well-known applications (Goar et al., 2023). ChatGPT, through its paid version, allows individuals and organisations to create their GPTs with the MyGPT application. In this context, the MyGPT application of ChatGPT, one of the generative AI applications, was used in the research as AI.

When the literature is examined, it is seen that after the 2020s, there has been an increasing number of studies on the use of AI technology in higher education, and generally, research is not conducted in areas such as academic support, language learning, support services, etc. It is observed that there needs to be more studies on the use of AI in administrative processes, specifically in processes related to determining programs or courses. Noroozi et al. (2024) examine various applications and effects of AI tools, including ChatGPT, in education, emphasising their potential to enhance teaching and learning in multiple contexts. Watermeyer et al. (2024), in

their research on the use of ChatGPT in higher education institutions, reveal that AI helps reduce the intensive workload of employees. Kumar (2021) states that ChatGPT has initiated a transformation in content development and evaluation in higher education institutions and has the potential to add value, especially in administrative processes. Nikolopoulou (2024) expresses that integrating ChatGPT and other AI tools into higher education processes has implications for curriculum design and university policymakers. McDonald et al. (2024), in their research conducted across 116 universities in the USA, state that most universities support the use of AI, and more than half of the institutions use AI in curriculum development and determining the content of courses. Alali & Wardat (2024) state that after ChatGPT and similar tools were widely adopted. However, AI is revolutionary in educational practices, and its integration should be carefully evaluated in terms of ethics, society, and pedagogy. Educators can leverage the potential of AI through proactive collaboration and partnership. Hashmi & Bal (2024) emphasise that higher education institutions need to adapt to enable future employees to succeed in a workplace filled with AI. Duah & McGivern (2024) underline that it is insufficient to prepare only students for the AI era; institutions need to focus on how AI can be effectively used with all their employees—many existing AI applications currently present potential for many academic and administrative higher education staff. Zeb et al. (2024), drawing attention to the unseen part of the iceberg, state that although AI offers opportunities in higher education, its threats should not be overlooked. Therefore, institutions need to adopt a proactive and practical approach. Including the latest version of the most widely used ChatGPT, it can still experience hallucinations. It should not be forgotten that synthetic data is produced, and the information provided should not be unconditionally accepted as correct without double-checking. As of 2024, although AI applications like ChatGPT are essential tools for accelerating processes, they need the quality to take responsibility like a human.

When the literature on the use of AI and ISCED codes is examined, more studies are needed. One of these is the study by Öncü & Süral (2024), which determined the ISCED codes of AUOES programmes according to ChatGPT. According to the ISCED codes determined by AI, the employment status of graduates from AUOES was revealed based on OECD's occupational field data. This study investigated whether AI could classify over a thousand courses according to specific standards in an ODL with over one million registered students. The study sought to explore how AI can contribute to the administrative processes within AUOES, specifically by categorising 1135 courses according to ISCED fields. The use of AI in this context not only suggests potential efficiencies in course classification but also offers insight into its broader role in optimising programme management, accreditation, and compliance with international standards. In this regard, the study sought to answer the following research questions:

RQ1: According to the ISCED fields proposed by AI for the courses:

- What is the general distribution across all courses?
- What is the distribution of unique courses (taught only in one programme)?
- What is the distribution of common courses (taught in at least two programmes)?

RQ2: How does the comparison between the distributions of unique and common courses look?

2. Methods

Document analysis, while often complements other research methods in the literature, is also used as a standalone method (Sak et al., 2021). In document analysis, interviews, direct observation, participant observation, tangible artefacts, and archival records can be used to collect data (Yin, 2009). Bowen (2009) analytically lists the stages of document analysis as locating, selecting, evaluating, and synthesising documents. In this research, the document analysis method was used by following the steps outlined by Bowen regarding document analysis (Figure 1).

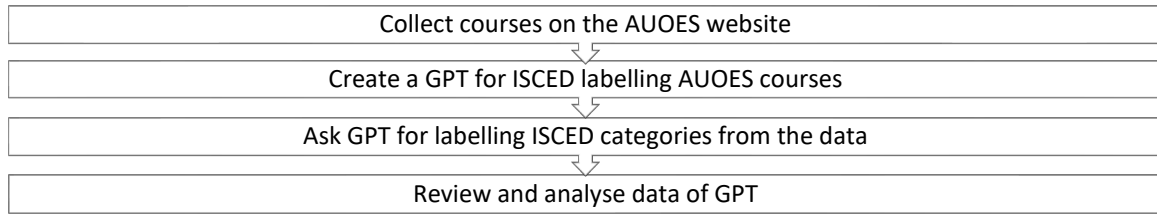


Figure 1: Flowchart of research

In the research, firstly, all courses available on the official website of AUOES, along with their contents, were compiled into a database (Anadolu University, 2023). At this stage, information on 1135 courses and their contents belonging to 63 enrolled programmes was obtained. Analyses were conducted assuming that courses with the same name in different programmes are similar, based on the programme and course information published on universities' websites. In the second stage, a MyGPT was designed on ChatGPT as a Course Labelling application, considering the opinions and experiences of field experts. The GPT was tasked with labelling the AUOES courses according to ISCED fields, considering the contents of the courses. Then, through the application, the GPT was asked to fulfil its task, and the responses provided by the GPT were collected in a database. In the final stage, the findings obtained in the research were evaluated, comparative analyses were conducted, and recommendations were made. Since the research was conducted based on course information accessed on the AUOES website, no interviews with individuals were conducted, private institutional information was used, and no additional permission was obtained.

3. Findings

The results obtained in the research are shown in Table 1.

Table 1: ISCED fields of courses based

ISCED field	All courses		Unique courses		Common courses	
	f	%	f	%	f	%
Business, administration, and law	386	34.01	271	31.40	115	42.28
Social sciences, journalism, and information	212	18.68	156	18.08	56	20.59
Arts and humanities	185	16.30	150	17.38	35	12.87
Health and welfare	114	10.04	93	10.78	21	7.72
Information and Communication Technologies	80	7.05	60	6.95	20	7.35
Services	47	4.14	39	4.52	8	2.94
Engineering, manufacturing, and construction	43	3.79	38	4.40	5	1.84
Agriculture, forestry, fisheries and veterinary	37	3.25	37	4.29	0	0
Education	27	2.38	15	1.74	12	4.41
The Other Occupation	4	0.36	4	0.46	0	0
Total	1135	100	863	100	272	100

The distribution of the courses taught in the programmes enrolled at AUOES according to ISCED codes is as follows: Business, administration, and law (386); Social sciences, journalism, and information (212); Arts and humanities (185); Health and welfare (114); Information and Communication Technologies (80); Services (47); Engineering, manufacturing, and construction (43); Agriculture, forestry, fisheries and veterinary (37); Education (27). Courses that do not fit into these categories are indicated as "The Other Occupation" (4).

The distribution of the courses taught in the programmes enrolled at AUOES, in terms of unique courses (taught only once), according to ISCED codes, is as follows: Business, administration, and law (271); Social sciences, journalism, and information (156); Arts and humanities (150); Health and welfare (93); Information and Communication Technologies (60); Services (39); Engineering, manufacturing, and construction (38); Agriculture, forestry, fisheries and veterinary (37); Education (15); The Other Occupation (4).

The distribution of the courses taught in the programmes enrolled at AUOES, in terms of their common teaching status (a course being taught in at least two programmes), according to ISCED codes, is as follows: Business,

administration, and law (115); Social sciences, journalism, and information (56); Arts and humanities (35); Health and welfare (21); Information and Communication Technologies (20); Education (12). Services (8); Engineering, manufacturing, and construction (5). Courses that do not fit these categories are indicated as The Other Occupation (4). There are no commonly taught courses in the fields classified as Agriculture, forestry, fisheries and, veterinary and The Other Occupation.

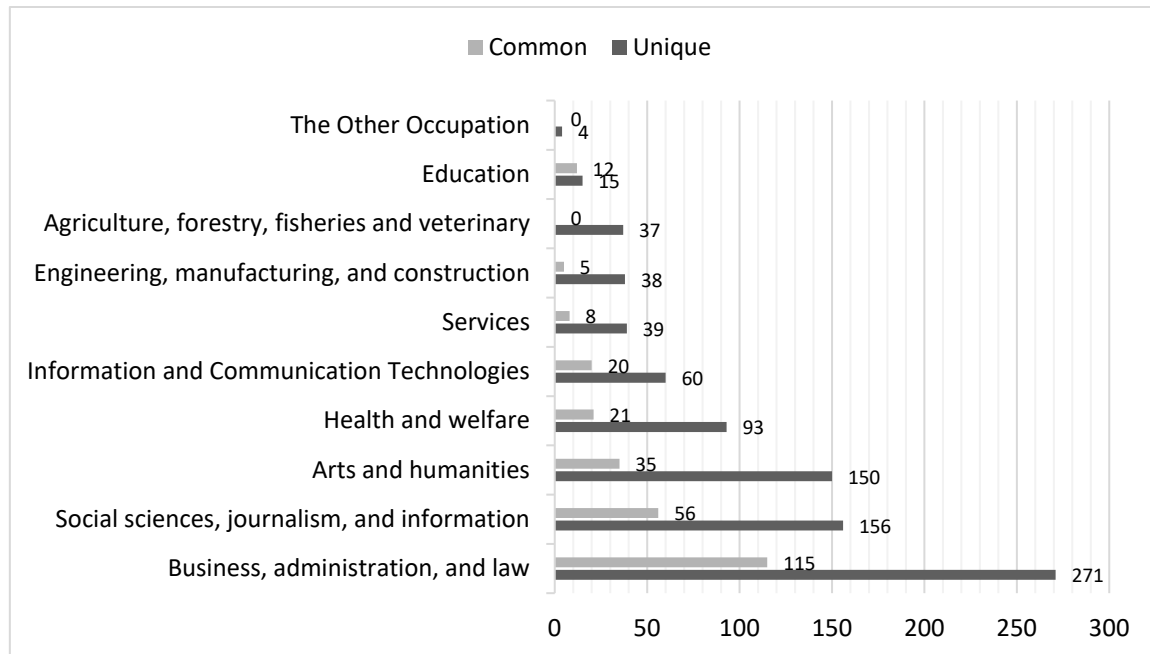


Figure 2: ISCED fields of courses based on their status

Figure 2 shows the status of courses being common and unique according to ISCED codes. Although the rankings according to the number of courses are similar, when examining the distributions within the fields themselves, it is observed that there are close values in the field of Education. Accordingly, 12 common and 15 unique courses are taught in the field of Education. In the fields of Agriculture, forestry, fisheries and veterinary and The Other Occupation, however, no courses are taught commonly; all of these courses (37) are taught uniquely, exclusive to only one programme.

The findings of this study suggest that AI appears to categorise courses according to ISCED fields and demonstrates its potential for administrative use in higher education. The AI-generated classifications reveal an underrepresentation of fields such as 'Education' and 'Agriculture', while 'Business Administration and Law' courses predominate. These results reflect AI's ability to process large datasets rapidly, offering insights that may help align courses with vocational fields and labour market demands. The study also highlights AI's potential to facilitate classification tasks and allow human resources to focus on more complex and strategic educational challenges. The integration of artificial intelligence into administrative processes enables AUOES to manage its large-scale operations more efficiently. Specifically, ChatGPT-4's ability to analyse course content and automatically assign them to ISCED fields ensures that courses are classified in accordance with standards. This automatic classification contributes to obtaining more detailed and accurate statistics in enrolment and graduation processes. Additionally, by reducing the manual classification burden on administrative staff, it allows them to focus on more critical tasks such as strategic planning and student support services. Thus, the use of artificial intelligence not only enhances AUOES's administrative efficiency but also strengthens the alignment of educational programs with international standards.

4. Results and Discussion

The results from the study suggest that the AI system employed in this research may have been able to categorise 1135 courses based on ISCED fields, with the largest proportion falling under 'Business Administration and Law' (34%), indicating a predominance of courses related to white-collar professions within AUOES. The AI also reflects a significant distribution of courses across 'Social Sciences, Journalism, and Information' (18.68%) and 'Arts and Humanities' (16.30%), supporting the notion that these fields are also strongly represented.

Furthermore, the classification of courses by AI suggests that fields such as 'Education' and 'Agriculture, Forestry, Fisheries, and Veterinary' are underrepresented in terms of both unique and common courses, which indicates areas for potential growth or realignment within the AUOES curriculum. While the findings reflect the potential utility of AI in administrative processes, particularly in mapping courses to vocational fields, it is important to exercise caution. AI-generated data, while useful, should be supplemented with human oversight to ensure alignment with vocational fields, employment trends, and ISCED classifications. "The rapid adoption of AI developments and generative AI tools like ChatGPT presents new opportunities and challenges for higher education. Although significant literature discusses AI in higher education, Katsamakos et al. (2024) have conducted a study adopting a complex systems approach, stating that there is a lack of a systemic approach capturing a holistic perspective on AI transformation in higher education institutions. According to this study, higher education institutions face policy traps. Leaders of higher education institutions need to be systems thinkers to manage the complexity of AI transformation and to benefit from AI feedback loops while avoiding associated traps. Additionally, managers must decide where AI will be positioned in long-term scenarios. Mao et al. (2024) emphasise that in determining AI policies in higher education, it is necessary to consider what role will be given to machines, the extent to which processes will be automated, the level at which human empathy can remain, and how decisions can be made between humans and machines on issues of justice and equality. Furthermore, although AI, thanks to applications like ChatGPT, can perform complex operations in a short time due to its natural language processing skills and advanced algorithms, it is still a machine that cannot take responsibility like a human, can produce synthetic data, and sometimes provides incomplete or incorrect information because it experiences hallucinations. In this context, it is essential to double-check rather than trust machines 100%.

ISCED fields, beyond serving merely as a categorization system, provide meaningful data that are utilized in the statistics of major organizations such as the OECD. This standardization not only facilitates international comparisons but also supports the alignment of educational programs with labour market needs. By integrating AI into the process of assigning courses to ISCED fields, institutions can ensure more accurate and timely classifications, enhancing the quality and relevance of the data used in both academic and policy-making contexts.

In their study with 1,217 participants from 76 countries, Yusuf et al. (2024) investigated the global impacts of AI in higher education and revealed a tendency worldwide to use these tools for different purposes in education and teaching. However, they have emphasised that using these tools without responsibility threatens educators and administrators and that AI integration in higher education should be carried out within certain standards. Chukwuere (2024) examined the use of AI in higher education in peer-reviewed English journals between 2020 and 2023 and stated that AI-based chatbots could improve student engagement, facilitate the educational process, support research assistants, and benefit administrative processes.

The results obtained from this study suggest that institutions with a high number of courses, like ODL, can utilise AI for both classification and course content by adhering to standards such as ISCED. Dabis & Csáki (2024) examined empirical studies of 30 universities among the top 500 in the 2023 Shanghai Ranking list. Despite legal and ethical concerns about how higher education institutions should use AI, they reveal the potential for using AI in curriculum development. Our results suggest that the use of AI optimizes AUOES's administrative processes by effectively classifying courses according to ISCED fields and accelerating compliance with international standards.

In summary, although there are limited studies in the literature on the use of AI for administrative purposes in ODL and even in higher education, the studies revealed that AI used for different purposes should be applied according to specific standards. However, using AI under the control and collaborating with experts in the field will prevent possible errors. In this respect, domain experts need to configure AI tools. The distribution of courses taught in programmes registered with AUOES according to ISCED codes shows that the field of "Business, administration, and law" has the highest value in terms of both the total number of courses and commonly taught courses. This indicates how central and widespread this field is among programmes. Similar trends are observed in other fields; however, especially in the "Education" field, the numbers of common and unique courses being close to each other shows that programmes in this field include both general and specific course contents in a balanced manner. In fields with no common courses, it is understood that course contents are more specific and unique to the programmes. This study highlights the potential benefits of using AI in administrative processes within higher education institutions, particularly in standardisation tasks such as the classification of courses according to ISCED fields. Due to its rapid reading and analytical capabilities, AI can streamline tasks that would otherwise require significant manual effort, allowing institutions to expedite these

processes. Consequently, limited human resources can be redirected to more critical and complex areas, enhancing operational efficiency. These findings emphasise the value of integrating AI tools into educational management, supporting decision-makers in optimising both course alignment and resource allocation.

5. Recommendation

This study was conducted using a GPT designed to determine whether AI can accomplish in a short time a complex process that would generally take longer in ODL, and it is limited to the responses provided by the AI. Researchers can undertake more comprehensive studies by performing agent-based simulations and can reveal experts' opinions through empirical studies based on the data obtained from this research. They can investigate employees' attitudes towards AI in large organisations like AUOES and the impact of AI usage on working life. Additionally, managers' and employees' opinions and concerns about using AI in administrative processes can be explored.

Decision-makers can consider the distribution of ISCED fields when opening new programmes or updating course lists in ODLs, especially in centrally administered ODL institutions like AUOES, which has over one million students. As of 2024, there is no elective course application in AUOES; ISCED fields can be considered when creating an elective course list. Moreover, if the micro-credentialing application is implemented, certification can be done according to course pools formed based on professional fields. Since ISCED fields are a widely accepted standardisation in Europe, the statistical status of higher education institutions in various metrics can be presented. Data such as the distribution of programmes for enrolment, the quota distribution of the programme, the number of students, and the number of graduates can be compared with employment situations. Programmes and courses can be structured primarily based on OECD reports and data from official statistical institutions in the country. The controlled use of AI as an effective support tool can accelerate administrative processes and enable decision-makers to utilise the automation process most effectively in deciding what and how much the machine will do between human and machine. Additionally, training can be provided to employees on how AI can be used.

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Technostress Among Information Specialists/Librarians at a Private Higher Education Institution in South Africa: Are They Spared?

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Abstract: In the digital age, information specialists at Private Higher Education Institutions (PHEIs) played a crucial role in managing vast amounts of digital information and providing essential services to support academic activities. However, the increasing reliance on technology brought about a phenomenon known as technostress—stress or psychosocial strain experienced due to the use of information and communication technologies (ICT). The aim of this study was to explore information specialists/librarians' experiences of technostress in the context of technology integration into library services at a private higher education institution in South Africa. It sought to identify the specific challenges librarians faced due to the adoption and use of technology and to understand how these challenges affected their daily tasks, job performance, and overall job satisfaction. The study was underpinned by the Transactional Model of Stress and Coping (Lazarus & Folkman, 1984), which provided a framework for understanding how individuals cognitively appraised and coped with stressful situations. Utilizing a qualitative approach guided by the interpretivist paradigm, the research gathered comprehensive data through qualitative semi structured interviews. A purposive sample of information specialists from a leading Private Higher Education Institution (PHEI) was selected, and thematic analysis was employed to analyse the interview transcripts. Participants were invited for semi-structured interviews until saturation was achieved. The thematic results of the qualitative study illustrated the effects of technostress on information specialists at the PHEI. Participants experienced system failures, technical glitches, and challenges with new tools, which significantly increased their stress levels. This stress manifested itself in physical symptoms such as eyestrain and headaches, as well as emotional symptoms such as anxiety and frustration, often exacerbated by increased screen time and poor ergonomics. The impact on work performance varied, with some experiencing minimal or positive impacts on productivity, while others experienced significant disruption to their work and well-being. The findings improved the understanding of technostress in higher education and provided recommendations for creating a supportive work environment and promoting the well-being of information specialists/librarians. Practical suggestions were made to address the identified challenges and improve the wellbeing and effectiveness of information specialists within the PHEI. This study informed strategies to effectively combat technostress among information specialists/librarians at a PHEI.

Keywords: Job satisfaction, Information specialists, Private higher education institution, Technostress, Well-being

1. Introduction

The ever-increasing reliance on technology in today's world has led to significant advancements in various sectors, including the library and information science (LIS) field. Information specialists/librarians play a vital role in the academic ecosystem of higher education institutions. However, this rapid technological change has also introduced a new set of challenges, leading to the phenomenon of "technostress"—the stress experienced due to the constant pressure of adapting to new technologies (Ragu-Nathan, Tarafdar, Ragu-Nathan, & Tu, 2008). Information specialists/librarians, who are often at the forefront of technological adoption within libraries and institutions, are particularly susceptible to experiencing technostress. Information specialists/librarians face unique challenges in the rapidly evolving technology landscape as they must constantly adapt to new tools while training and supporting others. This dual responsibility increases stress due to the need for high levels of expertise and makes them particularly vulnerable to technostress despite the widespread adoption of technology in higher education. This study aimed to explore the experiences of information specialists/librarians at a Private Higher Education Institution (PHEI) regarding technostress within the context of technology integration into library services.

1.1 Overview of Literature

Technostress, a concept introduced by Brod (1984), is gaining attention in academic libraries and information services due to the rapid adoption of new technologies. Information specialists face psychological and physiological stress responses due to the constant need for technological upskilling (Ragu-Nathan et al., 2008; Saunders et al., 2015). This constant need for adaptation can contribute to technostress, as noted by Ennis (2005), and is exacerbated by the increasing demand for technological proficiency among library staff. Technostress negatively impacts job performance and satisfaction, leading to decreased job satisfaction and increased turnover intentions among knowledge workers (Tarafdar et al., 2015). In academic libraries, it negatively affects librarians' service quality and engagement (Shu et al., 2011). However, some studies suggest that continuous professional development can mitigate technostress (Erasmus et al., 2015). Further research is

needed to understand the experiences of information specialists and librarians at private higher education institutions in South Africa, as their specific context may present unique challenges and opportunities related to technostress.

1.2 Experiences and Challenges of Technostress and Technology Integration

Ennis (2005) defined technostress in libraries as the stress experienced by librarians due to rapid technological change and the pressure to stay proficient. This stress has intensified with the integration of technology into library services, as Aharony and Prebor (2015) observed a shift towards digital resources, online catalogues, and electronic databases. Breeding (2018) noted that cloud-based systems have further transformed library operations. However, these advancements have led to technostress, with librarians facing challenges such as the need to quickly acquire new skills (Saunders, 2015) and manage information overload (Bawden & Robinson, 2009). Studies by McClellan et al. (2022) and Bond et al. (2021) emphasized stressors like constant connectivity and the pressure to keep up with technological advancements. The impact of technostress can include anxiety, depression, and physical symptoms (Yildirim & Correia, 2023; Chang et al., 2020; Fernandes et al., 2021). Chiparausha (2022) reported that prolonged engagement with digital tools can lead to both physical and psychological exhaustion among academic librarians, exacerbated by exposure to distressing content and the challenges of remote work.

1.3 Symptoms of Technostress among Information Specialists

Technostress is a growing concern at a Private Higher Education Institution (PHEI) in South Africa's libraries due to the rapid adoption of digital technologies and AI systems. This pressure on librarians and information specialists creates physical and emotional challenges. Symptoms of technostress include computer vision syndrome, anxiety, frustration, and reduced job satisfaction. These challenges highlight the importance of technostress as a potential risk in libraries and raise concerns for staff well-being and the effectiveness of library services in the rapidly evolving digital landscape

Studies by Ranasinghe et al. (2016), Ragu-Nathan et al. (2008), and Saunders et al. (2017) highlight the prevalence of Computer Vision Syndrome (CVS) and its associated discomforts, such as eyestrain and headaches. Similarly, Chiparausha (2022) reports that prolonged exposure to digital screens among librarians results in eye problems, sleep disturbances, and increased depressive symptoms, aligning with findings by Empire Retina Consultants (2016) and Halupa and Bolliger (2020), which include headaches, stiff shoulders, and vision issues. Emotional impacts, such as anxiety and frustration, have been documented by Tarafdar et al. (2007) and Laspinas (2015), who note that these stressors lead to difficulties in concentration and job dissatisfaction. The negative effects of technostress extend to decreased job satisfaction and increased intentions to leave the profession, as observed by Tarafdar et al. (2015).

1.4 The Impact of Technostress on Librarians' Job Performance, Productivity, and Well-being

Several studies have extensively examined the relationship between technostress and job performance among librarians, revealing a complex interplay between stress levels and professional efficiency. Saunders et al. (2017) and Ragu-Nathan et al. (2008) concurred that high levels of technostress significantly impair job performance. In contrast, Ayyagari et al. (2011) observed that moderate levels of technostress could paradoxically enhance performance by motivating librarians to refine their technological skills, though this effect was limited to a narrow stress threshold. Tarafdar et al. (2015) added that adequate training and support could initially boost productivity when new technologies are adopted, but this effect tends to plateau once the technology becomes routine. Physical manifestations of technostress, such as headaches and eye strain, were highlighted by Chen and Muthitacharoen (2016), who found a high incidence of these symptoms among librarians due to prolonged digital interaction. Qualitative insights from Ennis (2005) further underscore the emotional toll, revealing pervasive themes of frustration, inadequacy, and burnout among academic librarians. Together, these studies highlight the multifaceted impact of technostress on librarians, influencing both their performance and well-being, and underscore the need for effective strategies to manage stress in the evolving technological landscape of library services.

1.5 Effective Strategies for Managing Technostress in Professional Environments

Effective management of technostress in professional environments often hinges on robust organizational strategies, as underscored by Tarafdar et al. (2015), who highlight the critical role that comprehensive technology training and technical support play in alleviating technostress. Their research shows that organizations investing in thorough training programs for their employees see a significant reduction in

technostress levels, ensuring that staff are well-equipped to handle technological challenges and minimizing stress associated with new technologies. Similarly, Tu et al. (2005) and Barber and Santuzzi (2015) emphasize the importance of well-defined ICT usage policies, noting that clear guidelines, along with work-life balance initiatives like "email-free" hours, can effectively manage issues such as techno-invasion and techno-overload.

Technostress can be effectively managed through individual coping mechanisms such as mindfulness practices and technology self-efficacy. High technology self-efficacy correlates with lower levels of technostress (Pirkkalainen et al., 2019; Shu et al., 2011). Academic librarians use practical strategies such as taking regular breaks, limiting applications, and scheduling online activities to manage technostress and maintain work-life balance. An integrative approach that combines organizational and individual strategies is most effective because it considers both structural and personal factors and leads to more sustainable results. Bondanini et al. (2020) and Tarafdar et al. (2017) advocate this comprehensive approach.

2. Model and Framework Forming a Lens Guiding This Study

This study is based on the transactional model of stress and coping (Lazarus & Folkman, 1984), which views stress as a dynamic interaction between individuals and their environment, characterized by cognitive appraisal and coping strategies. The proposed conceptual framework examines technostress among information specialists by integrating key components that influence stress. Individual characteristics such as prior experience and technical skills, the work environment including training and work expectations, and IT characteristics such as complex interfaces and information overload all contribute to technostress (Shu et al., 2011; Tarafdar et al., 2007; Ayyagari et al., 2011).

Cognitive appraisals are crucial because they determine how information specialists evaluate IT requirements and their coping abilities (Ragu-Nathan et al., 2008). Effective coping mechanisms such as social support and problem solving can mitigate the negative effects of technostress, which include reduced work efficiency, lower job satisfaction, and impaired well-being (Pirkkalainen et al., 2017; Tarafdar et al., 2019). This framework provides a comprehensive overview of the factors that influence technostress and provides insights into the ways information specialists experience and manage stress related to their work and IT use (Ahmad et al., 2014).

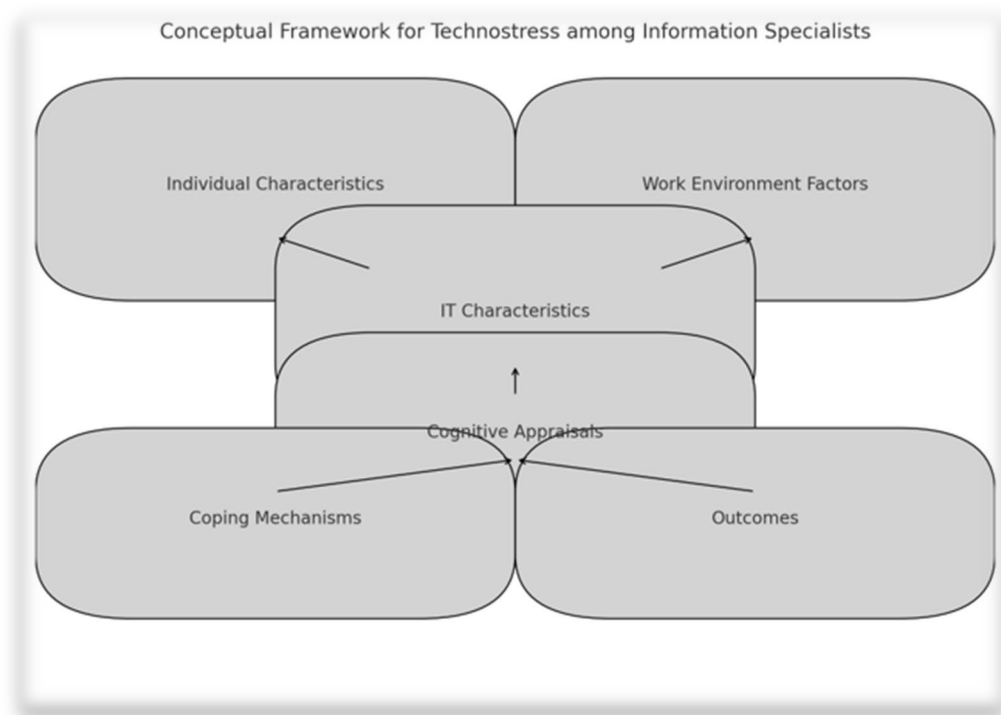


Figure 1: This figure shows how the original model by Brod (1984) has been adapted by Pasipamire (2024) to reflect new insights

The framework on technostress is supported by existing literature, which highlights individual characteristics, demographic factors, work environment factors, cognitive assessments, and coping strategies (Brod, 1984; Rosen, 1997; Ragu-Nathan et al., 2008). These elements are crucial in understanding how technostress impacts

reduced work efficiency, job satisfaction, and physical health problems. Factors such as inadequate organizational support, unclear work expectations, cognitive assessments, training, and mindfulness exercises are essential for coping (Harunavamwe & Ward, 2022). These findings support the focus on individual characteristics and coping strategies in managing technostress.

Cognitive appraisals and coping strategies such as training and mindfulness exercises are crucial for librarians to deal with technostress, which can lead to reduced work efficiency, job satisfaction, and physical health problems, as studies by Ayyagari et al. (2011), Ennis (2005), Stephens (2013), Tarafdar et al. (2015) and Pirkkalainen et al. (2019) revealed. Their results confirmed the framework's focus on outcomes and linked technostress to reduced job satisfaction and physical health problems.

3. Methodology

The study explored the experiences of information specialists experiencing technostress using an interpretivist paradigm and a qualitative approach (Denzin & Lincoln, 2008; Creswell & Creswell, 2018). The study used a case study design that focused on information specialists at a PHEI. Purposive sampling was used to select participants with library and information service experience (Patton, 2015). Data collection involved semi-structured interviews, which were recorded and transcribed verbatim (Creswell & Creswell, 2018). Thematic analysis was employed to identify recurring themes and patterns related to technostress among information specialists (Braun & Clarke, 2006). Data collection continued until saturation was reached, indicating no new information was emerging.

3.1 Data Presentation and Analysis of Findings

During the semi structured interview discussions four emerging themes were identified to address the research question: "What are the experiences and challenges of Information specialists/ librarians regarding technostress in the context of technology integration into library services, and how do these experiences affect their daily tasks and job performance?" The findings are analytically presented and discussed within these four themes.

The themes are:

- Theme 1: Experiences and Challenges of Technostress and Technology Integration
- Theme 2: Symptoms of Technostress
- Theme 3: The Impact of Technostress on Librarians' Job Performance, Productivity, and Well-being
- Theme 4: Effective Strategies for Managing Technostress

The themes identified during the data analysis, associated with technostress among Information Specialists/Librarians at a PHEI in South Africa are presented in Table 1 and discussed in detail thereafter.

Table 1: Themes

Main Themes	Sub-Themes	Description
Experiences and Challenges of Technostress and Technology Integration	Technical issues and System failures.	Librarians face significant stress and frustration due to recurring technical issues and system failures, causing emotional and mental strain during critical tasks like training sessions. Delayed IT support exacerbates their frustration and affects the users they assist.
	Challenges with Software and Tool Usability	Librarians face numerous software and tool challenges, such as network issues, software incompatibility, and format issues, which can lead to data loss, platform issues, and limited software knowledge, causing frustration and stress.
Symptoms of Technostress	Physical Symptoms	Librarians do experience physical and emotional symptoms of technostress. Physically, they often suffer from eyestrain, headaches, and general body aches due to prolonged screen use and technical issues.
	Emotional Symptoms	Librarians' performance and well-being are greatly impacted by technostress, a persistent problem that causes worry, irritation, and unhappiness with their jobs.
The Impact of Technostress on Librarians' Job Performance, Productivity, and Well-being	Varied Impact of Technostress	The effect of technostress on librarians varies widely, with some experiencing minimal disruption and others facing significant challenges in productivity and well-being.

Main Themes	Sub-Themes	Description
	Physical and Mental Health Effects	Technostress can lead to physical symptoms like migraines and exhaustion, as well as mental strain, impacting librarians' overall well-being and ability to perform their duties effectively.
Effective Strategies for Managing Technostress in Professional Environments	Taking Breaks and Physical Movement	Participants relieve stress by taking short breaks, walking around, and temporarily distancing themselves from technology to rejuvenate and refocus.
	Acceptance and Adaptation	Some participants manage stress by accepting what is beyond their control and focusing on what they can influence, which brings a sense of calm.

3.2 Theme 1: Experiences and Challenges of Technostress and Technology Integration

This theme explores the experiences and challenges of technostress and technology integration faced by information specialists in library services.

Participants were asked, "How often do you experience feelings of stress or overwhelm due to technology-related tasks or issues? Can you provide specific examples?"

"... When using systems like EBSCOhost or Workflow, it can be stressful when technical issues arise, especially during training sessions with students or lecturers. The frustration and emotional strain come from scheduling these sessions only to find that the system isn't working when needed..." [Participant I].

"... It's frustrating when librarians can't fix technical issues themselves and have to wait for IT, especially when help isn't immediately available. Software updates also cause delays, interrupting work with time-consuming pop-up messages..." [Participant C].

"...students often come to us for help when they're struggling to complete a task, especially when they're overwhelmed by deadlines or network issues. As information specialists, we sometimes need to go above and beyond to ensure they can submit their work on time..." [Participant B].

Participants were asked "Are there any particular technologies or tools that you find more challenging to use than others and why?"

"... the main challenge I often face is network issues with the tools we use. For example, sometimes when I add items to the workflow, they don't save properly, and I have to upload or edit them again due to system errors and software compatibility problems..." [Participant C]

"... I used a design on Canva, but when I tried to display it on the screens, it didn't work. This meant I had to redesign or remove important elements, causing stress because I really wanted that design, but our monitors didn't support it and I felt frustrated with the format compatibility issues in Canva ..." [Participant J]

"... the issue I have with Excel is that to get used to it, you need to use it daily. Since I don't use it often and only use a few functions, I struggle when new issues arise..." [Participant G].

The findings reveal that technological problems, such as frequent system failures and adapting to new tools, significantly increase stress levels among participants. Participants' experiences of being overwhelmed by system failures, technical glitches, and software issues align with Aharony and Prebor (2015) and Breeding (2018), who noted that such technological changes significantly impact library specialists. Ennis (2005) also highlighted that rapid technological advancements and the pressure to maintain proficiency contribute to technostress. Physical and psychological symptoms such as eyestrain, headaches, and general discomfort reported by participants align with Chiparausha (2022), who noted similar issues among librarians from extended use of digital tools.

3.3 Theme 2: Symptoms of Technostress

Participants frequently experience eyestrain, headaches, and general physical discomfort from extended screen use and poor ergonomics. Emotionally, they report high levels of anxiety and frustration, especially during technical issues and tight deadlines.

Participants were asked; “What physical, emotional, or behavioural symptoms have you experienced that you attribute to technostress in your role as an information specialist at our Private Higher Education Institution.”

The information specialists shared the following:

“...staring at the computer for long hours affects my eyes. I experience eyestrain, visual discomfort, and watery eyes from long periods at the screen, so I try to avoid staying on the computer too long...” [Participant B].

“...I get frequent headaches and anxiety, which make me sweat and feel nervous until I can relax. Extended screen use worsens these symptoms...” [Participant C].

“...being in front of the computer for a long time affects my vision and my eyes. For example, if I work from seven, I need to take bathroom breaks and come back to the computer, and I feel body aches, fatigue, and yawn during busy work periods...” [Participant F].

“...there is a lack of attention to detail and motivation. When I enter the information centre, I feel demotivated and just want to leave. This stress affects my performance and makes it hard to socialize and collaborate with other departments, creating a disaster situation....” [Participant G]

Participants frequently reported experiencing eyestrain, headaches, and general physical discomfort due to extended screen use and poor ergonomics, which aligns with Ranasinghe et al. (2016) and Watten et al. (2012), who found that prolonged computer use can cause significant eye discomfort and Computer Vision Syndrome (CVS). Headaches reported by participants are consistent with Ayyagari et al. (2011) and Chiparausha (2022), who identified headaches as a common symptom of technostress linked to extensive screen time. Emotional symptoms, such as heightened anxiety and frustration, match the findings of Tarafdar et al. (2007), who reported that technostress often increases anxiety and frustration due to job pressures and tight deadlines. This is further supported by participant reports of increased anxiety and frustration during technical failures and high-pressure periods. Observed demotivation and negative attitudes towards colleagues and students correlate with Tarafdar et al. (2015), which found a link between high levels of technostress and decreased job satisfaction. These findings are also supported by Murgu (2021) and Ranasinghe et al. (2016), confirming that technostress affects physical and emotional well-being, as well as interpersonal dynamics and job satisfaction.

3.4 Theme 3 : The Impact of Technostress on Librarians' Job Performance, Productivity, and Well-being

The impact of technostress varied widely among participants, with some experiencing significant negative effects on productivity and well-being, while others reported minimal or no notable impact. Observations revealed a range of outcomes, from minimal disruptions to significant negative effects on job performance and productivity.

Participants were asked: In what ways do you feel that technostress affects your job performance and productivity?

“...”I think the new technologies have made our jobs easier as information specialists, even though there are challenges like slow networks and computers. Despite these issues, the technologies are still beneficial for us...” [Participant B].

“...it just gets to a point where I get frustrated, but I try to manage it as much as I can. Overall, it doesn't significantly increase my stress because it's something I can control or handle...” [Participant D].

“... . I think technologies have enabled us to even reach out more to our students in a platform that doesn't have to have them physically with us here. So, there's been positive ...” [Participant H].

Participants were also asked: Can you share any personal experiences where technostress has impacted your mental or physical well-being?

“...I went to class to deliver a session on an electronic database for law students, but the database had a license that only allowed a certain number of students to log in at once. Some could log in, and some couldn't, which was frustrating because I had to advise the students who couldn't access it to just watch on the screen...” [Participant I].

"...Yeah, I would say the migraines, having like multiple migraines in a day and exhaustion. So as soon as I get to work, the only thing that you do is just fall asleep..." [Participant G]

Some individuals reported minimal impact from technology, indicating either no change or only slight disruptions in their job performance and productivity. For a few, technology even enhanced their work. This finding is consistent with studies suggesting that moderate levels of technostress can sometimes improve performance by motivating skill enhancement (Ayyagari et al., 2011).

Conversely, others experienced significant issues, such as slow technology and frustrations with tools like Excel, which negatively affected their productivity and work quality. This aligns with research indicating that high levels of technostress can reduce efficiency and productivity (Saunders et al., 2017; Ragu-Nathan et al., 2008). The experiences of anxiety, headaches, and physical symptoms such as eye strain and backache among some participants are consistent with existing research linking high technostress levels to increased anxiety, depression, and physical symptoms like headaches and eye strain (Chen & Muthitacharoen, 2016; Chiparausha, 2022).

3.5 Theme 4: Effective Strategies for Managing Technostress in Professional Environments

Based on the observed coping strategies used by information specialists, several key findings and observations emerged:

Participants were also asked: What strategies do you use to relieve stress when you feel overwhelmed by technology-related tasks?

"...If I am feeling overwhelmed, I take a short break and move away. After lunchtime, I come back and usually feel better..." [Participant H].

"... I just accept and do what I can. If it's not possible, I do what is possible and then communicate this to my line managers, letting them know if there's nothing more, we can do about it..." [Participant J].

"...I take walks around the building to take a break from the laptop screen. Another way I cope is by having tea without sugar and milk, and when I feel pressured, I play music in the background...." [Participant G].

Information Specialists employed a multi-faceted approach to managing technostress, which included physical adjustments, adaptation and learning, and support-seeking strategies. Regular breaks, physical activities, and screen adjustments were effective in alleviating symptoms such as eye strain and headaches (Tarafdar et al., 2015; Reinecke et al., 2017; Çoklar et al., 2016). Practical strategies, such as limiting the simultaneous use of applications and scheduling online activities, also contributed to stress reduction (Chiparausha, 2022). Support systems, clear ICT usage policies, and learning from technological experiences were critical elements for managing technostress (Tu et al., 2005; Barber & Santuzzi, 2015). Additionally, strategic time management and seeking assistance from colleagues and IT support were essential for effective technostress management (Tarafdar et al., 2017; Çoklar et al., 2016). Integrating individual short-term remedies and refining existing practices further enhanced technostress management.

3.6 Summary of Findings

Technological issues and the integration of new tools contributed to stress and physical discomfort. Effective management strategies, such as making physical adjustments, adapting through learning, and seeking support, were found to help address these challenges. The impact on job performance and well-being varied, with some participants experiencing significant negative effects, while others found technology beneficial or minimally disruptive. The findings underscored the need for supportive measures and effective coping strategies to manage the diverse impacts of technostress in professional environments.

4. Recommendations

To reduce technostress among information specialists, several recommendations are proposed:

First, implementing a comprehensive onboarding process is essential. This should include practical exercises and detailed documentation to facilitate technology adoption and reduce initial stress. Research by Tarafdar et al. (2015) and Shu et al. (2011) supports this approach, indicating that efficient adaptation helps lower the stress associated with learning new technologies.

Another crucial component is providing mental health resources. Access to stress management workshops and counseling services can significantly help information specialists manage the emotional and psychological impacts of their work. Evidence from Reinecke et al. (2017) and Chen & Muthitacharoen (2016) underscores the importance of such resources in coping with technostress and improving overall well-being.

Offering training on time management strategies is also important. Effective training should focus on prioritizing tasks, meeting deadlines, and managing interruptions. Ayyagari et al. (2011) and Tarafdar et al. (2017) emphasize that these techniques are vital for alleviating technostress. By equipping information specialists with time management skills, the institution can help them handle their workload more effectively.

Finally, establishing clear technology policies and support for work-life balance can significantly reduce technostress and enhance job satisfaction. Barber and Santuzzi (2015) and Tu et al. (2005) recommend policies that address technology-related expectations and support flexibility, realistic guidelines for technology use, and personal time, all of which contribute to a more manageable work environment.

5. Summary and Conclusions

Technological challenges, such as system failures and adapting to new tools, significantly increase stress among information specialists, leading to physical symptoms like eyestrain, headaches, and discomfort. Emotional symptoms like anxiety and frustration during technical failures are also observed. Some individuals reported minimal impact from technology or enhancements, while others faced significant issues like slow technology and frustrations with tools like excel, negatively affecting productivity. Physical symptoms like anxiety, headaches, and backache are also reported. Information specialists employed a multi-faceted approach to managing technostress, including physical adjustments, adaptation, and support-seeking strategies. Regular breaks, physical activities, and screen adjustments are effective in alleviating symptoms. Support systems, clear ICT usage policies, and strategic time management are crucial for managing technostress, supported by continuous refinement of these practices.

6. Areas for Further Research

There are several key contributions that add valuable insights to the existing knowledge base. The study focused on a Private Higher Education Institution in South Africa; a setting underrepresented in global technostress literature. This context-specific approach fills a gap and offers unique insights, potentially allowing for comparisons across different institutional settings within the same country or across similar contexts in the Global South.

The study suggests several areas for further research, such as exploring technostress in other private or public institutions, examining the long-term effects of technostress on job satisfaction and retention, and assessing the effectiveness of different intervention strategies. These suggestions help to map out a research agenda that could significantly advance the understanding and management of technostress in the higher education sector.

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Generative AI Tools in Teaching and Learning: An Enabler to Creating Work-Ready Students in the 4IR

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Abstract: Higher education is experiencing a paradigm shift with the advent of generative artificial intelligence (AI) tools and large language models. This transformative approach is revolutionising education and the world of work and, if harnessed correctly, has the propensity to shape future minds. The study sought to understand academics and teaching and learning (T&L) specialists' perceptions at a private higher education institution (PHEI) in South Africa on how Generative AI tools should be used in T&L to prepare students adequately for the world of work. This qualitative exploratory study purposively selected 40 academics and T&L specialists across ten sites from a PHEI in South Africa. Three themes emerged from the data: curriculum integration, discourse, partnerships and collaboration and training and awareness. To prepare students for the world of work that uses AI, it is important to integrate Generative AI into the curriculum and teaching and learning, considering industry-specific requirements through continuous discourse, partnerships and collaboration between stakeholders. The training and awareness of Generative AI tools are necessary for lecturers and students to understand better how to use Generative AI tools correctly and responsibly.

Keywords: Artificial intelligence, Generative AI tools, Private higher education, Students, Teaching and learning, Work-ready

1. Introduction

The evolution of technology is vast and, when misunderstood by users, can create a divide in adoption and use. As a result, over the last decade, there has been a growing interest in integrating technology into higher education institutions (HEIs) based on its understanding, capital contribution, and willingness to adapt to technological changes (Dignum, 2021). A contemporary exponential growth in technology uptake in HEIs can be seen through artificial intelligence (AI) (Selwyn, 2022).

The relevant integration of AI into the world of work and society is growing at a rate that many are still struggling to comprehend. However, those who can grasp the comprehensive breadth and depth that AI integration brings to an organisation or HEI can fully leverage AI's capabilities through streamlined applications ((Xie et al., 2021)). This results in improved efficiencies, innovation, profitability, and customer service. AI is fast becoming the new norm, and as industries and societies begin to adopt and integrate AI into their daily practices more smoothly, there is a conscious and heightened need to integrate AI into HEIs' T&L strategy to ensure that students are equipped with the relevant technological skills for the world work, enabling them to readily integrate into the job market. Hence, a radical shift in T&L pedagogies needs to occur, which, if done correctly, will also translate beyond the traditional classroom (Holmes and Tuomi, 2022) and impact the students' personal, social, and professional lives. The deliberate integration of generative AI into HEI will result in a radical disruption of the existing stasis of an HEI, which can result in fear of the unknown or misunderstanding of the power of AI (Niemi and Liu, 2021) if a lack of adequate AI literacy prevails.

From a global perspective, the United Nations Educational, Scientific and Cultural Organization (UNESCO) recommends that the inclusion of generative AI be integrated into students' curricula in consultation with stakeholders so that opportunities are leveraged and challenges are minimised to create a cohesive and inclusive society, economy, and world of work to ensure that they produce graduates who are easily absorbed by the labour market and have the required skills, competencies, and attributes that are viewed favourably by the industry (UNESCO, 2023; Ramos, 2022). To this end, the study sought to answer the following research question:

- How can the PHEI ensure that T&L enables students to learn about Generative AI, learn with Generative AI, and thrive in a world with Generative AI?

2. Literature Review

AI has been used prominently in educational institutions, from computer-related technology to web-based and online intelligent education systems and integrated computer systems that use chatbots and humanoid

robots (Holmes and Luckin, 2016). This evolution in computerised technology in education has assisted educational instructors, lecturers, and administrators in performing various tasks and duties more efficiently and effectively (Singh and Hiran, 2022). In some cases, it has also completed time-consuming tasks in minimal time on behalf of educational instructors, lecturers, and administrators so that they can focus on customised learning experiences that require a more in-depth instructor approach (Chen *et al.*, 2020).

- **AI's Position in the World of Work**

The role of AI will vary across sectors, with a marginal- to niche adoption of AI in manufacturing and service sectors, while employment and labour markets will see wider adoption of these applications (Hammer & Karmakar, 2021). George and Wooden (2023) expand on this claim; they explain that the digital marketing, customer support, healthcare, education, and e-commerce sectors have yielded positive results from using AI-based chatbots. Introducing AI-driven solutions for business is the leading trend in contemporary businesses.

The practical implications of AI in the world of work can see the creation of new functional departments that will facilitate the relationship between the employee and the AI system, a shift in the mindset of employees where there is a conscious recognition of the roles played by AI agents and a contemporary theory or framework for business to reference, given the introduction of this new dynamic organisational contributor (Farrow, 2022; Jarrahi *et al.*, 2022; Nimmi, Vilone, and Jagathyraj., 2021). Contemporary organisations wanting to integrate AI into their operations and organisational structures efficiently must ensure stakeholder buy-in; any hesitancy towards integrating AI may be met with declining productivity (Ruel and Njoku, 2020). A shift is needed for the greater good; instead of employees competing with technology, they should work harmoniously with technology.

- **The Power of AI for Students**

There are fundamental lessons when using AI to empower students, namely: including the youth in discussions that affect them, being inclusive in design (i.e., being non-discriminatory against those with different physical or learning abilities), democratising educational material so that students are empowered with AI, and addressing any potential bias in AI (Hawkins and Ciarrusta, 2023). The use of Generative AI tools, such as large language models (LLM), in advancing academia and librarianship is viewed with excitement and hesitancy (Lund and Wang, 2023). As a result, the onus rests on the institution to ensure that effective ways of working alongside technology to enhance academic deliverables are met, as opposed to academics misusing these tools in a hasty effort to create new educational knowledge (Holmes and Tuomi, 2022).

When entering the world of work, graduates will face practical applications that they would not have encountered before (Tuomi, 2018); thus graduates should be equipped with a wide range of practical skills to manage the vast applications of the world of work that are necessary for the respective industries; in order for organisations to maintain a competitive advantage in the market, they would actively need to leverage the utilisation of the Internet, technology, and AI together with those willing to do so. Organisations will have to take entrepreneurial risks to ensure commercial success (Makridakis, 2017). Examples of the most common educational technology platforms that have seen the fastest uptake in AI use are 1) virtual mentor, 2) voice assistant, 3) smart content, 4) presentation translator, 5) global courses, 6) automatic assessment, 7) personalised learning, and 8) intelligent tutoring systems (Schmelzer, 2019; Fitria, 2021). While a growing number of resources are dedicated to integrating Generative AI tools into T&L, there is equally a growing concern about understanding and reflecting on these practices. Zawacki-Richter *et al.* (2019) conducted a systematic review of AI applications in HE and noted concerns about a lack of critical reflection on the risks and challenges of AI in HEIs, a lack of understanding from a pedagogical perspective, as well as the lack of a deeper understanding of the ethical and educational perspectives of AI applications in HEIs.

- **Institutional Guidelines for T&L**

The use of AI has steadily been introduced into various educational institutions. However, over the last five years, there has been a rapid uptake in the number of Generative AI tools that have entered the market, such as LLMs like ChatGPT. This uptake has profoundly affected higher education (Schiff, 2022). Therefore, it has become imperative for HEIs to invest in a guiding document or policy that addresses the incorporation, integration, and, ultimately, the use of various Generative AI tools in student T&L and assessment of students (Tuomi, 2018). As a result, institutions should consider formulating essential guidelines that will serve as best practices, protect against unethical practices from students and lecturers and prepare for future evolutions in

Generative AI tools for higher education (Chan, 2023). The absence of such can perpetuate unethical academic performance in teaching, learning and assessment practices.

Some of the guidelines that institutions should be cognisant of include understanding the types of Generative AI tools that are available in the market, how these tools relate to specific academic disciplines, understanding the nature of Generative AI tools, and choosing the most suited ones for an assessment, and to ensure that the chosen AI tool is aligned with the academic needs of students and the institutional goals and objectives. It should provide clear communication through training sessions on how the chosen Generative AI tools are expected to be used to complement and supplement T&L activities in a classroom, encourage open and honest discussions within the institution and amongst students to gauge stakeholder buy-in and participation, and finally, to continuously engage in these practices so that the institution can refine its approach to AI and T&L practices for the betterment of students (UNESCO, 2021; Schiff, 2022; Utah Tech University, n.d.).

3. Research Methodology

The study sought to answer the following:

- How can the institution ensure that T&L enables students to learn about Generative AI, learn with Generative AI, and thrive in a world with Generative AI?

The study was exploratory, as there is little previous research at present to serve as a reference point on the perceived use of Generative AI tools, including LLMS, in higher education and the ability to adequately prepare students for the world of work. Using a qualitative methodological approach, the study sought to understand academics and T&L specialists' perceptions at a PHEI of their subjective experiences and views of the phenomenon under study. The study sought the perceptions of academics and T&L specialists before the PHEI took a formal stance on using these tools at the institution. The study was cross-sectional. For the study, Generative AI tools included, but were not limited to, CHATGPT, BING's Copilot, Midjourney, and DALL-E.

Data was collected using an open-ended online questionnaire comprising unstructured questions to assess the research question. An online questionnaire was deemed the most suitable instrument regarding the geographical reach of the PHEI campuses and the accessibility and availability of the target population. The PHEI Postgraduate and Research Ethics Committee reviewed the instrument, and two academics from the institution reviewed the instrument for clarity. Data were collected using the online survey platform Microsoft Forms from 03 April 2023 to 15 April 2023.

The targeted population was academics and T&L specialists at a PHEI across the ten delivery sites, with an approximate population size of 180. The survey link was distributed to the targeted population via email, by the institution's central information technology department, using purposive sampling. The participants had to be an academic or a T&L specialist and be employed at the PHEI. Participants of all races, genders and ages were included. The survey was closed after 40 responses were collected due to data saturation being achieved. Using Nvivo 12 Pro software, content and thematic analysis using inductive reasoning were performed on the data to establish trends and patterns. Three themes emerged from the Nvivo analysis.

Ethical clearance for the study was obtained from the PHEI Postgraduate and Research Ethics Department in accordance with its ethics review and approval procedures (R.00084).

4. Results

Based on the data collected, the following section presents the three emerging themes: Curriculum Integration, Training and Awareness, and Discourse, Partnerships, and Collaborations.

- Curriculum Integration

Many participants noted that module outcomes should be updated to incorporate industry-specific AI requirements and to integrate AI into the classrooms, curriculum, and assessments.

Participant 1 makes a valid point that for T&L to be effective and achieve the desired outcome, it is important for the institution to *"Meet students where they are and be able to adapt teaching in accordance with the latest AI advancements."*

Participants 2, 8, 19, 33 and 35 advised to *"Incorporate it into content, assessments and classrooms and T&L strategy,"* with Participant 8 suggesting *"teaching them how to use it correctly for their specific qualification and career, and how it can be useful or not within their future career".*

Participant 7 proposed that *"By ensuring that industry-specific AI Learning Units / Learning Unit Outcomes are effectively implemented into other appropriate modules within each and every degree "*, with Participant 16 indicating that *"Digital citizenship must be a module in all programmes."*

However, Participant 35 postulated that the PHEI should first understand what *"Generative AI tools are used in different industries"* before integrating them into the T&L strategy and curriculum.

Participant 10 said, *"Introducing students to different Generative AI tools in modules and in the classroom is a start, and even using Generative AI tools as part of lectures could benefit students. Participant 14 had similar sentiments. "We need to bring this into the classroom, emphasise these tools' augmentative role, and let them use it in such a manner. "* Participant 15 suggested, *"Use generative AI for possible class activities and scenarios, such as analysing AI responses to assess their relevance and evaluating what you would do differently. "*

Participant 20 painted a very bleak picture if Generative AI tools were not incorporated into T&L: *"They will fail in the workplace if we do not integrate AI into our T&L, and tertiary study as it exists today will become irrelevant"*, and Participant 32 advised the PHEI to *"Allow the use but change the way we question and interrogate the knowledge."*

Participant 10 felt, *"We may need to consider prescribing Generative AI tools within study material and even allowing students to access AI within certain assessment parameters. This may also necessitate a move from paper-based material to going totally online in the near future."*

Participant 35 asserted that the PHEI needs to *"Create an enabling environment that allows AI to take place in moderation and understanding."*

Over and above the PHEI creating an enabling environment, Participant 36 noted, *"We need to inculcate AI into our DNA, curriculum, T&L strategy and create innovation hubs. It must become part of our daily lives."*

Most participants did not use Generative AI tools, and some used them in their personal capacity or for their research, but not in the classroom. Hence, most participants are unaware of the various Generative AI tools, their capabilities, and their associated limitations. Thus, sentiments around the need for educating, demonstrating the correct use, and allowing students and lecturers to use AI emerged prominently to ensure that the benefits of AI, accompanied by its ethical and responsible use, are realised optimally.

To get students to learn about AI, learn with AI, and thrive in a world with AI, Participant 4 advised that *"We as educators need to guide them correctly from the start, the same way students are guided with social media,"* with Participant 5 encouraging the use because *"Like with everything else...practice makes perfect."*

Participant 3 argued, *"We should be demonstrating, promoting and allowing the use of any tools they will face in the world of work."*

Participant 11 indicated, *"Let the student use it and understand the wonders and dangers of AI. Students must understand that many white-collar jobs, such as marketing/advertising managers, accountants, contract lawyers, etc., may disappear. They must choose wisely; otherwise, they will sit without a job."*

Participant 18 felt that AI should be *"introduced in all stages of learning, including primary, secondary and tertiary,"* because *"Students should be educated on "AI literacy" to prevent the dumbing down of society,"* as alluded to by Participant 4.

Participant 15 stated, *"We need to adapt to the change in technology. Students will use it. It boils down to academics being adequately trained in the intended use and purpose of the tool and developing our students in the same manner."*

Participant 22 noted, *"Students should be educated on ethical use and misuse and provided with learning opportunities to ensure students are on an even playing field, despite varying levels of tech-savviness and access to technology."* Participant 25 shared similar sentiments: *"The best way to prepare students for the world of work is to use Generative AI tools and teach them how to use them correctly, responsibly and ethically."*

To assist students in understanding the key uses of generative AI and to use it responsibly, Participants 29 and 40 advised that *"A dedicated course on Generative AI tools" be created.*

The need to educate and train staff was also noted among many participants, with Participant 38 summarising the key points: *"We should first know how to use it. Staff should be trained; teaching and learning strategies need to be revisited. If we, as the holders of all knowledge, cannot figure out how to do it, we will not be able to prepare students for the world of work. As an educator and researcher, the institution should have been ahead of the curve and empowered us to utilise the tools. The students know all about it and are already using it."*

- Discourse, Partnerships, and Collaborations

In addition to providing training and increasing awareness of AI, its uses and ethical implications, participants also expressed the need for discourses, collaboration, and partnerships with various stakeholders from other HEIs or industries.

Participant 10 suggested, *"It may also be worth getting guest lecturers from industry who are actually using Generative AI tools in the workplace to show students what awaits them in the world of work."*

Participant 28 indicated, *"Students will generally be way ahead of their lecturers... this is THEIR world. Guests from the world of work need to collaborate with developers and lecturers to expose students to the practical uses and implications."*

"We need to revisit our Teaching and Learning strategy. We need to embrace AI at the highest levels. We need to research what other thought leaders in this area are doing and mimic what works well," argued Participant 38.

4.1 Implications of the Findings

PHEIs must be agile in adopting Generative AI and not be bureaucratically outdated despite their resistance to change (UNESCO, 2023). Generative AI tools should be used to support and not replace T&L and assessments. The use of AI is not to replace existing teaching strategies, but it rather serves as a tool in working with available technologies that are already in use better to support its ethical, deep-learning, creative-solutions formation, and scaffolding in students where information dissemination and teaching away is not the sole responsibility of the lecturer (Bearman, Ryan and Ajjawi., 2022). It will allow for better management of students and the student learning journey by awareness of how to leverage its use to promote smarter T&L whilst harnessing more efficient ways of thinking, methods of assessment, and critiquing baseline automatically generated AI information.

PHEIs must ensure continued involvement with key stakeholders in the industry that will guide the integration of Generative AI tools into higher education. PHEIs should establish industry partnerships (Ramos,2022), especially for professional qualifications where macroeconomic trends and guidelines continuously change. This will allow PHEIs to update the content and assessments accordingly so that industry needs are met comprehensively. The current and future curriculum design and PHEI qualifications must be flexible enough to accommodate changes and allow the seamless integration of technology-driven solutions, such as Generative AI tools. The converse can lead to the PHEIs having redundant qualification offerings resulting in unemployment (George and Wooden, 2023) if they have been too stringent in their original design that did not permit valid updates to the qualification. Further to this, T&L pedagogy must be thoroughly investigated, and key pedagogical teachings must be used to support the application of AI in curriculum and assessments (McGehee, 2023). PHEIs must ensure that existing T&L practices are critiqued so that future applications can harness value from these pedagogies within a new frame of Generative AI tools and AI reality in the curriculum. It is further recommended that AI-Education framework be created to guide T&L and that the policies and regulations of the PHEI be updated to include AI and the parameters within which it can be used (Chan, 2023; UNESCO, 2023) as the ethical aspects of AI are a concern to lecturers (Pisica et al., 2023).

Stakeholders responsible for delivering academic material, namely lecturers, must demonstrate AI literacy (UNESCO, 2023; Kuka *et al.*, 2022) before integrating AI into their teaching, learning, and assessment practices. There must be a deliberate initiative from the PHEI to ensure that awareness of Generative AI tools is brought to the attention of key academic stakeholders, as well as ensuring that training is conducted for lecturers and students (MacGregor, 2023) on how to engage with Generative AI tools (Chan, 2023) and to work effectively alongside technology (Holmes and Tuomi, 2022). They should be competent to work with AI and Generative AI tools before engaging with it with appropriate support in place (Ocaña-Fernández, Valenzuela-Fernández and Garro-Aburto, 2019). The absence of this will cause a ripple effect in that lecturers would be hamstrung in evolving their T&L best practices, and T&L managers would not be correctly addressing the market needs.

Students will be presented with an added complexity to their learning journey; they will be challenged to meet the industry graduate skills and fluid integration into the world of work (Xia and Li, 2022). As it stands, South African students are already faced with many challenges that hinder their ability to access and succeed in higher education. PHEIs must also hedge against integrating Generative AI tools into teaching, learning, and assessment in a manner that would create additional barriers to entry and learning.

Using Chen *et al.* (2020) model of Technology Structure of AI Education, the PHEI can work to integrate the use of AI in their curricula, teaching, learning and assessments and to facilitate the adoption of AI by the various stakeholders at the PHEI, the Unified Theory of Acceptance and Use of Technology model (Chatterjee and Bhattacharjee, 2020) is recommended. PHEIs should consider creating a collaborative platform for all stakeholders involved in curriculum development, assessment development, and facilitation to share best practices and innovative ideas towards AI integration (McGehee, 2023). This would also provide the PHEI with an indication of which resources are viewed more favourably and which resources are not leveraged by stakeholders, including students.

Furthermore, PHEIs must conscientiously develop partnerships between themselves and other PHEIs, non/governmental organisations and privates to foster learning between peers and share ideologies and learning strategies on digital technologies, especially AI (UNESCO, 2023). PHEIs can no longer view education as a solo initiative; rather, broadly, as a society, it becomes our responsibility to ensure that students are provided with the necessary capacities, skills, and attributes to contribute positively to the country's economic output. Although it is essential for PHEIs to engage with Generative AI tools and develop the competencies and skills of all involved in the development and dissemination of curricula, equal importance is placed on understanding how and why these initiatives are undertaken, relevance to the discipline, industry and professions hence the importance of conducting regular reviews and collaborations with stakeholders cannot be underscored (Nkulu-Ily, 2023; UNESCO, 2023). It is no longer acceptable for PHEIs to simply demonstrate their Generative AI support, but a more holistic approach to this integration is required; this must be facilitated through continuous improvement. The notion of continuous improvement can also be supported through dedicated capacity building and a quality assurance framework (UNESCO, 2023) that PHEIs can invest in developing that will systematically integrate all AI, assessment, and T&L components such that robust diagnostics can be run.

5. Conclusion

There is a pressing need for PHEIs to adapt to the changing needs of the world of work by ensuring that graduates exit with the desired skills, competencies, and attributes. PHEIs must invest in the training and development of T&L managers, curriculum and assessment developers, and lecturers so that this knowledge and competencies can be efficiently delivered to students. Furthermore, there must be deliberate intervention from PHEIs through programmes, training, and short learning programmes that create AI literacy and competencies for students. Before students can learn with AI and thrive in a world led by AI, the foundational building blocks of understanding what AI is, its benefits and limitations, and how to use it correctly and responsibly are crucial. This study was limited to a single PHEI in South Africa prior to the PHEI taking a formal position on the use of Generative AI tools in the institution. Therefore, it is recommended that a similar study be conducted among other private and public HEIs nationally and abroad to establish if similar perceptions prevail there. A post-study should also be conducted when institutions have a formal position on the use of AI, to establish if perceptions have changed. To attain a holistic view of the use of Generative AI tools in equipping students for the world of work, it is further recommended that perceptions of students, recent alumni, and industry stakeholders should be attained.

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Service-Learning Pedagogy: Student Experiences at a University of Technology

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Abstract: The changing educational landscape in the 21st century has seen higher education institutions (HEIs) focus more on innovation, flexibility, and adaptability. Despite these advances, there is still a need for innovative pedagogies like service learning (SL) to encourage students to critically examine their own contexts, beliefs, values, knowledge, and attitudes whilst empowering students to engage in self-reflection, appreciation of diversity, and critical thinking. However, to date, limited studies have sought to elicit the experiences of students within construction-related programmes in South African Universities of Technology alongside their lecturers concerning the utility of this pedagogy. As a contribution towards filling this gap, this paper used a quantitative research design to elicit the experiences of second year learners from the Built Environment Department at a University of Technology as it relates to the utility of the pedagogy. Integrated capstone projects were used in capturing the experiences in the form of engaged teaching. Data was collected using a survey administered to students to dig deeper into the experiences shared. Students were asked about their expectations and perceptions from the integrated projects in relation to using SL pedagogy to drive the development of competences among learners such as problem-solving and analytical thinking, respectively. The findings revealed that students were exposed to transformative learning through having to understand the socio-affective factors relating to their projects will facilitate the development of skills for lifelong learning, social inclusion and effective teaching and appropriate instructional resource use. The academic significance of this study lies in its contribution to understanding the impact of service-learning pedagogy on the development of critical competences such as problem-solving and analytical thinking among second-year Built Environment students at a South African University of Technology, thereby addressing the gap in research on student and lecturer experiences in construction-related programs.

Keywords: Capstone projects, Higher education, Service learning, Transformative pedagogy

1. Introduction

Traditionally, community engagement in higher education has been regarded as an optional service to communities, rather than an essential function alongside teaching, learning, and research (Pinfold, 2021). Higher education institutions in South Africa have undergone a shift that has made them more attuned to community needs. As a result, they now offer services and infrastructure to support service-learning programs (Thomson, 2011). Despite the existence of community engagement and service-learning initiatives at higher education institutions, the incorporation of community engagement into the curriculum has been slow (Jordaan and Mennega, 2022). Community engagement initiatives are typically considered as supplementary rather than integral parts of the curriculum.

Higher education institutions (HEIs) are increasingly prioritizing innovation, flexibility, and adaptation in response to the evolving educational landscape of the 21st century (Olo, Correia and Rego, 2021). Although there have been significant advancements, there is still an urgent want for teaching methods that drive students to analyze their own circumstances, beliefs, values, knowledge, and attitudes in a critical manner (Anderson and Stillman, 2013). Service-Learning (SL) is an innovative teaching method that enables students to participate in self-reflection, value diversity, and cultivate critical thinking abilities (Ramsaroop and Ramdhani, 2014). Although SL has gained significant popularity across several fields, there is a lack of research examining its effects on students enrolled in construction-related degrees at South African Universities of Technology.

This study aims to fill this need by examining the experiences of second-year students in the Built Environment Department at a University of Technology. It will do so by utilizing integrated projects and engaged teaching approaches. This study also aims to examine the effectiveness of Service-Learning pedagogy in improving the educational experiences of students enrolled in construction-related programs at a South African University of Technology. The study's main objective is to investigate the impact of SL on the enhancement of students' capabilities, particularly in problem-solving and analytical thinking.

2. Literature Review

2.1 Overview of Service-Learning Pedagogy

Academic service-learning integrates a university's education, research, and community service missions (Altun, 2021). Many university instructors worldwide have found that students who do community activities as part of their courses are more engaged and active (Chenarani, 2017). They recognize the practical relevance of their studies to real community challenges and contribute constructively to an organization (Carnicelli and Boluk, 2017). Students learn through actual experience in service-learning. It uses experiential learning theory to teach (Levkoe et al., 2014). Educational reform concepts that encourage student autonomy and accountability in learning shape it. This belief stems from the idea that the academy must prepare students for active citizenship (Mtawa, 2019).

Service-learning is linked to cognitivism, behaviorism, and constructivism. Cognitivism conceptualises students' learning processes, including information acquisition, organisation, and storage (Deeley, 2015). Language, logic, and problem-solving can retrieve information (Ertmer and Newby 2013). Social learning improves cognitive learning through reciprocal interactions with society, according to Vygotsky (1978). Behaviorism describes learning by observing behavior changes. It implies that students respond appropriately to external stimuli. Behaviourism links previous learning to new learning by applying it to new situations (Ertmer and Newby, 2013).

Service-learning activities demonstrate constructivism by helping students put fragmented knowledge together. Unlike cognitivism and Botha and Bezuidenhout, Service-learning causes pedagogical regression. Behaviourism and constructivism argue that students can learn from scaffolding because information is subjective (Salam, Iskandar & Ibrahim, 2019). The constructivists believe that our worldview comes from our subjective interpretations of personal experiences. Students learn and gain personal meaning by participating in community service-learning activities, including planning, preparation, implementation, and reflection (Lin, 2021). This new meaning may change their behavior. Service-learning promotes active learning by engaging students in their own learning. Participatory learning is widespread in service-learning (Botha and Bezuidenhout, 2020).

Instructional sessions encompass lectures, collaborative discussions, student panels, and debates (Mey, 2018). Service-learning activities and resources depend on students' personal experiences, ingenuity, and expertise, as well as their engagement with the community, to broaden and diversify the intellectual resources available to them (Buswa, 2015). Service learning also exposes the underlying assumptions, attitudes, beliefs, and emotions that influence how students respond to new knowledge, either in a positive or negative manner. Service-learning enables students to get a more profound comprehension of module content by tackling intricate issues within real-life situations (Mey et al, 2018). Service-learning facilitates the application of knowledge and problem-solving abilities to unfamiliar situations through practical solutions. The activities related to the implementation of service-learning should be organized in a way that community involvement improves academic learning, without substituting it.

2.2 The Role of Service-Learning in Higher Education

Service learning (SL) is an educational approach that combines academic study with community service. Recently, higher education institutions have adopted the SL as a modern teaching and learning strategy. It can be defined as a balanced approach to experimental education that can expand boundaries to enhance student cultural competence, create social capital and transformation and promote serving and learning (Salam, et. Al., 2019) & (Zembylas & McGlynn, 2012). Unlike traditional classroom learning, service learning actively engages students in real-world experiences, allowing them to apply theoretical knowledge to practical situations. Zulkefli and Uden (2013) suggest that quality is still key that it should be managed within higher education institutions by measuring and applying the emerging discipline of service learning. Therefore, it is key to note some of the key aspects of service learning which include integration of community service. Community service refers to voluntary work done to benefit the community, while service learning is a more structured approach that integrates community service with academic learning objectives. In the figure below, Mitchell (2008) illustrates the difference between traditional service learning and critical service learning in the figure below to explain how integrating community component transforms learning as a critical service.

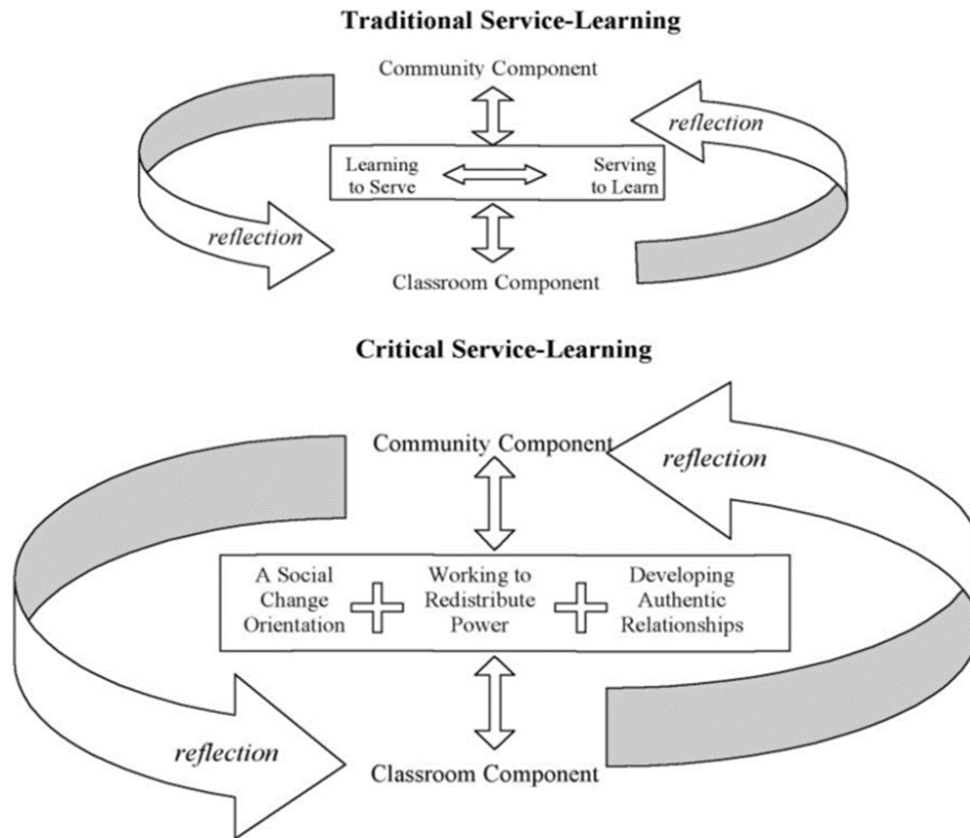


Figure 1: Differences between traditional and critical service learning (Mitchelle, 2008)

Transformative learning is a paradigm shift approach to learning as it enables a learner to critically reflect on their cultural beliefs and frame of reference (Jones & Miles 2017). Students will be able to critically reflect on their experiences, connecting what they have learnt in class to the community service activities. Reframing their ideologies helps them to transform into new ways of understanding and solving their own problems with understanding of their own beliefs (Mezirow, 2018). Through active engagement with the community projects, students can actively be aware of the social issues to be addressed whilst at the same time they take their individual social responsibility and use for personal growth (Shie, Leal and do Paco 2016). The projects identified should be such that they align with the transformational processes to advance societal well-being amongst the students and relevant to the curriculum.

2.3 Significance of Service Learning in Higher Education

Salam et.al., (2019) highlighted SL as a pedagogical approach that integrates community-based service with academic instruction. The significance lies in its capacity to enhance student learning by providing students skill enhancement for better knowledge on the practical implications of their studies and to develop critical thinking, problem solving and communication skills. Students acquire practical skills (communication, teamwork, problem-solving) while serving the community.

Through these lived experiences, service learning enhances employability by providing relevant experiences and networking opportunities. This hands on lived experiences can lead to increased motivation and engagement as students can see tangible results of their applied knowledge and work.

An analysis of the current research on the effectiveness of Service-Learning (SL) pedagogy in construction-related programs at South African Universities of Technology can provide valuable insights for future studies and improve the implementation of this teaching strategy (Chen 2016). Furthermore, there is a lack of comparative studies are required to assess the efficacy of SL pedagogy in construction-related programs across several Universities of Technology in South Africa (Lin, 2021). By comparing diverse institutions, one can gain a more comprehensive picture of the obstacles and achievements of service learning. Also, there is a lack of extensive research on the integration of SL into the wider curriculum and its compatibility with academic objectives and professional skills (Queiruga-Dios et.al. 2021). An analysis of the incorporation of SL into the curriculum and how

it complements conventional teaching techniques can improve its implementation (Botha and Bezuidenhout, 2020).

2.4 Service Learning in Construction Management (CM) Education

When looking at the effectiveness of service learning in higher education, it differs from one discipline to another. The curriculum mainly focuses on sustainability development concepts and how they can be effectively integrated. This examines the role that service learners play in the construction studies highlighting its benefits, challenges and best practices. Engaging in service-learning enhances students' metacognitive abilities, strategic planning and task-analysis skills, discernment of valuable information, and comprehension of client requirements and limitations (Caroline *et al*, 2013). Research and educational evidence indicate that service-learning is a very successful and appropriate method for training students in design, architecture, engineering, and construction. Considering these fields are practical in nature, many of them already necessitate experiential education such as internships, practicums, or cooperative service to graduate (El-adaway *et al*, 2015). Service-learning actively fosters participation and cooperation. Engaging in practical construction projects provides substantial chances for cooperative learning, which is crucial in contemporary construction practice (Redden and Bugg, 2022).

Service-learning in CM programs typically incorporates active learning (AL), collaborative learning (CL), and problem-based learning (PBL) techniques (Cline *et al*, 2014). Active learning is a type of learning that involves the learner actively participating in relevant learning activities (Hernández-de-Menéndez *et al*, 2019). AL prompts pupils to engage in tasks that compel them to contemplate ideas and evaluate their use of those ideas (Bertrand *et al*, 2021). Students frequently evaluate their own level of comprehension and proficiency in dealing with concepts and/or situations, and subsequently acquire knowledge through active participation or contribution (Kaddoura and Hussein, 2021). The method engages students both mentally and, at times, physically, by involving them in activities that require knowledge collection, critical thinking, and problem solving. Collaborative learning enhances the active learning process by necessitating the learner to engage in group activity with the aim of achieving a shared objective, so enabling many individuals to learn or attempt to learn something collectively (de Hei *et al*, 2020). Problem-based learning necessitates the learner's engagement with practical challenges that serve as a genuine framework. Problem-Based Learning (PBL) is launched by presenting a challenging problem, question, or puzzle that the learner is motivated to solve (Salvador *et al*, 2023). PBL emphasizes the process of students defining, researching, and solving authentic and practical challenges (Thorndahl and Stentoft, 2020).

2.5 Benefits of SL in the Built Environment

Students being involved in community projects; they apply their theoretical knowledge to real-world scenarios. By engaging themselves on activities such as renovating community facilities, being involved in building houses processes etc., students gain a deeper understanding and application of how construction materials are used, what actual construction processes entails and how to choose different techniques of construction for different types of projects. The process allowed students to clearly perceive problems relevant to their live and giving the students opportunity to collaborate with their peers to share their knowledge in problem solving (Mebert, Dalley & Gawarecki, 2020). Harris *et al*, (2018), also put emphasis on the fact that these experiences also cultivate cognitive behaviour that enhances critical thinking and problem-solving skills to navigate through the real construction projects.

According to National Academies of Sciences, Engineering and Medicine (2017), after series of engagements with the community, the students develop a better understanding of concepts through application thereby improving their academic performance and become involved in issues of communal importance such as risks, how to engage with the community, public decision making and sustainability. Other opportunities of construction organisations are that they are increasingly relying on stakeholder groups, project teams to accomplish complex tasks faced in a construction project. Built Environment students and construction workers, therefore won't be able to work in silos but will be forced to work in collaboration with each other teams to adapt to the demands of the 21st century skills development (Sabat, Whiteney & Perry 2015).

2.6 Barriers of SL in the Built Environment

Recent research conducted at the Cape Peninsula University of Technology (CPUT) highlights a growing recognition of the value of community engagement within academic institutions. However, it also reveals a significant gap in participation of staff at the departmental level, often due to a lack of incentives and inadequate communication from management (Pinfold, 2021). This finding underscores the broader challenges faced in

integrating service learning into construction-related courses, particularly in terms of the efficacy of the integration of service-learning pedagogy in the curriculum.

Queiruga-Dios et al., (2021) discuss the many challenges of adopting service learning as a pedagogical strategy within engineering studies. They emphasize that for service learning to be effectively integrated, it must align with academic learning outcomes and be supported by robust assessment mechanisms. This necessitates careful curriculum alignment, ensuring that service-learning projects are not only relevant but also enhance the educational experience (Queiruga-Dios et al., 2021). It is emphasized by Bettencourt (2015) and Salam et al. (2019), that if learning outcomes are not well integrated into the curriculum, service learning cannot serve as an effective pedagogical or assessment tool. This misalignment can lead to fragmented learning experiences, where the practical benefits of service learning fail to translate into academic success. Furthermore, Chen (2016) identifies the importance of selecting community projects that are meaningful and relevant to the course curriculum. Projects that do not align well with academic goals can diminish the educational value and fail to engage students effectively. Construction students have different practical skills and experience, which influences their capacity to contribute to community projects in service-learning projects. Academic support and training are needed to guarantee effective participation and benefit from the experience (Pearce, Bohmann, & Berkebile, 2016).

Community engagement is another major issue, according to Jordaan and Mennega (2022). Building and maintaining connections with community organizations takes time and effort to choose built environment initiatives. Building trust and understanding between academic institutions and community partners is crucial but difficult, according to Welch and Plaxton-Moore (2019). Effective community participation requires clear communication, common goals, and continuous collaboration, which can be hampered by institutional regulations and limits (Pinfold, 2021). Long-term partnerships with community stakeholders should be prioritized by higher education institutions to satisfy community needs and provide relevant learning experiences (Welch and Plaxton-Moore 2019).

Moreover, managing the expectations of both the community and the students is a delicate balance. Lee and Ceylan (2021) highlight that aligning the needs and expectations of the community with the educational objectives of the students can sometimes be difficult and if there is any kind of misalignment and expectation are not met, it can lead to dissatisfaction and disengagement from both parties, undermining the potential benefits of service-learning projects.

Essentially, integrating service learning into construction-related courses involves navigating several challenges, including curriculum alignment, skill level variability, and community engagement (Queiruga-Dios, Santos, and Acosta 2021). Addressing these challenges requires strategic planning, effective communication, and a commitment to aligning service projects with both educational outcomes and community needs (Botha and Bezuidenhout, 2020).

3. Research Methodology

3.1 Research Design

This study used a quantitative research methodology to examine the experiences of second-year students in the Built Environment Department at a University of Technology in South Africa regarding the effectiveness of Service-Learning (SL) teaching methods. The research aimed to investigate the impact of SL pedagogy on students' acquisition of competences such as problem-solving and analytical thinking. This was achieved through the implementation of integrated projects that fostered active and participatory teaching methods. The study also aimed to enhance the existing information on SL pedagogy in construction-related programs offered by South African Universities of Technology, which is currently restricted.

3.2 Participant Selection

The participants in this study were chosen via purposive sampling to guarantee that they had relevant experiences with SL pedagogy. The sample comprised second-year students who were currently enrolled in the Built Environment Department at the chosen University of Technology. The selection of second-year students was made considering their substantial experience with both conventional teaching methods and SL pedagogy, ensuring a well-rounded understanding of its effectiveness. A total of n=100 students were requested to participate, assuring a representative sample of the entire student population. of the n=100 students, n=65 students completed the survey.

3.3 Data Collection Methods

The collection of data was conducted by the implementation of a well-organized survey that was given to the chosen participants. The survey was created to gather comprehensive data regarding students' anticipations, perspectives, and encounters with SL teaching methodology. The survey incorporated a combination of closed-ended and open-ended questions to collect quantitative data and allow students to express their personal perspectives and observations. The survey was disseminated electronically, guaranteeing convenient accessibility and completion for all participants.

3.4 Data Analysis Techniques

The study used quantitative analysis as a statistical method to interpret the information provided by the students. It uses the statistical techniques to understand the data presented. This technique helps the researcher to identify patterns in student's experiences and perceptions. It provides clarity with percentages to predict how variables perform. Descriptive analysis was used to summarise the data by providing key points, filtering fewer valuable data and check how variables are related.

4. Findings and Discussion

4.1 Student Expectations and Perceptions

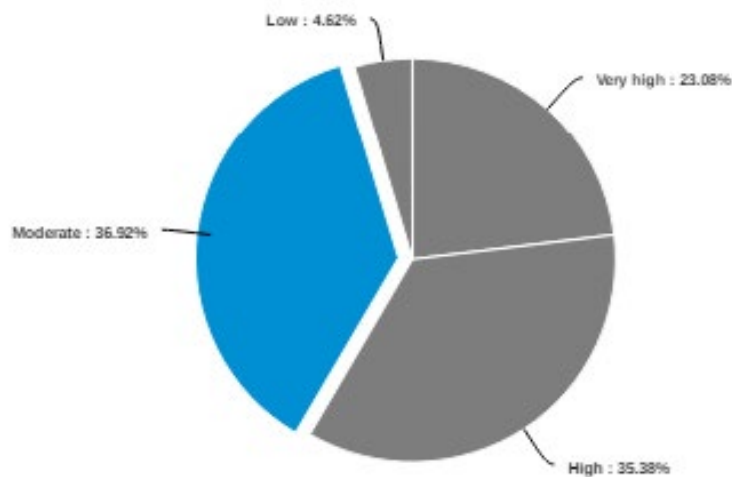


Figure 2: A chart showing student expectations and perceptions

The data indicates that a significant number of students felt unprepared for SL projects, with 41.54% unsure about their readiness and 10.77% feeling unprepared. Despite this, initial expectations for SL projects were high, with 23.08% having very high expectations and 35.38% having high expectations. Prior to participation, a substantial portion of students were either neutral (37.50%) or somewhat unfamiliar (28.12%) with the concept of service learning.

The difference between preparedness and expectations suggests a gap in preparatory education for SL pedagogy. This aligns with Queiruga-Dioset al., (2021), who emphasize the need for curriculum alignment to prepare students adequately for SL projects. The high expectations indicate being aware of the potential benefits of SL, but the lack of preparedness may hinder students' ability to fully engage with and benefit from these projects. The lack of familiarity with the concept of service learning highlights the need for better integration of SL concepts into the curriculum. According to Bettencourt (2015) and Salam et al. (2019), effective SL requires that students understand its purpose and methods. Enhancing students' familiarity with SL can improve their engagement and the overall effectiveness of the pedagogy.

4.2 Development of Competences Through Service-Learning

Answer	Count	Percent	20%	40%	60%	80%	100%
Problem-solving	38	15.51%					
Analytical thinking	37	15.1%					
Teamwork	53	21.63%					
Communication skills	46	18.78%					
Leadership	22	8.96%					
Social inclusion	21	8.57%					
Lifelong learning skills	25	10.2%					
(Other	3	1.22%					
Total	245	100 %					

Figure 3: A table showing development of competences through Service-Learning

Students identified several competencies developed through SL projects, with teamwork (21.63%) and communication skills (18.78%) being the most prominent. Problem-solving (15.51%) and analytical thinking (15.10%) were also significant outcomes. These competencies align with the goals of SL, which integrates academic learning with practical skills development. Pearce, Bohmann, and Berkebile (2016) emphasize that SL projects enhance skills essential for professional practice. The competencies identified in this study reflect the practical benefits of SL, preparing students for real-world challenges in the construction industry.

4.3 Socio-Affective Factors and Transformative Learning

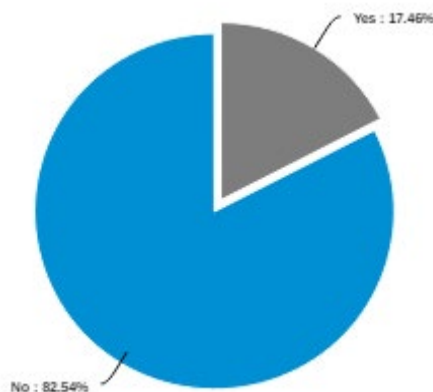


Figure 4: A chart showing socio-affective (e.g emotions and relationships) and transformative learning

While 82.54% of students reported no significant socio-affective factors impacting their learning, those who did (17.46%) mentioned issues such as mental health pressures, group conflicts, and lack of guidance. These findings underscore the importance of providing support mechanisms for students engaged in SL projects. According to Chen (2016), adequate training and support for both students and faculty are crucial for successful SL implementation. Addressing socio-affective factors can enhance the overall effectiveness of SL pedagogy and ensure positive learning experiences.

Engagement levels were high, with 52.38% of students feeling engaged and 23.81% feeling very engaged. Additionally, 30.16% of students reported that SL projects significantly encouraged self-reflection and the examination of their own contexts, beliefs, values, and attitudes. High engagement levels and the reported self-reflection indicate that SL can be a powerful tool for transformative learning. This supports the findings of Eyler and Giles (2015), who assert that SL fosters critical thinking and personal growth. The study's results demonstrate that SL projects can significantly impact students' socio-affective development, enhancing their educational experience.

Answer	Count	Percent	20%	40%	60%	80%	100%
Very Engaged	15	23.81%					
Engaged	33	52.38%					
Neutral	10	15.87%					
Disengaged	4	6.35%					
Very Disengaged	1	1.59%					
Total	63	100 %					

Figure 5: A table showing engagement levels service-learning projects

4.4 Satisfaction and Recommendation

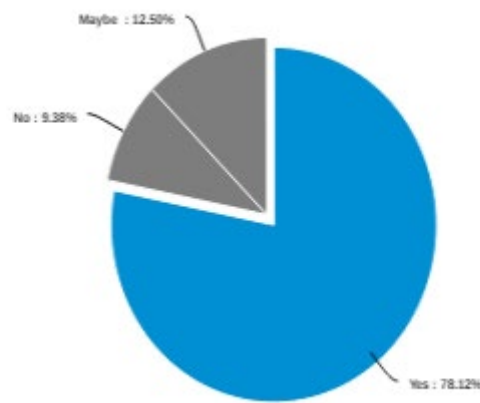


Figure 6: A chart showing the level of satisfaction

Regarding satisfaction with SL projects, 46.03% of students were satisfied, and 4.76% were very satisfied. The majority (78.12%) would recommend SL pedagogy to other students in construction-related programs. The high levels of satisfaction and willingness to recommend SL suggest that, despite challenges, students recognize the value of SL experiences. Welch and Plaxton-Moore (2019) highlight the importance of positive student perceptions in sustaining and expanding SL programs. This positive feedback supports the continued integration of SL in the curriculum.

4.5 Integration into Curriculum

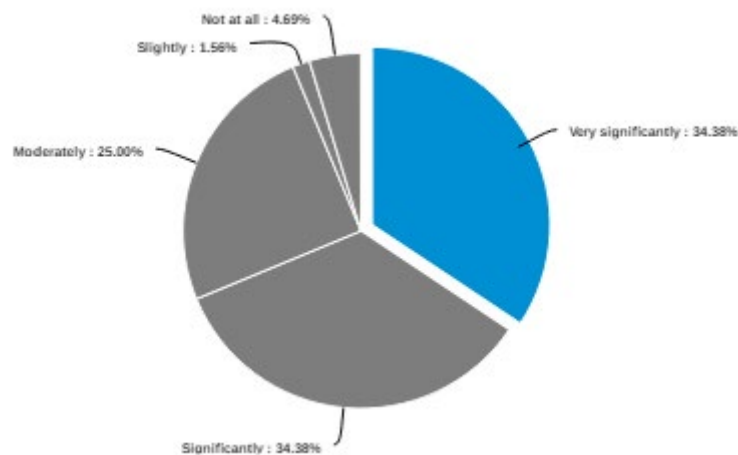


Figure 7: A chart showing integration of the curriculum

A significant portion of students (68.76%) believe that SL projects should be very significantly or significantly incorporated into other modules within their program. With student feeling the need to incorporate SL into the curriculum reflects a desire for more practical, experiential learning opportunities. Lee and Ceylan (2021) stress the importance of aligning SL projects with academic objectives to maximize their impact. The study's findings suggest that incorporating SL more comprehensively can enhance the overall educational experience, fostering critical skills and social responsibility.

5. Conclusion

This study explored how SL teaching affected second- year Built Environment students at a South African UoT. Despite high initial expectations, many students were unprepared for SL projects, but they improved their teamwork, communication, problem-solving, and analytical thinking. These skills are crucial for building success. Most students did not report significant socio-affective issues influencing their learning, but a few did mention mental health issues and group conflicts, stressing the need for support. SL's strong interactivity and self-reflection make it ideal for transformative learning. It fosters critical thinking and personal growth. Most students were satisfied with their SL experiences and supported integrating SL pedagogy into the curriculum.

Many students also supported incorporating SL projects into other classes, preferring hands-on, real-world learning. This study provides empirical evidence that SL pedagogy improves critical competencies and promotes transformational learning in construction-related programs. This research explains SL's pros and cons, helping educators and policymakers understand how it might improve education.

Future research should compare multiple South African UoTs. Service Learning (SL) should be studied throughout time to determine its effects on academic performance and professional growth. Research should also examine how to integrate SL into the curriculum. SL project community partnerships and socio-affective aspects should be examined in detail. Higher education institutions can use service learning (SL) to enhance vital skills, social accountability, and academic accomplishment to mitigate these gaps.

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‘Please Think Critically’: A Theoretical and Conceptual Analysis of Curriculum Delivery of Law Degrees

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Abstract: This paper aims to perform an analysis of pedagogy and theory of the law degree. Pedagogy is the method and practice of teaching. The paper proposes that law education may accommodate a pedagogy of the development of ‘alternative critical scholarship’ in relation to law students. It employs the phrase ‘Please think critically’ because it is common in the history of legal education that the most successful scholars, and litigators all lived by the mantra: ‘please think critically’. It does not argue that a critical law student must be trained to be disruptive without cause, but that our methodology in curriculum delivery must encourage the law student to de/construct legal doctrine or concepts. This exercise may be accommodated as an alternative model for legal research. Thus, this paper contributes knowledge to critical legal research methodology. The research problem in this paper hinges on the fact that law students learn the skills of litigation (or problem-solving in the legal context) from learning by rote legal principles that are trite. They often do not learn the skills to perform a historical, theoretical and philosophical or doctrinal analysis of a/the law. This paper argues that to address this problem, they may be encouraged to learn about the epistemology, ontology, morality, philosophy of history and African philosophy. This will arm them with the tools to approach the established legal principles with an ability to re/think, re/imagine, and/or re/de/construct the law. This type of study may, wholly or in part, be dependent on research from other disciplines. The development of this critical law student is dependent on the manner they are taught, assessed and developed in and out of the classroom. To encourage critical thinking, the student may be assessed on their ability to critique established legal instruments: the legal doctrine, nature of the law, new and proposed legislation, new case law and judges’ legal interpretations. The critical analyses and thoughts on alternative theories like decolonial schools of thought and African jurisprudence may be reflected in their dissertation.

Keywords: Conceptual critique, Critical thinking, Law dissertation, African philosophy

1. Introduction

The phase of university education (whether on the basis of a degree, diploma or higher certificate) is an important area of development for most legal scholars and practitioners. It is imperative that the development of such a scholar or practitioner be equipped with the skills enabling continuous engagement with their studies and practice. The preparation of the law dissertation often hinges on learning skills of litigation (or problem-solving in the legal context) from learning by rote legal principles that are trite. The law students will often identify a gap in the primary and binding sources of law and employ persuasive sources to articulate a legal argument. They often do not learn the skills to perform a historical, theoretical and philosophical or doctrinal analysis of a/the law. The shortcoming of this approach is that the legal doctrine/concepts or principles remain uncritiqued by law students. Even so the law student will not question whether these concepts are apt for a theory of justice. The legal problem statement is often responded to by applying similar legal doctrine that retain the same conceptual root. This may lead to conceptual and epistemic injustice. Thus, most law dissertations do not perform a conceptual critique.

This paper defines a conceptual critique as an analysis of the concepts and theories of legal doctrine/principles with the aim of achieving epistemic and conceptual justice. Some schools of thought show the benefits of expanding our research methodology to include a conceptual justice as a research methodology and not limit it to black-letter analysis. This paper proposes that to address this problem, the law degree may encourage law students to learn about epistemology, ontology, morality, philosophy of history and African (legal) philosophy. This will arm them with the tools to approach the established legal principles with an ability to re/think, re/imagine, and/or re/de/construct the law. This type of study may, wholly or in part, be dependent on research from other disciplines like Politics, Philosophy and Economics; and information, communications and technology in areas like patent law, electronics and technology law.

This paper aims to perform an analysis of pedagogy and theory of the law degree. Pedagogy is the method and practice of teaching. The paper proposes that law education may accommodate a pedagogy of the development of ‘alternative critical scholarship’ in relation to law students. It employs the phrase ‘Please think critically’ because it is common in the history of legal education that the most successful scholars, and litigators all lived by the mantra: ‘please think critically’. This paper does not argue that a critical law student must be disruptive without cause, but that our methodology in curriculum delivery must encourage the law student to de/construct

legal doctrine or concepts. This exercise may result into a new model for legal research. Thus, this paper contributes knowledge to critical legal research methodology.

The conception of law and justice is intertwined according to African philosophy as extrapolated by Prof (Ramose, 2015; Ramose, 2003). According to Ramose, it is important that the legal scholarship and degree is not far placed from the conceptualization of justice, this places conceptual critique at the heart of legal study and jurisprudence as the basis of questioning and engaging with legal sources of law as though they were fallible and may lead to injustice. The conceptualization of a critical legal study requires the student to critically engage with the concepts, doctrines and sources to achieve a conception of justice.

The conceptualization research question is: what interpretation of this legal regime would be just? What are the tools needed to achieve a just interpretation of this legal regime? The research is an exercise rooted in questions of justice. Western ideology introduces us to principles of natural justice and the certainty of legal positivism. SA constitutionalism hinges its praxis of justice on social justice and transformative constitutionalism. The question becomes what then of those students and scholars who are critical and sceptical of these western paradigms that are adopted in SA? Are their thoughts silenced and suppressed or moulded to fit these paradigms that are already cast in stone? 'African'/Azanian ideology teaches that justice can be achieved through the praxis of ubuntu philosophy, to develop law by Africans for Africans in order to achieve conceptual and epistemic justice (Dladla, 2021).

2. A Conceptual Critique and Methodology

2.1 Foundations of Critical Skills

At the foundation of critical thought is the idea of questioning, identifying the problem, and engaging with material at an analytical and synthetical level (Billig, 2003). (Billig, 2003, p. 37) defines 'critical analysis' as not 'referring to a criticism of books and systems, but to an analysis of reason which would be conducted by rational a priori principles *without the aid of experience*.'. Thinking further, the 'formulation of an academic theory inevitably occurs in the context of argumentation, so that the propounding of a theory involves the explicit, and sometimes, implicit criticism of alternative theories' (Billig, 2003, p. 37). It can be deduced that a critical analysis includes a discussion of the conceptual roots of all the binding and persuasive sources of law to advance or unsettle the current position of law.

- Logic and reason

A conceptual critique can only be achieved through a foundational understanding of logic and reason. Plato propounded that the principles of logic require an epistemic agreement that knowledge is justified true belief. (Appiah, 2003, p. 41). It is justified (proven) true (based on sources, evidence) belief (legal position, philosophy of law) and that when we identify a collection of premise/s that are justified true belief then we can conclude that some other manifestation of a phenomenon (legal position, philosophy of law) is correct. A (a) justified (b) true (c) belief in the context of legal research can be expounded by (a) inferred/deduced/reasoned, (b) proven, properly argued by lawful binding authority, and (c) ideological/legal/jurisprudential position.

The question that remains is what did the philosophy of epistemology require to prove truth – the absence of deception/malice? In law we deal with truths that are logical or deduced from the consequence of everything we already know. Hence the formulation 'If you know both A and B, then it is true of each sentence that (a) you believe it, (b) it is true, and (c) you must have good-but not necessarily indefeasible-evidence for the belief. Suppose you believe C, which follows logically from A and B. Since you do know A and B, it follows that your belief is true.' (Appiah, 2003, p. 53). (Ramose, 2003; Ramose, 1999).

The implicit premise contained therein is that a thorough study must be performed where all stones are turned (or at least the stones within reach). At the first instance the law student is expected to find the correct legal position through sources of law. Secondly, the law student performs a constitutional analysis to argue for law or conduct to be brought in consonance with the Constitution; and expanded through constitutional paradigm – that is the 'spirit, purports and objects of the constitution'. This is the area for creativity. It is at this stage that the law student is expected to bring afore all the skills they would have learned from the 'black letter' substantive engagement with legal doctrine. This would include (a) knowledge on the area of law, (b) skill in statutory interpretation and (c) litigation skills. Third, the law student will determine whether there are aspects of that law that violate the constitutional rights and other provisions associated with the constitutional provisions on governance. The critical student would identify an area of law that has not been dealt with properly (what we often refer to as the research gap).

- Research gap

The research gap manifests in different ways: (a) it often manifests through an incorrect understanding of the phenomenon, i.e. a wrong interpretation or application of the law; (b) an area that has gone unconsidered yet constitutes a violation of current provisions of law; (c) clashing judgments or legislations or interpretations of law; (d) minority judgments that are more persuasive than the majority judgment; (e) an unregulated legal phenomenon; (f) new areas that are undergoing regulation in the legislature that are tabled in the form of a Bill of Parliament, or Regulation, or by-law or mentioned in an arbiter by a court of law.

- Research gap: operations of law and justice

The further area of research manifests itself through: (g) the operations of laws that bring about unjust outcomes. It is this piece of research that is often ignored yet plays a significant role in legal reform and research. This area borrows itself from a historical, ontological and epistemological foundation of the legal ideology. At the heart of this legal ideology is often where the in/justice is hidden.

We identify further that the ideology in the Constitution is the ideal of transforming South Africa from the dynamics of colonial-apartheid to a democratic society. These positions inform legal research in the constitutional era. It follows that law enacted in SA may have remnants of Apartheid ideology, or if made recently, transformative constitutionalism, especially if we are interpreting a right or legislation mandated by the Constitution which often enables a right or expands on other constitutional provisions. This also applies to the context of common law.

A constitutional exercise either takes the form of a direct (frontal) attack on the common law, conduct, policy, legislation, interpretation of a judgment, development of the common law, or it could be merely an interpretative exercise in understanding a legislation or judgment properly. If we take the Hate Speech Act 2024 for instance, the interpretation commences in 16(2)(c) of the Constitution and its interpretative paradigm is transformative constitutionalism, that is so because the legislation aims to remedy the injustice of hateful speech towards certain persons who were previously marginalized, harmed, abused and killed due to that hate.

(Qwelane v South African Human Rights Commission, 2021) is evidence of this point. In *Qwelane*, the question was whether section 10 of the PEPUA Act extended beyond section 16(2)(c) of the Constitution and infringed section 16(1) of the Constitution. Research on the area focused on four aspects, (a) the harmful speech towards gays and lesbians; (b) transformative constitutionalism, (c) the value of dignity and equality and substantive equality jurisprudence, (d) constitutionality of the definition in the legislation. Through conceptual critique, the legislation was declared unconstitutional for the injustice embedded in its writing (Jeewa & Bhima, 2021).

2.2 History, Critique of law and Constitutionalism

The exercise of legal research has proven to be of *historical* moment (and signifies a critical shift in history) since it is not an anomaly for the law student to pull out research from an academic journal or case law that played a significant role in the development of law, justice and society. Secondly, the law is based on knowledge systems, it forms part of constitutive memory, (Balkin, 2022), and it explains shifts in societal normative and governance structures (De Vos, 2001; Mureinik, 1994).

During colonial-apartheid, the dominant critical culture stemmed from liberal thought as a political and rights tradition. We encounter authors like Prof Dugard who critiqued apartheid's reliance on the legal positivist Austin command theory as opposed to Prof Venter who argued strongly for the God ordained separation of the races, God-forbidding of homosexuality and so forth (Bilchitz, et al., 2017). The further critique was its abuse of authority through the supremacy of parliament and the undermining of the authority of the courts. The critiques of colonial-apartheid were levelled at four aspects: tricameral parliament which had three races: white, Indian and coloured whereby the white assembly had a veto power over all the other houses, land dispossession under the Native Land Resettlement 1954 and the Native Land Act 1913, racial legislation in socioeconomic outputs like education, healthcare, employment opportunities, and legal ideology.

The new positions on law seek to provide, as (Klare, 1998) states, 'a culture of justification' where the exercise of power shall be open to scrutiny. The schools of thought levelling critique at the Constitution/the law mostly develop their foundation from critical legal studies and legal realism, and they often formulate their theory on the injustice that emerge from the application of the law. The idea is that the new Constitution will provide a culture of rights that will create an opposite ideology to that of apartheid.

- Critiques in the post-apartheid era

Some critiques in the post-apartheid era were aimed at shaping constitutional interpretation through the praxis of social justice. To bring into frame certain principles not expressly written in the Constitution like 'substantive equality' (which got judicial recognition), transformative constitutionalism (which was inferred from the preamble of the Constitution), separation of powers and checks and balances (inferred from the corporative governance provisions of the Constitution) and public interest litigation (inferred from section 28 of the Constitution) that made alive to the court patterns of discrimination and disadvantages that required the court's attention. These culminated into jurisprudence from (*Minister of Health v Treatment Action Campaign*, 2002), similar elements of critical methodology are reflected in *Walker, Grootboom, Soobramoney, Baleni, Bhe, Nkandla, Blue Moonlight, Dladla, Beja, Joseph, Eskom, Phaahla, Mahlangu*.

The substantive interpretation of the praxis of 'social justice' has been a contested one. In 1998, (Albertyn & Goldblatt, 1998) advanced an interpretation of substantive equality that requires the Constitution to dismantle 'patterns of disadvantage' and 'eradicate systems of domination'. Later in 2018, (Albertyn, 2018) argued for an interpretation of the Constitution that advances a shift from systemic inclusion to 'systemic justice'. This interpretation has not been accepted by the courts yet. Former Chief Justice (Langa, 2006) provided an arguably ambiguous interpretation of transformative constitutionalism that left some critiques like (Sibanda, 2011) arguing that the Constitution was 'not purpose made', and (Bilchitz, 2002) arguing for a 'minimum core' in socioeconomic rights. The courts have rejected this position as strenuous on the state (*Grootboom v Government of RSA*, 2000) (Bilchitz, 2003). Later (Sibanda, 2020) critiques the compromise embedded in the Constitution, and its political economy (Sibanda & Raboshakga, 2023). Ramose challenged its epistemic foundation arguing for the sovereignty and epistemic justice of SA by critiquing the Truth and Reconciliation Commission and redelivering the conception of ubuntu back into African legal philosophical frame (Ramose, 1999; Ramose, 2020) and Modiri introduced critical race theory which argues that the liberal epistemological frame of race does not address the racial problem in South Africa (Modiri, 2012). Constitutionalism has been deeply contested and many do think it is hanging in the balance, and it remains 'elusive' for the deeply marginalized in SA as argued by Prof (Madlingozi, 2007; Madlingozi, 2017).

2.3 Types of Conceptual Critiques

The types of critique levelled at the law stem from (a) critical legal theory (Kennedy & Klare, 1984), and post-modernism (McVeigh, 2013), (b) critical race theory, (Modiri, 2012), (c) critical feminism, (Bonthuys & Albertyn, 2007), (d) legal realism, (Albertyn & Davis, 2010), (e) Marxist-legal critique, (Hunt, 2010), (f) decolonial critique to public law (Modiri, 2018), and private law (Zitzke, 2018), and stemming from African philosophy, (g) Azanian philosophical critique (Dladla, 2021; Modiri, 2021), (h) Biko jurisprudence in the afterlife of Apartheid, (i) critical race feminism (Wing, 1996), (j) historiography/historical justice (Dladla, 2018) and, what we may refer to as, (k) critical constitutionalism, (Pieterse, 2005) which comprises critics correcting the interpretation of the constitution. These critiques all have a similar trait in them, in that they critique the epistemic foundations of the law, its implementation, historiography and ethical foundations. At the roots, they all pursue justice.

3. Towards a Legal Conceptual Critique: Schools of Thought and the Conceptualization of Justice

Critical methods that have led to repeals of the law employ the history of law as a research device and formulation of school/s of thought to inform the conceptualization of justice. For the sake of brevity, I can only briefly consider two areas of critique: (a) feminist and gender critique to law and (b) a decolonial critique to private law. The substance and methodology adopted by the authors in these areas of critical thought inspire proper development of the law degree dissertation. In (*Sithole v Sithole*, 2021), para 30, the Constitutional Court (CC) cited Kimberley Crenshaw who 'coined the concept of the 'intersectional' nature of discrimination, writing as a Black feminist on women studies' and in para 31 the CC acknowledged 'social dynamics such as patriarchy, gender stereotyping, inflexible application of oppressive cultural practices. These dire circumstances have rendered women vulnerable, and this vulnerability is an aspect of social reality'. The court held further that 'the ideology of patriarchy' seems to have developed as a result of the elevation of the 'the idea of the leadership of the fathers' to a position of importance in society' and 'women were regarded as inferior to men. This developed an uneven power-relationship where the male sex obtained superiority over women, resulting in their subordination. (Matlala, 2022)

3.1 Schools of Thought and the Historical Device in Termination of Pregnancy and sex Work

Termination of pregnancy during Apartheid was prohibited and criminalised by the Abortion and Sterilization 1975. Read on its plain text, the legislation does not provide a clear picture. The term 'abortion' had a stigma and stemmed from the religious prohibition of ending a life. It was expressed as a sin in some religions and the sanction was that one would be an abomination and thereafter burn in hell for committing such an evil. As a result of medical research, there was later room for exception. This exception had several jurisdictional facts that had to be met in order for abortion to be lawful under the Act.

The advent of the Constitution brought into frame section 12. The Choice on Termination of Pregnancy Act 92 of 1996 (TEPA) enabled section 12 rights and repealed the Abortion Act. We observe the traces of feminist legal philosophy in words like 'right to choice' and 'bodily autonomy'. Feminist legal philosophy influenced the drafting of the legislation and constitution places it in the heart of constitutional jurisprudence. It stands to reason that the interpretation of TEPA is a feminist legal and philosophical exercise. A law dissertation with a conceptual critique would consider or critique feminism when interpreting the rights to reproduction and bodily autonomy entrenched in termination of pregnancy.

On the constitutionality of sex work, (*S v Jordan*, 2002) had to answer the question whether the Sexual Offences Act 23 of 1957 read with Section 11 of the Sexual Offences Amendment Act 32 of 2007 was a violation of the right to choice of occupation and free trade, labour, privacy, dignity and equality. The court held that the legislation was a justified limitation of those rights in terms of section 36. The feminist critique attacks the reasoning of the court under the leg of purpose of limitation. The critique argues that the reasoning of the court has undertones of stereotyping women in the context of bodily autonomy.

The SA Law Reform Commission 107 (26 May 2017) has considered the decriminalisation of sex work. Sex Workers Education and Advocacy Task Force made substantive submissions that the criminalisation of sex work is a denial of women's rights to choice in profession. The Report did not accept decriminalisation as the correct approach. Consequent to years of further research, the legislature tabled a Sexual Offences Amendment Bill, 2022. The Bill protects women's rights in terms of section 12 and gives effect to section 22 of the Constitution. I have sought to argue throughout this section that the interpretation of law in legal research cannot be effectively performed in exclusion of schools of thought. Any further research on this area requires an in-depth analysis of feminist philosophy (Bonthuys & Albertyn, 2007, pp. 15-49).

3.2 Critiques to Private law

- History of law as research device

In this subsection, we observe the research methodology from Emile (Zitzke, 2018). The paper delivers a critique on SA law, it opens with a historical analysis of the epistemic roots of private law. The author discovers that 'the private law stalwart paging through the *Corpus Juris Civilis* of the Roman Emperor Justinian, the writings of the Roman Dutch author Hugo de Groot, or the Law Reports of the South African appellate division will find no substantive encounters with the terms: 'transformation', 'Africanization' or 'decolonization' (Zitzke, 2018, p. 492). This opening is significant as it lends itself to a conceptual critique of the application of the law in South Africa.

In the paper, a historical device is utilised to critique dominant private law's ethical grounding – that common law has a 'synergetic relationship with conquest, and why this possesses dominant private law in South Africa today with a racist spirit'. The main claim is that 'colonization caused dominant private-law rules to flourish by annihilating, or in less severe cases, deforming African versions of law'. This phenomenon is referred to as an 'epistemicidal' dimension of private law 'in colonisation because the 'epistemology' (in other words, the knowledge systems, shown by 'epistemi-') of African people was 'killed' (shown by '-cide') (Zitzke, 2018, p. 492).

- Conceptualization of justice as research device

For the ethical dimension, the concept of 'epistemicide' is conceptualised as 'a veritable intellectual and spiritual holocaust from which the indigenous conquered peoples are yet to recover'. The analysis of epistemicide in the context of law entailed that the injustice of the '-cide' occurred throughout the concepts and knowledges of African people. Further that 'the Dutch afforded no respect to African law and completely ignored its existence while Roman-Dutch law was imposed on African people during the period of Dutch colonisation in the mid to late-1600s.' The ethical question was whether: 'at no point was it accepted that, being in Africa, African law should pre-dominate the legal system.' (Zitzke, 2018, p. 497)

Further, not only 'African rules and principles of private law that were destroyed and replaced by European versions in the process of colonisation' because with the 'imposition of a legal system comes new ways of reasoning and different conceptions of justice' (Zitzke, 2018, pp. 497-498). English law brought legal positivism which argued that law and justice should be kept separate in legal reasoning. Dutch law came with 'patriarchal' justice like concepts such as 'reasonable man', 'objectivity', 'rationality', 'certainty' amongst others (Zitzke, 2018, p. 489). He further makes the argument that 'dominant private law has been allowed to thrive in the way that it has because of belief in European intellectual and cultural superiority. This phenomenon is identified as racist. Borrowing from critical legal theory to understand manifestations of racism, Zitzke concludes that 'Joel Modiri teaches us that racism, as understood in critical race theory, does not simply relate to patent expressions of hatred based on race. We can also identify systems as being racist in that they uphold white power.' (Zitzke, 2018, p. 500). Finally, 'dominant private law in a material sense is guilty of the latter type of racism in that it upholds a white system of epistemic power and serves to deny alternative conceptualizations of the world as legitimate' (Zitzke, 2018, p. 500).

- School/s of thought as research device

In the paper, Zitzke introduces the schools of thought of African philosophy and their common themes by comparing them with western philosophy: 'there are interesting gaps between central themes in African legal theory and the English legal method of positivism, and the Dutch notions of natural justice.' (Zitzke, 2018, p. 498). In African legal theory, justice and law is inseparable concepts unlike in some strands of English positivism (Zitzke, 2018, p. 498). The argument made is that a human rights paradigm is not a decolonial option to private law because it has epistemic roots in 'European law'. He argues that albeit that transformative constitutionalism seeks to reform in a form of slow legislative changes to law, it 'nevertheless falls short of being a revolutionary, and decolonial, understanding of law.' (Zitzke, 2018, p. 501). This is so because human rights could have 'neo-colonial effects' that do not radically disturb or disrupt dominant private law. The concept of neocolonialism occurs when state independence is achieved on paper while 'certain superpowers still exercise control over the 'independent' state, and so the colonial order is maintained' (Zitzke, 2018, p. 504). On the colonial outcomes, 'when we merge colonial law (common law) with neo-colonial law (human rights) we are left with creole-colonial law and not a decolonial option' (Zitzke, 2018, p. 504).

On the roots, 'dominant private law is rooted in natural-law tradition, and it revolves around talks of subjective rights' (Zitzke, 2018, p. 504). The second reason that the human rights paradigm has neocolonial effects is that the prime instrument that advances human rights still 'subordinates African customary law to common law and the supreme Constitution itself' (Zitzke, 2018, p. 505). He recommends that the 'spirit of justice present in African law and legal theory could and should play an important role in how SA law is continuously reconceptualized. For this to be done successfully, we might have to rely on African philosophy' (Zitzke, 2018, p. 506).

The third reason why human rights have neocolonial effects is that they have a similar legal reasoning to dominant private law. They have found their central reasoning on law and liberal justice. This can be seen in the interpretation of the contractual principles of *caveat subscriptor* and *animus contrahendi*. Accordingly, we do not find any interpretation of African principles of ubuntu in contractual undertakings and what constitutes a meeting of minds and legal validity in relation to binding contracts.

Zitzke, borrowing from Prof Mogobe Ramose, extrapolates the African legal philosophy of ubuntu and how it differs from how it was adopted by our courts as a value of constitutionalism. The concept of ubuntu is missing in our Constitution and has been utilized in the context of public law to 'infuse illusions of hope in socioeconomic rights jurisprudence.' (Zitzke, 2018, p. 508). But it has been used less in private law, and that was in the context of a minority judgment which forms part of soft law, and it is not binding but persuasive authority. Recent authors like Metz and Bennet encourage that ubuntu must be interpreted through egalitarian outcomes (Zitzke, 2018, p. 504). This position has not proven to be persuasive.

Ramose correctly teaches that (a) 'legal ubuntu through the Constitution is not the same as the African [legal] philosophical concept of ubuntu. Ramose has repeatedly argued that there can be no ubuntu while African sovereignty still hangs in the balance; (b) Africans are not the supreme democratic authority but an animate document is. True restitution of land has not taken place, making reconciliation impossible. Furthermore, (c) the onto-triadic conception of be-ing (the notion that there are three interrelated dimensions of be-ing, namely the unborn, the living and the living-dead) is not properly respected in SA law.' (Zitzke, 2018, p. 508); (Ramose, 2014); (Oyowe, 2013). In sum: this means that any judicial interpretation of ubuntu that does not take cognisance of these dimensions of ubuntu legal philosophy give 'an inaccurate portrayal of what ubuntu has

meant and does mean, and so mocks and distorts African epistemology' in that it creates a dynamic where 'African notions are acceptable only insofar as they can be reconciled with the Western conception of law' (Zitzke, 2018, p. 508).

4. Conclusion

This paper has argued that a conceptual critique is necessary in the development of the law dissertation. It argued that legal education may have to accommodate a legal methodology of a conceptual critique of legal doctrine. This, as argued herein, will produce critical legal thinkers taking into account the interests of justice and devices necessary for considering a legal problem. This paper has not had the privilege of canvassing all areas of law including the typically commercial areas like competition law, insolvency, insurance, tax that some argue are not typically within constitutional debate or conceptual critique. It has also not dealt with traditional courts jurisprudence. These areas of law are not beyond conceptual critique. The methodology argued herein may, to the extent necessary, apply in those contexts. Due consideration may be placed on two arguments made in this paper: a conceptual critique made on historical research methodology and critical schools of thought such as (a) (Matlala, 2022) teaches that feminist philosophy plays a significant role in constitutional jurisprudence in relation to gender rights and (b) private law with resort to African philosophy and (Zitzke, 2018) teaches us that South African private law is neocolonial, and its application perpetuates colonial outputs. This article encourages further research in relation to research methodology encouraging conceptualisation of justice.

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Neuroscience-Informed Design of Learning Materials: Examining the Impact of Emotion, Interest, and Attention on Learning

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Abstract: The impact of emotional design on learning, particularly related to emotional valence, is a topic of interest in the domain of online and distance learning. This study, situated in the South African private higher education context, sought to explore how students learn and why certain learning materials better promote learning than others. The study used psychophysiological assessments, including eye-tracking, galvanic skin responses, and facial expressions, to explore the relationship between emotional arousal, interest, and attention in online learning. Nineteen students aged 18 to 24 were shown 11 different variations of an online module's first page, each differing in design elements, for 9 seconds to gauge their initial reactions. Emotional responses were measured using the Self-Assessment Manikin (SAM), and qualitative discussions provided further insights into students' preferences. The findings produced valuable recommendations for instructional design that fosters interest and enhances the learning experience. By integrating neuroscience techniques and educational psychology principles, the study established a link between emotion, interest and attention as key factors influencing student engagement and memory retention. This finding is significant as it highlights the importance of designing learning materials that capture students' initial interest, providing valuable insights into the universal principles of effective learning design. It emphasises the importance of emotional design in learning materials and the need for a balance between emotional arousal that generates interest but avoiding cognitive overload. The study underscores the critical role of purposeful learning design in creating engaging and effective learning experiences for students.

Keywords: Neuroscience for learning, Higher education, Learning material design, Emotional interest

1. Introduction

Widening access to higher education is a critical issue in South Africa, where there is a national shortage of university places for qualifying matriculants (IOL, 2024). In response to this challenge, STADIO Higher Education, a large private higher education institution, has committed to expanding its reach with the goal of enrolling 56,000 students by 2026. This ambitious target includes offering 20% of its programmes through Blended Contact Learning (BCL) and 80% through Distance Learning (DL), thereby catering to a diverse student body across nine academic schools, including Administration and Management, Engineering and Architecture, Commerce, Education, Fashion, Humanities, Information Technology, Law, and Policing and Law Enforcement.

STADIO's approach to education places a strong emphasis on student-centeredness and independent learning, particularly for DL students who rely heavily on their learning materials. To support these students towards their academic success, the institution recognises the important role of well-designed learning materials that support their independent learning experiences. The aim of these learning materials is to create effective, accessible, and high-quality educational experiences that align with the institution's broader goals of widening access and supporting student success (STADIO, 2024). The learning materials are designed to be affordable, inclusive, and tailored to the diverse needs of STADIO's student population. The policy emphasises the importance of accessibility and inclusivity, ensuring that learning materials are suitable for various demographic groups and consider cognitive load and the National Qualifications Framework (NQF) levels.

The STADIO Materials Development Policy (2024) emphasises the need for materials to be relevant and current, incorporating local and culturally relevant examples while promoting global perspectives. Legal and ethical compliance, including adherence to intellectual property laws and the ethical use of AI, is also a key consideration in the development of these materials. The materials are expected to align with learning outcomes and curriculum objectives, utilising effective instructional design principles to enhance the learning experience.

It is within this context that the current study was conducted. The research aimed to provide psychophysiological insights to develop learning materials that are engaging and effective. More specifically, the study focused on exploring the underlying psychophysiological reactions of first-year students when exposed to different layouts of learning materials, with the overarching goal of improving the learning experience. The study examined their approach, avoidance, and valence reactions to the presented stimuli, providing further insights into potential study material layouts. The primary research questions addressed

were: What are the psychophysiological reactions to different layouts of study material, and how can these insights better guide the design of learning materials?

2. Literature Review

The literature identifies several neuroscience factors that significantly influence student engagement with learning materials. Cohen (2018) found that neural engagement, as measured by the inter-subject correlation of the electroencephalogram (EEG), is predictive of academic performance, particularly in educational video contexts. Similarly, Khedher, Jraidi, and Frasson (2019) demonstrated that EEG signals could effectively monitor mental engagement during learning activities, with higher engagement levels correlating with better academic performance. Kalogeras, Mejri, and Efthimiou (2022) emphasised the importance of narrative instruction in enhancing student engagement. Conversely, Howard-Jones (2010) warned against the dangers of neuromyths in education, noting that misconceptions about brain function can negatively impact teaching practices. Collectively, these findings underscore the importance of integrating neuroscience insights into the design of learning materials to optimise student engagement and learning outcomes. The review of the literature that follows, covers the concepts of emotion, interest, and attention, and concludes with the current gaps identified as a result.

2.1 Emotion

The Cognitive-Affective Theory of Learning with Media (CATLM), developed by Mayer (2014), emphasises the importance of integrating emotionally engaging elements into the design of learning materials to enhance cognitive engagement and learning outcomes. According to this theory, emotional valence—the positive or negative emotions associated with a stimulus—plays a crucial role in learning. Positive emotions, such as joy and excitement, can enhance engagement, creating a conducive learning environment that improves retention and understanding of content (Hascher, 2010). Hascher (2010) further emphasises the connection between mood and student motivation, suggesting that emotionally engaging content is more likely to be processed and remembered.

Studying the link between emotion and memory, Bradley and Lang (1994) found that emotional experiences have two independent dimensions: valence, which depicts the extent of happiness or sadness, and arousal, related to the intensity of the experience. Emotional arousal, closely linked to emotional valence, influences attention, motivation, and information processing. O'Reagan (2003) challenges the traditional view that cognition is purely logical, arguing that cognition is intertwined with emotion. This perspective is supported by Plass et al. (2014), who highlight that the emotional design of multimedia learning materials can promote positive emotions in students, thereby enhancing comprehension and transfer.

A recent study by Ozcelik and Arslan-Ari (2023) on the relationship between emotional arousal and learning, revealed that interest acts as a mediator between arousal and learning. Their research found that emotional arousal can increase interest, which in turn enhances learning. They also discovered a direct effect of emotional arousal on learning, reinforcing the idea that emotion and cognition are deeply interconnected. From an evolutionary perspective, the remembrance of information surrounding emotional events is considered vital for survival (Hamann, 2001). For example, remembering the location of a water source or avoiding a predator's attack is crucial (Buchanan & Adolphs, 2002).

However, it is important to recognise that emotion does not always enhance memory. Meinhardt and Pekrun (2003) found that negative emotions could interfere with learning processes. Harp and Mayer (1997) also discovered that adding "seductive details"—emotionally interesting but irrelevant information—can detract from the recall and transfer of multimedia materials. Park, Flowerday, and Brünken (2015) suggest that such details may divert cognitive resources away from essential learning content, highlighting the complexity of emotional valence in educational settings. Therefore, while positive emotions can be beneficial, careful consideration must be given to the type and relevance of emotional content integrated into learning materials.

2.2 Interest

Interest, closely linked to curiosity, is essential for maintaining student engagement with learning materials Pintrich (2004). Research suggests that a student's reaction to the visual appearance of text can significantly affect their interest in reading, which then influences their engagement with the material. Caine and Caine (1990) further emphasise that the human brain seeks novelty while requiring familiarity, suggesting that learning materials must balance these elements to sustain student interest.

2.3 Attention

Attention, defined as the cognitive process of selecting and focusing on specific information for processing, is another critical factor impacting learning. Dzulkifli and Mustafar (2013) describe attention as crucial for memory retention, noting that the degree of attention attached to certain stimuli increases the likelihood of that information being stored in memory. The eye-mind hypothesis supports this by suggesting that what is fixated upon is processed, highlighting the importance of strategically positioning key elements in learning materials to attract and maintain attention. While the importance of sustaining attention is recognised (Pintrich, 2004; Dzulkifli & Mustafar, 2013), there is a lack of longitudinal studies examining how sustained attention impacts long-term learning outcomes. This gap highlights the need for research into designing learning materials that maintain engagement over extended periods, particularly in self-paced online courses.

2.4 Summary

Despite the progress in understanding the impact of emotion, interest, and attention on learning, several gaps remain. While emotional arousal is recognised as a key factor influencing attention and cognitive engagement, most existing studies do not fully explore how emotional arousal specifically impacts learning in online or distance learning settings. The dynamics of emotional arousal in these contexts, where social cues are limited, remain underexplored. Although the role of visual design in capturing and maintaining student interest is acknowledged, there is a gap in understanding the specific visual design elements—such as colour, typography, and layout—that most effectively promote emotional engagement and learning (Mayer, 2014).

Finally, while there is a growing understanding of the importance of emotion, interest, and attention in learning, further research is needed, particularly in the context of online and distance learning. The findings of this paper are relevant for instructional design and materials development, especially in learning settings where social engagement is limited. Integrating these neuroscience-informed insights into the design of learning materials could significantly enhance student engagement and improve learning.

3. Methodology

In this study, an interpretivist approach was employed to understand participants' subjective experiences and perspectives to uncover underlying meanings and insights, acknowledging that knowledge is socially constructed and shaped by individual and cultural contexts (Schwartz-Shea & Yanow, 2012). Additionally, an experimental design was implemented alongside the interpretivist framework, allowing specific stimuli to be presented in a controlled environment. This combination of approaches enabled a systematic exploration of causal relationships within observed behaviours, facilitating an understanding of both subjective insights and specific reactions to controlled stimuli (Joubert & Bothma, 2019).

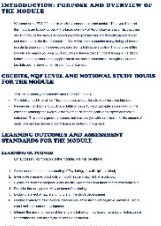
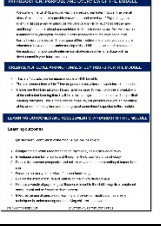
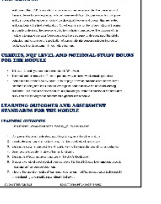
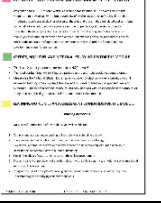
3.1 Sample

Participants were purposefully and conveniently selected from the first-year cohort on a single campus. The sample comprised 19 students, of whom 13 were aged between 18 and 20 years (68%), four were aged between 21 and 24 years (21%), and two were aged between 25 and 28 years (11%). The gender distribution included 15 female participants (79%) and four male participants (21%). Considering the experimental nature of this study, which does not require large sample sizes, this sample was deemed adequate to ensure reliable and valid data for analysis and reporting purposes.

3.2 Research Instruments

The study involved exposing participants to the introductory page of the study guide of an education module, presented in 11 different formats. Each page featured minor variations in font, colour, white spaces, and headings (see Table 1).

Table 1: Summary of the findings

		
Version 1	Version 2	Version 3
-	Grey shading behind headings removed	Headings: 14px and red. Content 12px and black
Original version	Same as original version but made very plain. Blue font	Original page content still fits on one page. Font remains blue
		
Version 4	Version 5	Version 6
Headings: 14px and red. Content 12px and black	Area below headings coloured blue with heading font in white	Same as version 5 but with addition of a graphic
Addition of colour and white space. Same font throughout as original.	Original page content still fits on one page	Page content less than original and with more white space – less text
		
Version 7	Version 8	Version 9
Heading font size increased	Heading font size increased	Same as version 3. Content font colour changed to black. Content indented 18 points
Colour added. Graphic added. Not all original content fits on page	Original page content still fits on one page. Blue font	Same as version 3 but content font colour changed to black. Increase in white space
		
Version 10	Version 11	
Same as version 4 but addition of thin red block line around page	Same as version 7. Font changed to Calibri. Same sizes as original but addition of coloured blocks next to headings and indented text. Sub-heading centred	
Addition of colour and white space	Colour added	

Students were exposed to each page in a random order for a duration of nine seconds to capture their initial reactions—specifically, their approach/avoidance responses—while preventing any in-depth reading of the content.

Two main research instruments were employed, the Self-Assessment Manikin (SAM), followed by student interviews. By combining unconscious physiological responses with conscious qualitative feedback, the study aimed to identify the visual elements that most effectively captured students' initial interest and attention, setting the stage for deeper cognitive engagement with the content.

3.2.1 Self-Assessment Manikin (SAM)

The Self-Assessment Manikin (SAM), developed by Bradley and Lang (1994), was used to capture the students' immediate emotional responses to each slide. SAM is a non-verbal tool that uses three pictorial scales—valence, arousal, and dominance—to represent different dimensions of emotional experience.

The following Psychophysiological measures were recorded during this exposure, as follows:

- **Heat map:** Eye-Tracking was captured to reveal attention by tracking where and for how long students looked at different parts of the slide. This measure indicated students' attention.
- **Pupillometry:** Pupil Dilation measured interest by determining how much students' pupils dilated while viewing the slide.
- **Galvanic Skin Response (GSR):** Peaks in the GSR indicated arousal which was then linked to specific moments of eye movement to understand the relationship between what students saw and how emotionally engaged they were.
- **Human Facial Expression:** These were captured to determine the overall emotional valence response (positive, negative, or neutral) as students interacted with each slide.
- **Self-Assessment Manikin (SAM):** Following the recording of psychophysiological measures, participants completed a Self-Assessment Manikin (SAM) attitude scale.

The data collection process commenced with initial exposures to a positive, a negative, and a neutral image to obtain benchmark readings, followed by the 11 different versions of a single learning materials page (see Figure 1).

3.2.2 Interview discussion

To complement the psychophysiological data, each student was briefly interviewed to share their impressions and feelings about each slide. This qualitative feedback provided deeper insights into the subjective experiences of the participants, which were then used to triangulate the findings from the psychophysiological assessments. In this way, it was possible to form an understanding of how different design elements influenced student engagement.

3.3 Data Analysis

Guided by the literature, the study was organised thematically around three key areas: emotion, interest, and attention.

3.3.1 Emotion

Emotional arousal responses were gauged using two primary methods: Galvanic Skin Responses (GSR) and human facial expression analysis. GSR data, linked with eye-tracking data, indicated levels of arousal, showing how emotionally stimulating each slide was. Facial expression analysis provided additional insights into the emotional valence—whether students felt positive, neutral, or negative emotions—associated with each slide. These observations were triangulated through the student feedback data collected during the focus group discussion.

3.3.2 Interest

Interest was signalled by pupil dilation (pupillometry), captured using eye-tracking technology. The extent of pupil dilation indicated how engaged a student was with a particular slide, providing insight into which design elements were most effective at capturing interest. This data was supplemented by the student feedback collected during the focus group discussion.

3.3.3 Attention

Attention was measured by eye-tracking through the recording points of fixation and the sequence of eye movements across the slide (heat map). This allowed the researchers to determine whether certain design elements, such as bold headings or colour contrasts, effectively guided students' attention through the content. In addition, the student responses collected during the focus group interview were noted.

3.4 Ethics

The research ethics for this study were overseen by the Bureau of Market Research (BMR) on behalf of the research team. All participants were thoroughly informed about the purpose of the study, the confidential nature of their participation, their right to withdraw at any time, and what to expect from their involvement in the research. Participants were provided with a clear explanation of the research objectives, the expected duration of their participation, and the potential risks—although none were anticipated—and benefits of their involvement. They were assured that the research would not cause them any harm and were explicitly informed that they were free to withdraw from the study at any point. An invitation to ask any questions regarding the research was also extended to them. Informed consent forms were distributed and explained to each participant, detailing the research methodology as outlined in this chapter.

4. Findings and Discussion

The study found that students' initial reactions to the slides varied significantly, with some slides eliciting higher levels of sustained interest and emotional arousal than others. For example: Slide 3 (with a change in heading font) and Slide 8 (with larger font size) both led to a logical top-down reading process, facilitating coherent engagement and knowledge acquisition. Slides 6 and 7, which included graphics and more white space, generated strong emotional responses, though interest in the graphics themselves was limited.

The results underscored the importance of first impressions of learning materials, especially in online learning environments. Visual presentation, including the use of colour, font styles, and layout, plays a crucial role in capturing students' attention and maintaining their interest. Emotional arousal was linked to sustained attention, supporting the notion that well-designed learning materials can enhance cognitive engagement and memory retention.

4.1 Emotion

The role of emotional arousal in enhancing transfer learning, as evidenced by the SAM measurements and the higher transfer scores associated with high-arousal slides, aligns with the findings of Gong, Jia and Li (2017) and Knörzer, Brünken and Park (2016), who also reported that emotion improves transfer performance. However, our study contradicts the meta-analysis by Brom, Starkova, and D'Mello (2018) and Wong and Adesope (2021), who suggested that emotional design positively affects all learning outcomes, including retention. The lack of significant improvement in retention scores in our study suggests that while emotional arousal can enhance the application of knowledge, its impact on the recall of factual information may be more limited.

4.2 Interest

The study's findings on the role of visual design in capturing and sustaining interest align with existing literature on the importance of distinct and engaging visual elements in educational materials. For instance, Plass et al. (2014) highlighted the significance of aesthetic design in enhancing student engagement, a finding supported by the strong interest generated by Slides 3 and 8 in our study. The logical top-down reading pattern observed with these slides also reinforces the notion that well-organised and visually appealing content can facilitate more structured engagement, as noted by Schiefele and Krapp (1996).

In contrast, the lack of sustained interest in Slides 1 and 2, which had more plain designs, contradicts the findings of Um et al. (2012), who suggested that even minimal aesthetic enhancements could positively affect student engagement. This discrepancy may be due to the specific context of our study, where students were exposed to highly similar content across slides, potentially diminishing the impact of minor design changes.

4.3 Attention

The eye-tracking data showing initial focus on the centre of the page and the effectiveness of bold and distinct headings in directing attention is consistent with the findings of Mayer and Estrella (2014), who emphasised the importance of visually salient features in guiding student focus. The relatively short gaze fixation on

graphics in Slides 6 and 7, despite their initial attraction, supports the conclusions of Park, Flowerday and Brünken (2015) that, while images can capture attention, their contribution to deeper cognitive processing may be limited unless they are directly relevant to the learning content.

5. Conclusion

This study confirms the vital role that neuroscience-informed design plays in creating engaging and effective learning materials. By focusing on the emotional aspects of valence and arousal in relation to the aesthetics of these materials, the research provides valuable insights into how the visual presentation of content can positively influence student engagement. The findings emphasise that a balanced approach to emotional arousal—one that captures interest without causing cognitive overload—is essential for fostering learning environments where emotional elements enhance both attention and curiosity. This balance is necessary to support better learning outcomes, particularly in contexts where maintaining student engagement is more challenging, such as distance and online learning.

One of the unique contributions of this study is the identification of a clear link between attention and curiosity, demonstrating that carefully managed emotional arousal can enhance student interest and cognitive engagement. This insight is particularly relevant for the design of learning materials, where emotional design can play a key role in maintaining engagement. Additionally, the research highlights the impact of specific design elements—such as font style, colour, and the inclusion of graphics—on emotional and cognitive engagement, offering practical guidance for developing more effective learning materials.

Furthermore, this study contributes to the growing body of research on the impact of neuroscience-informed design on learning by providing empirical evidence that emotional arousal, mediated by interest, enhances transfer learning but not necessarily retention. The findings support Cognitive-Affective Theory of Learning with Media (CATLM) (Mayer, 2014), highlighting the importance of integrating emotionally engaging elements into the design of learning materials to improve cognitive engagement and learning outcomes.

Finally, this research contributes to the broader goal of widening access to higher education in South Africa by informing the development of effective learning material design principles that are inclusive and responsive to the diverse needs of students.

Despite its contributions, the study acknowledges several limitations. The relatively small sample size and short exposure times may not fully capture the long-term effects of emotional design on learning outcomes. Additionally, the uniformity of content across different slides may have limited the ability to detect more subtle differences in how various emotional and aesthetic elements impact learning.

Future research should focus on exploring the long-term effects of emotional arousal on different types of learning outcomes, including both retention and transfer. It would also be beneficial to examine how emotional design influences learning in more diverse and complex environments, such as real-world tasks or collaborative learning scenarios. Further studies should investigate the interaction between different emotional and cognitive factors, such as how emotional valence interacts with cognitive load, to provide a more comprehensive understanding of how best to optimise student engagement and learning.

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Re-Imagining Teaching and Learning at South African Higher Education Institutions in the Digital Landscape

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Abstract: The core purpose of teaching and learning in HEIs in South Africa is to provide high-quality education and training that prepares students for success and meets societal needs. HEIs must develop curricula that are rigorous, relevant, and responsive. In the past five years, there has been a significant shift towards focusing on individual institutions' teaching, learning, and research practices. This study aimed to re-imagine teaching and learning within the digital landscape of South African public HEIs and provide recommendations for developing assessments in this context. For this study, primary data was collected through the analysis of the 2021 annual reports and official websites of the 26 public universities in South Africa. Primary data was collected from the 2021 annual reports and official websites of the 26 public universities. Content analysis identified trends and uncertainties impacting teaching and learning. The findings revealed that South African HEIs had experienced a shift towards blended and hybrid teaching, driven by the goal of expanding access to education and improving teaching quality through digital technologies. Several recommendations were developed that educators can follow to ensure that assessments developed in the digital landscape are of high quality and uphold academic standards and integrity. These include that assessments must be designed in such a way that they promote accessibility and equity. Educators should develop their own pedagogical approaches to ensure that they adapt to their students' requirements and that evaluations ultimately help students meet the outcomes required by the various modules and qualifications. Educators should also look for ways to boost student involvement and motivation while creating online tests, as this will benefit the students. Educators are also encouraged to embrace continuous improvement in their own assessment practices, such as approaching assessment design as an ongoing process and iterating and improving depending on data and feedback.

Keywords: Digital landscape, Teaching and learning, HEIs, Environmental scanning, Assessments

1. Introduction and Background

Higher Education Institutions (HEIs) have several responsibilities, which form the basis of their social contract with society (Gornitzka and Maassen, 2007). These responsibilities include producing values and social legitimation, selecting the elite, training the labour force and producing new knowledge (Cloete, Maassen and Bailey, 2015). The last three decades have witnessed dramatic developments in higher education. The changes have reflected increased student numbers, a broadening of curricula, alternative approaches to teaching and learning and many higher educational institutions re-defining their geographical and pedagogical boundaries (Neary, Harrison, Crellin, Parekh, Saunders, Duggan, Williams and Austin, 2010).

The digital revolution has impacted nearly every aspect of human life. More than 4.39 billion people globally have access to the internet and more than 6 billion are estimated to have some sort of mobile device, with half of them being smartphones in the near future (Kemp, 2019). This level of connectivity has influenced how people engage with others, get their news and see the world around them.

2. Research Objective

The primary objective of this study is to explore the future of teaching and learning at South African HEIs within the digital landscape and to develop recommendations for educators to consider when developing assessments in the digital landscape.

3. Research Questions

For Creswell and Plano Clark (2007:103), research questions are shaped by the purpose of a study, which, in turn, informs the methods and the investigation's research design. For this study, the researcher identified four research questions that shaped the study's structure. These research questions included:

RQ₁: What is the current state of the digital landscape at South African public HEIs?

RQ₂: What are the trends adopted by South African HEIs regarding teaching and learning within the digital landscape?

RQ₃: What critical uncertainties do South African HEIs face related to teaching and learning within the digital landscape?

RQ4: What recommendations should educators consider when developing assessments in the digital landscape?

4. Literature Review

4.1 Overview of Higher Education Institutions in South Africa

HEIs are defined by the Department of Higher Education and Training (DHET) as “any institution that provides higher education on a full-time, part-time or distance basis and which is established, deemed to be established or declared as a public higher education institution, or registered or conditionally registered as a private higher education institution under the Higher Education Act, 101 of 1997 page 9”. In South Africa, HEIs are responsible for providing tertiary education to students. These institutions are overseen by the Council on Higher Education (CHE), which is an independent statutory body that was established in 1997 to oversee the quality assurance of higher education in the country (CHE, 2021). The CHE's mandate is to promote and assure quality in higher education, as well as to advise the Minister of Higher Education and Training on matters related to the sector.

The Council on Higher Education (CHE) in South Africa identifies the core functions of HEIs as teaching and learning, research and innovation, and community engagement (CHE, 2021). Simpson and Gevers (2016) identify that these functions are generally interdependent. These core functions of HEIs in South Africa reflect the critical role that higher education plays in promoting economic, social and environmental development, and in shaping the future of the country and the region.

4.2 Teaching and Learning at South African HEIs

The core purpose of teaching and learning in HEIs in South Africa is to provide high-quality education and training that prepares students for success in their chosen fields, and that meets the changing needs of society (Tewari and Ilesanmi, 2020). To achieve this, HEIs are responsible for developing and delivering curricula that are rigorous, relevant, and responsive to the needs of students and society. Over the past five years, higher education teaching and learning in South Africa has experienced a significant shift as the focus has turned inwards to teaching, learning and research practice of individual institutions (Singh, 2015).

Teaching and learning in HEIs are typically structured around a range of programmes and courses that are designed to provide students with a comprehensive understanding of their chosen fields, as well as the critical thinking, problem-solving, and communication skills needed for success in the workforce (CHE, 2021). These programmes may include undergraduate and postgraduate degrees, diplomas, and certificates, and may be delivered through a range of teaching methods, including lectures, seminars, tutorials, and online learning platforms (CHE, 2021).

Overall, the core purpose of teaching and learning in HEIs in South Africa is to provide students with the knowledge, skills and competencies needed to succeed in their respective fields, and to contribute to the economic, social and cultural development of the country.

4.3 Digital Landscape

The digital landscape is defined as the collection of technological platforms, devices, and digital media that are used to access information and interact online (Maher, 2022). The digital landscape includes the internet, social media, mobile applications, online platforms as well as other digital tools and technologies (Maher, 2022). Webster, Svalastog and Allgaier, (2020:1101) define the digital landscape as the complex and overlapping ways in which information flows, exchanges and meanings occur both online and offline.

The term the digital landscape is often used synonymously with terms such as the digital environment (Boczkowski and Mitchelstein, 2021:6) and the digital ecosystem (Barykin, Kapustina, Kirillova, Yadykin and Konnikov, 2020:8). For the purposes of this study, these terms are referred to as the digital landscape.

The digital landscape is constantly evolving and changing as new technologies and platforms are introduced while old ones are updated or phased out (Bakri, 2019:232). For example, new social media platforms are constantly emerging, while older ones are becoming less popular. Alternatively, new technologies such as artificial intelligence and blockchain are being integrated into various industries (Feroz, Zo, and Chiravuri, 2021:2).

Moreover, the digital landscape also supports educational opportunities for all types of learners and provides digitally enhanced instruction (Johnason, Adams, Cummins, Estrada, Freeman and Hall, 2016). Educational researchers from diverse disciplines have been trying to identify the success factors of learning with digital media

in higher education for about two decades (Schneider and Preckel, 2017). One central aim of higher education is to foster student potential for high-quality accomplishments (Ellis, Pardo & Han, 2016) and support them in applying their knowledge to future challenges in their professional lives (O'Connor and Allen, 2010). Therefore, research on the use of digital learning environments in higher education should pay particular attention to learning outcomes as a prerequisite for evaluating learning success.

In this context, online assessments offer a broad range of pedagogical functions (Heil and Ifenthaler, 2023). Online assessments can be administered formatively throughout the learning process, offering continuing feedback and support, or summatively at the conclusion to assess overall accomplishment (Gikandi, Morrow and Davis, 2011). By incorporating online assessments into digital learning environments, educators may improve instructional efficacy and meet the needs of a wide range of learners.

4.4 Overview of the Digital Landscape in South African HEIs

The digital landscape in South African higher education institutions is complex, with both challenges and opportunities (Kayembe and Nel, 2019:87). On the one hand, many institutions face limited funding and inadequate infrastructure, limiting their ability to fully utilise digital technologies (Yende, 2021:56). Furthermore, there is a significant digital divide between urban and rural institutions, with many rural institutions lacking access to high-speed internet and other digital resources (Moonasamy and Naidoo, 2022:76).

On the other hand, several initiatives and programmes exist to encourage the use of digital technologies in higher education (Manda and Backhouse, 2017:5). For example, the South African government has launched several programmes to improve access to digital resources and support the development of digital skills among students and staff at higher education institutions. Furthermore, many institutions are exploring the use of online and distance learning to increase educational access, and a variety of e-learning platforms and resources are available to support these efforts (Mhlanga, 2021:28).

The COVID-19 pandemic, which started in the 2020 academic year and reached its peak during the 2021 academic year, had a substantial impact on the digital landscape in South African HEIs (Mhlanga, 2021:15). The sudden shift to remote learning in response to the pandemic has highlighted the need for greater investment in digital infrastructure and resources (Mhlanga, 2021:16). With many students and academics unable to access physical classrooms, institutions have had to quickly adapt and find ways to deliver education online (Mhlanga, 2021:16).

Mhlanga, Denhere and Moloi (2022:12) indicated that one of the major challenges faced by HEIs in the current digital landscape is the digital divide, which has been exacerbated by the pandemic. Mhlanga et al (2022) highlight that many students and HEIs, particularly those in rural or remote areas, have limited access to high-speed internet and other digital resources, making it difficult for them to participate in online learning and assessments. Additionally, Mhlanga et al (2022) found that institutions in these rural and remote areas would likely continue to be marginalised while the higher education industry undergoes a digital revolution.

5. Research Methodology and Design

The methodology employed in research concerns a set of rules and procedures that guide the researcher (Brewer and Miller, 2003). According to Fink (2005), to review literature one must have a methodology with a systematic approach that explains the complete mechanism of its operations and includes all material relevant to the area of the study. This section gives an overview of the primary and secondary research that was conducted in this study.

For this study, primary data was collected through the analysis of the 2021 annual reports and official websites of the 26 public universities (HEIs) in South Africa. An environmental scan was conducted through content analysis of these documents to identify the current trends and key uncertainties faced by the 26 institutions for their core functions of teaching and learning related to the current digital landscape. These findings were then used to develop recommendations for educators to consider when developing assessments in the digital landscape. Secondary research was obtained through the use of reputable academic sources such as academic publications in accredited databases that can be found on university library websites. Websites and annual reports of South African private and governmental institutions were also used to guide the literature overview to provide a basis for the study. Table 1 provides a detailed overview of the data analysis steps followed by the study.

Table 1: Data analysis steps for the study

Phase	Activity	Application to the study
Step One	Data are collected and organised	Annual reports for the 2021 academic year as well as the official websites of the 26 public HEIs were analysed by the researcher. Notable extracts related to teaching and learning in the digital landscape were extracted from the annual reports, policy documents and websites and placed in the content analysis schedule.
Step Two	Researchers carefully study the data	The researcher carefully studied the data and removed extracts that were not relevant to teaching and learning in the digital landscape.
Step Three	Categories and themes are provided	The researcher manually categorised each extract as either a Current Trend (CT) or a Key Uncertainty (KU). Each driver was then allocated a code.
Step Four	Data are coded	Each extract was manually coded based on the codes developed in Step Three. A description of each code was developed based on notable extracts extracted from annual reports and official websites.
Step Five	Data are interpreted	Findings were interpreted, and interpretations were verified by a research expert, comments and suggestions were incorporated after mutual consensus was reached.
Step Six	Alternative understandings of the data are sought	Findings were then used as inputs for the development of assessment recommendations.
Step Seven	Data are reduced to meaningful chunks	Findings were then used to develop recommendations for educators to consider when setting up assessments in the digital landscape.

Source: Adapted from Marshall and Rossman (2016)

The steps presented in Table 1 were meticulously followed by the researchers to ensure that a comprehensive examination of the annual reports for the 2021 academic year and the official websites of all 26 public HEIs in South Africa were conducted to ensure the credibility of the findings.

6. Results and Findings

6.1 Current Trends

Current trends, in the context of any field or industry, represent the prevailing patterns, shifts and developments that are shaping the present landscape (Schoemaker, 1995). For Venter (2022), current trends are based on environmental scanning and represent issues that formed a pattern of developments over some time. Current trends can be derived from extensive research, analysis and observation of the field, including scholarly publications, annual reports, expert insights and empirical data.

To gain insights into the current trends within the core function of Teaching and Learning, a meticulous qualitative data analysis was conducted for this study (see Table 1). The analysis involved a comprehensive examination of the annual reports for the 2021 academic year and the official websites of all 26 public HEIs in South Africa, thereby encompassing the broad scope of this research. Table 2 tabulates current trends identified from the analysis accompanied by a description of the current trend and a unique code.

Table 2: Description of current trends in teaching and learning at South African HEIs

Code	Current Trend	Description
TLCT1	Blended/hybrid teaching and learning	In South African HEIs, there had been a shift towards blended/hybrid teaching, which combined traditional face-to-face teaching with online or digital learning. This had been driven by the need to improve access to education, reach a wider audience, and enhance the quality of teaching and learning. This shift had also been driven by the increasing availability of digital technologies and the need to provide flexible, accessible, and personalised learning experiences to students. South African HEIs were investing in digital infrastructure, training, and support to enable this transition. This approach had the potential to expand access to education, improve student outcomes, and enhance the overall quality of higher education in South Africa.
TLCT2	Student development and support	South African HEIs had implemented different student development and support initiatives to ensure student success. These initiatives included digital literacy training for students, mentorship programmes, psycho-social support services, and academic development services such as supplemental instruction (SI) and tutoring. Additionally, some HEIs had established crisis lines and apps for students with mental health issues, while others had designed programmes and plans for students with disabilities to ensure their success.
TLCT3	Curriculum transformation and policy renewal	South African HEIs had been transforming their curricula and renewing their policies in response to the current digital landscape. HEIs had been focusing on digital innovation and the integration of technology into teaching and learning practices. There was an emphasis on preparing students with digital skills and competencies that were essential to equip them with the skills needed for the workforce.
TLCT4	Development of fully online modules/programs	South African HEIs had been developing fully online modules/programmes. Some universities had been expanding their distance education capabilities even before the pandemic, while others had launched new initiatives and programmes to cater to different niche areas. Many universities had also implemented policies and procedures to guide remote learning, including the development of multimodal teaching and assessment methods.
TLCT5	Social learning and collaboration	The digital landscape had prompted South African HEIs to implement initiatives to promote social learning and collaboration among their students. South African HEIs were also implementing initiatives such as Collaborative Online International Learning (COIL) projects, virtual exchanges, and joint programmes with other universities to provide opportunities for students to work collaboratively with peers from different faculties and countries. HEIs were also adapting their modules to be more accommodating to student needs and encouraging group activities to foster peer interaction and experiential learning.
TLCT6	Use of emerging technology for teaching and learning	South African HEIs were using various emerging technologies to enhance student learning experiences, promote student success, and to keep pace with the Fourth Industrial Revolution. South African HEIs were using Learning Management Systems (LMS) such as Moodle and Blackboard, which provided real-time reports on learning progress to students and lecturers, and IdeaHubs, which offered interactive teaching and learning with multimedia features. Additionally, universities were implementing online proctoring systems such as Proctorio and the Invigilator app to maintain assessment integrity during online assessments. Furthermore, universities were using data analytics to identify at-risk students, which allowed them to intervene and provide support at an early stage.
TLCT7	Creation of new services in response to changes in the digital landscape	South African HEIs had implemented various initiatives and support systems to enhance online and blended learning opportunities for both students and academic staff in response to the current digital landscape. These included the establishment of learning technology hubs, e-learning units, centres for academic technologies, and online student support services. Many HEIs had also implemented data tracking systems to monitor student progress and provide support where necessary. Additionally, some HEIs had created online training programmes and courses to equip students with soft skills and employability skills.
TLCT8	Professional development for teaching staff	South African HEIs had been providing professional development and support to academic staff. HEIs had implemented various measures to ensure that academic staff were adequately equipped to teach in an online environment, such as offering training and resources on how to use online teaching platforms and technology. Additionally, HEIs had established support structures to assist academic staff with the challenges that arose from teaching in a digital environment. These structures included virtual help desks, online communities of practice, and mentoring programmes to provide guidance and support to staff. HEIs had also encouraged collaboration among academic staff through the formation of virtual teams and communities to facilitate knowledge sharing and support.

Source: Author's compilation

Evident from Table 2 is that in South African HEIs, there had been a significant shift towards blended and hybrid teaching and learning, which combined traditional face-to-face teaching with online or digital learning. This approach had been driven by the need to improve access to education and reach a wider audience, as well as the availability of digital technologies that could enhance the quality of teaching and learning. Additionally, HEIs were investing in digital infrastructure, training, and support to enable this transition, which had the potential to expand access to education, improve student outcomes, and enhance the overall quality of higher education in South Africa.

6.2 Key Uncertainties

Venter (2022:162) defines a key uncertainty as a situation or condition where outcomes or future events are not fully known or predictable. It denotes a lack of clarity or certainty regarding future circumstances. Table 3 tabulates key uncertainties identified from the analysis accompanied by a description of the key uncertainty and a unique code. Table 3 provides a concise yet comprehensive overview of the key findings that emerged from the qualitative data analysis.

Table 3: Description of key uncertainties in teaching and learning at South African HEIs

Code	Key Uncertainty	Description
TLKU1	Academic Quality and Integrity	South African HEIs had indicated that academic quality and integrity were being impacted in the digital landscape. As a result, HEIs had expressed concerns regarding the integrity of online assessments, including issues of cheating, collusion and plagiarism.
TLKU2	Cybersecurity	Cybersecurity was recognised as a significant challenge and risk, for South African HEIs, with the need for improved measures to protect valuable institutional information and student data.
TLKU3	Infrastructure and Systems	South African HEIs faced various challenges and concerns related to infrastructure and systems. These challenges included the need for improved academic and administrative systems to support student growth, customisation and consolidation of critical systems, inadequate IT provisioning and resources, upgrades to information technology infrastructure, insufficient ICT support, managing online systems and adjustments, legacy IT infrastructure limitations, control weaknesses in assessment management, energy supply disruptions impacting connectivity, inadequate infrastructure and equipment, outdated server infrastructure, difficulties in system ownership and technical support, the absence of an integrated help desk, and the need for adequate training and resources for staff and students. These challenges posed significant obstacles to creating an optimal learning environment and required attention and investment in infrastructure, systems, and support services.
TLKU4	Accessibility and Equity	South African HEIs had identified various challenges and disparities in access to technology, digital skills and resources among students and institutions. These challenges included the gap between basic and tertiary education standards, the digital divide affecting the adoption of blended learning approaches, difficulties faced by students with data and load shedding, disruptions in the academic calendar owing to external factors, limited participation and skills in online learning, the need to upskill students in ICT literacy, unequal access to devices and internet connectivity, disparities in digital skills and knowledge, inequities in access to resources and technology, and the impact of digital inequality on learning spaces.
TLKU5	Compliance and Policy	South African HEIs had raised concerns relating to compliance with DHET requirements and insufficient policies relating to teaching and learning in the digital landscape. Concerns had been raised about the potential loss of accreditation, which could harm an institution's reputation, reduce student employability, and impede its ability to attract new students. Additionally, there were limitations on offering fully online credit-bearing aspects, while non-accreditation of academic programmes was identified as a significant constraint.

Code	Key Uncertainty	Description
TLKU6	Pedagogical Effectiveness	South African HEIs had highlighted concerns about pedagogical effectiveness in the digital space for teaching and learning. Ineffective pedagogic relationships, unpreparedness for blended learning, and challenges with self-directed online learning were identified as issues impacting student success, learning capability, and staff satisfaction. There were also concerns about the fairness and proficiency of online assessments and the need for contextually responsive teaching approaches. Additionally, the integration of technology into the curriculum and the training of academic staff in online pedagogies were emphasised as essential for enhancing pedagogical effectiveness. These concerns collectively underscored the importance of addressing pedagogical strategies and support mechanisms to ensure effective teaching and learning in the digital environment.
TLKU7	Student Engagement and Motivation	South African HEIs had highlighted concerns about student engagement and motivation in the digital landscape for teaching and learning. Strategies such as feedback and varied student experiences across campuses were mentioned to support student engagement. However, there were instances of low engagement, underestimation of effort, and limited interaction between academics and students, leading to disengagement and impact on learning quality. Factors such as lack of communication, feeling isolated, distractions, and domestic responsibilities contributed to decreased student engagement. Challenges with online teaching included dealing with passive students, different learning styles, and difficulties in encouraging collaboration and interaction. Adapting to remote learning environments, maintaining student engagement, and ensuring equitable access were identified as significant challenges in programme delivery in the current digital landscape.

Source: Authors' own compilation

As evident from Table 3, there were several key uncertainties South African HEIs faced in the current digital landscape. Academic quality and integrity were areas of concern as HEIs raised uncertainties about the credibility and fairness of online assessments, including issues of cheating, collusion and plagiarism. Cybersecurity was recognised as a significant uncertainty, with HEIs expressing the need for improved measures to protect institutional information and student data from cyber threats. Infrastructure and systems presented uncertainties related to inadequate resources and energy supply disruptions (for example, loadshedding) impacting connectivity. Access to technology, digital skills, and resources also raised uncertainties regarding the digital divide and unequal access among students. Compliance with regulations and policies, such as accreditation requirements, introduced uncertainties about potential reputational harm to institutions. Pedagogical effectiveness uncertainties included unpreparedness for blended learning, proficiency in online assessments, and the integration of technology into the curriculum. Student engagement and motivation uncertainties arose from limited interaction, feelings of isolation, and distractions in online learning environments. Addressing these uncertainties is crucial for HEIs to navigate the evolving digital landscape effectively. These key uncertainties are to be understood and considered when developing online assessments so that an inclusive assessment approach is developed.

6.3 Recommendations to Consider When Developing Assessments in the Digital Landscape

Based on the findings from the analysis presented in Table 2 and Table 3, recommendations were developed for educators to consider when developing assessments in the digital landscape, these recommendations are presented in Table 4.

Table 4: Recommendations to consider when developing assessments in the digital landscape

Recommendations	
Ensure Academic Quality and Integrity	Implement tools such as Proctorio or Respondus to monitor online exams and prevent cheating. Educate students on the importance of academic integrity and use plagiarism detection software like Turnitin. Design assessments that are authentic in that students are required to provide personalized responses which minimize the opportunity for dishonesty.
Promote Accessibility and Equity	Identify the technologies that students have available and ensure that the assessments are compatible with those technologies. Create assessments that are accessible to students with disabilities.

Recommendations	
Improve Own Pedagogical Effectiveness	Educators are advised to continuously improve their own pedagogical effectiveness by engaging in ongoing training on digital pedagogies and assessments strategies in order to equip them to develop the most appropriate assessments.
Increase Student Engagement and Motivation	Provide students with timely and constructive feedback on their assessments to keep them motivated and informed about their progress.
Embrace Continuous Improvement	Treat assessment design as an ongoing process, continuously iterating and improving based on data and feedback.

Source: Authors' own compilation

As shown in Table 4, there are several recommendations that educators can follow to ensure that assessments developed in the digital landscape are of high quality and uphold academic standards and integrity. Assessments must be designed in such a way that they promote accessibility and equity. Educators should develop their own pedagogical approaches to ensure that they adapt to their students' requirements and that evaluations ultimately help students meet the outcomes required by the various modules and qualifications. Educators should also look for ways to boost student involvement and motivation while creating online tests, as this will benefit the students. Educators are also encouraged to embrace continuous improvement in their own assessment practices, such as approaching assessment design as an ongoing process and iterating and improving depending on data and feedback.

These recommendations are not an exhaustive list of recommendations educators need to consider when setting up assessments in the digital landscape, however, they serve as a solid foundation for educators. By incorporating the various recommendations presented, educators can ensure that assessments are of good academic quality, ensure academic integrity and promote accessibility and equity, which ultimately leads to an increase in student engagement and motivation and allows for introspection, which then ultimately improves the effectiveness of an educator's own pedagogical approaches.

7. Conclusion

The primary objective of this study was to set the scene for re-imagining the future of the core function of teaching and learning at South African HEIs in the digital landscape and to develop recommendations for educators to consider when developing assessments in the digital landscape.

Based on the results from the environmental analysis it was clear that the digital landscape had radically impacted teaching and learning in South African HEIs. The findings showed that South African HEIs had experienced a shift towards blended and hybrid teaching, driven by the goal of expanding access to education and improving teaching quality through digital technologies. This transition was supported by investments in infrastructure, training, and support services. South African HEIs were also prioritising student success by offering digital literacy training, mentorship, and academic support. South African HEIs were also focusing on equipping students with digital skills for the workforce as well as ensuring equity and accessibility through supportive policies. On the other hand, the findings also showed that teaching and learning in South African HEIs faced multiple uncertainties in the digital landscape. Uncertainties related to upholding academic quality and integrity, addressing cybersecurity risks, improving infrastructure and systems, ensuring accessibility and equity, complying with regulations and policies, enhancing pedagogical effectiveness, and promoting student engagement and motivation were critical.

Based on these findings, recommendations were developed for educators to consider when developing assessments in the digital landscape; these recommendations are not an exhaustive list of recommendations educators need to consider when setting up assessments in the digital landscape, however, they serve as a solid foundation for educators.

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A Reflection on how Universities Perform Against Criteria for Authentic Community Engagement

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Abstract: Departing from the belief that academic community engagement (ACE) initiatives should result in impactful developmental outcomes that improve the livelihoods of vulnerable populations in society, this paper offers an evaluation of how authentically a sample of universities are meeting criteria depicting such authentic engagement. The specific focus will be on what is publicly available, since university rankings and membership to scientific committees are shared as part of presenting the university's status, the study aims to determine if the engagement aspects are shared publicly as well. The intention of the institutions to publicly reflect their true civic impact in critical developmental areas is important to showcase the importance they attach to addressing societal challenges. The more criteria are addressed, the more likely the engagement activities will contribute to the targeted changes. Results from the evaluation will be shared with recommendations on how all higher education (HE) institutions can strengthen their impact through ACE. This will provide a departure point for measuring the return on investment of activities that at times are viewed as charity instead of the rigorous form of scholarship it has become.

Keywords: Sustainable development goal 3, Evaluation of academic engagement, Engaged scholarship

1. Background to the Study

Service-learning (SL) as academic engagement facilitated through community-university partnerships, is arguably the first thrust towards demonstrable real-world impact, at least for South Africa (SA). Its practice as one of the three core aims of HE, or its 'third mission', was embedded through the Council on Higher Education (CHE)'s framework which postulated that community engagement (CE) has the potential to advance social development and transformation agendas (Bender *et al.*, 2006). Criterion 18 of institutional audits conducted by the Higher Education Quality Committee (HEQC) involves the provision of evidence that "quality-related arrangements for community engagement are formalised and integrated with those for teaching and learning, where appropriate, and are adequately resourced and monitored" (Council on Higher Education, 2004, p. 18). At the turn of the century, a rise in publications on SL was evident and the integration of engagement by academics were prioritised in university workloads. Bidandi, Ambe and Mukong (2021) confirm that CE by universities is about social responsibility and that engaged universities are essential for any country's economic and social future. Brackmann (2015 in Mohale, 2021, p. 118) stated that "CE fosters new knowledge circuits by positioning education and research outside the ivory tower, thus, enhancing higher education's civic commitment". Initially CE was not defined by the CHE, allowing institutions to define the concept in ways that were appropriate to their own contexts and missions (Favish and Ngcelwane, 2009). Three aspects of the institutionalisation of CE have been identified as "defining social responsiveness; linking social responsiveness to research and teaching; and supporting and rewarding social responsiveness" (Favish and Ngcelwane, 2009, p. 19). In an intense process of its positioning at one university in SA, a broad definition of social responsiveness was suggested to incorporate activities involving academic staff, partnerships with external constituencies, and the notion of contributing to the public good that is integrated with executive accountability – recognising the major forms of social responsiveness as research orientated at responsiveness; teaching and learning forms of responsiveness; and civic engagement without a link to the formal curriculum (Favish and Ngcelwane, 2009). Through a grant by the Ford Foundation the Community Higher Education Service Partnerships (CHESP) was established in the early 2000s to advance SL to incorporate the objectives of supporting programmes that include CE as part of the core function of HE, which are monitored and evaluated, while also using the outcomes of the activities to influence policy and practice (Council on Higher Education, 2010). The CHESP articulated the *triad* as a three-part triangular partnership model with the partner poles of the academic institution, the service agency, and community leaders (Community Higher Education Service Partnerships, 2008). In a keynote address at a recent CE conference, an 'engagement transformation interface' was introduced as a practical strategy for rethinking the university structure, where forms of epistemic freedom, engagement activities, and institutional cultures, are transformed through a three-tier model that considers the multi-faceted policy restructuring, while also responding to global challenges, but more urgently to mobilise the language of human rights, equality, non-discrimination and cultural tolerance – as part of the university's orientation and character (Nkunzi, 2024).

In more recent years, CE has been “connected to activities that focus on social justice and promoting sustainability” (Neary and Osborne, 2018, p. 336). The World Commission on Environment and Development report on ‘Our Common Future’ defined sustainable development (SD) as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (Neary and Osborne, 2018, p. 338). In September 2000, the United Nations adopted the eight Millennium Developmental Goals, updated to the seventeen Sustainable Development Goals (SDGs) in 2015 (Millennium Development Goals, no date) as an impetus to global mobilisation to achieve universal and interconnected priorities (Neary and Osborne, 2018). The goals follow a *triple bottom line* approach to well-being, focusing on economic development, environmental sustainability, and social inclusion (Neary and Osborne, 2018). While there is a risk that sustainability is merely seen as ‘green’ or eco-centric practice, Gordon and Dixon (2021) highlight that the topic includes legal, social and ethical concerns, and that beyond environmental sustainability, social sustainability can be broken down into financial and professional sustainability. Two decades after the first formalisation of impact demonstrated through development goal indicators, and considering the poor performance against the 2030 Agenda, the ‘Decade of Action’ has been announced (Ghorbani, 2020). The push for this decade of action involves the call to ‘mobilize everyone, everywhere; demand urgency and ambition; and supercharge ideas to solutions’ (United Nations, 2020). Apart from ensuring equal access to HE as an aim in itself (SDG 4.3), HE is also seen to play a prominent role in achieving the other goals in the 2030 Agenda (Yemini, 2021). Against this background an evaluation was done on how some South African universities are performing against criteria for SL that incorporates elements of authentic CE and impact on SDGs.

2. Methodology

The research question is to determine how many critical SL protocol criteria are publicly evident for universities in SA. The aim of the study is to establish the level of HE CE/SL engagement addressing societal needs, especially within health and welfare courses which should be contributing to the targets and indicators of SDG3. Seeing that it is not possible to reflect on all the SDGs, the general one of ‘Ensure healthy lives and promote well-being for all at all ages’ should target concerns for a variety of vulnerable populations and should therefore link to SL projects aiming to meet the needs of communities. The specific focus will be on what is publicly available, since university rankings and membership to scientific committees are shared as part of presenting the university’s status, the study aims to determine if the engagement aspects are shared equally. University members will therefore not be interviewed on information that may only be available internally and influenced through individual perceptions. Keywords obtained from a scoping review conducted by the researcher in an earlier study were used to inform the search for activities seen as authentic critical SL. The universities were selected based on *Wiki South Africa’s* list of top 10 universities in 2023, according to a combined consideration of ranking bodies like QS BRICS University Rankings, QS World University ranking, the Times Higher Education World University Rankings, and the Academic Ranking of World Universities (Wiki South Africa, 2023). This served as a convenient form of sampling that represents universities of different sizes and situated in, or serving, 7 of the 9 provinces and of different sizes. Apart from two universities in this top 10, they were also in the top 8 of the 2023 Shanghai university ratings (ARWU, 2023). Of interest is that one province excluded through the sampling only had a central public university for that province opened in 2014, while the other province not represented, had their public university established in 2005. Using public universities with a much longer history, some established in the 1800s, in a study aiming to evaluate performance related to impact, would then make sense for this paper. The order of the universities reported on in this paper is different to the order provided in the top 10 list, to provide some anonymity to the discussion of the findings. While the universities were deidentified during the analysis, there may be a possibility to indirectly identify them with some effort, through description of the type of activities or rankings, even with an intention to minimise the detailed shared. Since the unit of analysis is publicly shared content, this is not considered to be a breach of the conditions for the institutional ethics clearance obtained (R.000191), as the results merely form a synthesis of what is already available for public viewing. The focus is not on the university per se, but the reflected ACE activities.

The sources used for the review of the ten universities’ evidence of engagement involved university webpages; Google search of university events / engagement in the news; case studies from sources obtained from the database search; and open communication on engaged curriculum design, delivery processes and initiatives. The intention of the institutions to publicly reflect their true civic impact in the identified service delivery areas is important to showcase the importance they attach to addressing societal challenges. The importance of showcasing impact publicly is confirmed by the methodology used by Times Higher Education (THE) to score evidence for the impact rankings. A point is allocated if evidence is provided of activities, and another if this evidence is available publicly (THE reporters, 2024). In a presentation by the Executive Director of the Research

Chairs and Centres of Excellence directorate at the National Research Foundation, he stated that: “A strong culture of research excellence and innovation for epistemological (knowledge advancement) and societal impact (social, economic and environmental) are key to producing high-impact, discoverable and highly visible scholarly content” (Khati, 2024). The scoping review focused on what is accessible online from the last ten years (from 2014) and only those projects linked to the thirteen targets and twenty-eight indicators of SDG 3. The keyword search was done in three parts, an initial search of ‘engagement’ and ‘sustainability’ linked to each university’s name to allow for the inclusion of a wide spectrum of webpages linked to the topic. Secondly the researcher followed the lead of what was provided online by the university, which mostly incorporated menu options or sub-headings on their webpages, being redirected to other pages with more specific information. What was found was then evaluated against the key word criteria for critical SL criteria (protocol). The findings were summarised, and a third part of the search were done to also look for missing criteria. Institutions’ information was deidentified during the analysis process through the allocation of a number to the institution in place of their name. Since the evaluation of the universities against the designed protocol criteria focus on content available online, the limitation to the findings discussed in the result section, would imply that relevant content that may only be available internally to the institution or published on through subscription-based sources or networks requiring member login, were not incorporated in this study.

3. Discussion of Results

From a protocol designed to capture the elements of authentic critical SL or civic engagement in HE, the main aspects were identified as: (a) designing curriculum for civic engagement; (b) building authentic partnerships; (c) infusing cultural sensitivity; (d) a focus on developmental impact (sustainability); (e) institutionalisation of critical service-learning; and (f) mitigating barriers to critical service-learning or civic engagement (Swanzen, 2025). These overall six categories had various sub-categories with more specific descriptors representing each (see Swanzen, 2025). This protocol type synthesis of elements was used to screen the publicly shared engagement endeavours of the universities. Table 1 summarises the results in terms of the number of websites and documents found and consulted and lists the Impact ranking by THE, where applicable. It then captures the types of ACE activities found and indicates which elements of ACE were met through these activities. The latter column will reflect the sub-categories as listed above, and thereby will provide more descriptive terms for the purpose of this paper. It can be expected that not all descriptors would be found with each university, since a large number of 160 descriptors were represented, and the detailed descriptors can only be confirmed if module content would be available online. Since content of university modules will not be available online, it can be expected that a lesser number of the aspects in (a) were found to reflect on in the findings. With different terminology still being used by different institutions, reference to ACE as a general overarching term is used in discussion, with highlights to related conceptualisations per institution where relevant. Interestingly concepts like Quintuple helix and GAP framework were not discovered in the findings. The exercise of applying the protocol also provided the author with insights on its applicability to the universities’ ways of describing ACE, which informs her further refinement of the tool. Table 1 provides a breakdown of the number of websites and documents found for each university, and the ACE elements that were the most and the least evident from the findings. The impact rankings, indicated as the SDG rank in Table 1, are only provided for interest to show a focus on development that is reported on by some of the universities, but it will not be discussed in detail, after which expanded findings from each of the universities are discussed.

University 1 was successful in building a history of reporting that is integrated into their institutional planning. This university made a definitive separation between the terms social responsiveness (SR); civic engagement; and engaged scholarship (ES). The biggest difference was where the academic’s activities were initiated or informed by their scholarly expertise, which incorporates SR and ES (with the latter seen as a form of SR), while civic engagement is recognised as the engagement with external, non-academic constituencies, but which could not be linked to the professional and disciplinary expertise of the academic.

University 2 has a CE directorate that incorporates SL as a focus area. While the initiatives of the different academic departments are considered, the reporting of these on the webpages are not as integrated, noting different topical pages with little info. A strength is the good integration with other initiatives, such as linking the research association of the institution to the page speaking to engaged research. One of the programmes also aim to inform communities of the benefits the institution can provide from their academic endeavours to address their societal challenges. Where university 1 excluded consultancy work under their concept of ACE, university 2 sees this as one of the ways academics share their expertise with the community, but for the influencing of policy only. The latter also includes external training, presenting public lectures and serving on

panels as experts as examples of engaged activities. The university has one space where all news coverages were archived from 2003, ensuring that the impact of the university is shared in a cohesive manner.

With university 3 engagement projects were shared with a focus on the projects, and not reported in an overarching manner to showcase where individual projects fitted in. While this gave exposure to the impact of individual projects it does lack the integrative essence and reporting years were inconsistent – thereby not giving a sense of what engagement is occurring in a certain period. What was evident is how each faculty gets the responsibility of showcasing their own engagement, an aspect lacking in the more overarching reporting of university 1. There is a stronger emphasis on outreach and philanthropy than SL integrated into the curriculum.

Table 1: Results from the ACE university evaluation

University info		Available online CE sources		Most evident Academic Community Engagement (ACE) elements	ACE elements not evident
Number	SDG rank	Number of websites	Number of documents		
1	77	16	11	multi-disciplinarity; stakeholder relationship; participation/ citizen science; social responsiveness; sustainability drive; institutionalized SL; social justice orientation	tracking; civic engaged & global citizen curricula; asset mapping of community
2	-	24	21	tracking; sustainability drive; recognize traditional leadership; participation/citizen science; stakeholder relationship; social responsiveness; advocacy course; institutionalized SL	participation planning; asset mapping of community;
3	36	14	15	critical SL curriculum design; participation/citizen science; global citizenship; institutionalized CE; indigenous knowledge hub; social justice orientation; celebrate	conviviality principles; asset mapping of community;
4	1001+	6	10	sustainability drive; knowledge creation for community gain; social justice orientation; celebrate	tracking; advocacy courses; institutionalized SL
5	-	16	18	knowledge creation for community gain; interculturalism; tracking; celebration; stakeholder relationship; sustainability drive; social justice orientation; tracking; multi-disciplinarity	global citizenship; institutionalized SL
6	42	18	7	institutionalized SL; global citizenship; social responsiveness; participation/ citizen science; celebrate; asset mapping of community	tracking; global citizenship; knowledge creation for community gain
7	-	18	16	social responsiveness; celebration; knowledge creation for community gain; designing curriculum for civic engagement; celebration; institutionalized SL	global citizenship; asset mapping of community;
8	-	16	10	global citizenship; social responsiveness; participation/citizen science; social justice orientation; designing curriculum for civic engagement; tracking; stakeholder relationship	asset mapping of community; institutionalized SL
9	401+	14	5	celebration; sustainability drive; social justice orientation; institutionalized SL; knowledge creation for community gain	participation planning; conviviality principles
10	201+	5	3	conviviality principles; sustainability drive; advocacy courses; address inequality contexts	institutionalized SL; asset mapping of community; tracking; stakeholder engagement

University 4 is successful in having all their CE related activities grouped on one page, categorised by year – even though this is only done from 2018 onwards, but then CE reports are provided from 2014 to 2017. Another CE website exists for news articles linked to projects. This institution has a longstanding foundation that drives philanthropic activities and reports on the impact of donations. This reporting is done in the form of magazine articles and was up to volume 15 until only one annual report is shown for 2022. The most visible explanation of this university's approach is a focus on projects, by staff and students, designed to impart knowledge and skill development for meaningful change and to create lasting impact. The diversity of the various projects shared, is however remarkable, and shows vibrant participation by students.

For university 5 a clear focus on impact and reciprocity was evident in the description of and reporting on their ACE activities, as well as differentiation with or clarification of related concepts such as social justice, sustainability and volunteerism. A practice that shows potential for institutional integration is the use of an open access online repository for all material created by members of this university. Data from the repository is then also used for the statistics drawn for the reporting on their impact. This very likely created a culture where a central space for reporting is recognised, even though the 2023 report on CE indicated remaining challenges with terminology and uptake in capturing. This university also provided guidelines for the engaging of partners or stakeholders.

In one of the volumes of a CE newsletter for university 6, a project by one of the academic schools listed the learning outcomes of an activity, thereby displaying the SL balance considered. Most of the articles in the newsletters, depicting the ACE activities, have an educational value with some literature sources referenced as well. The members of the CE committee are listed in each volume, and these include those representing sectors from the community. While categories for CE are defined by this institution, the webpages are sparse with content. A geographical map is provided to show where the activities are focused, and a database of partners are linked to one of the sites, but it is not clearly stated whether permissions were obtained for the sharing of contact information.

A first volume of an open access HE CE publication was initiated by university 7 in 2023. The institution's CE policy provides definitions of the related terms as well as a clear indication of the roles for each stakeholder. There is separation made with engaged citizenship as a model that goes beyond traditional volunteerism to cultivate a more impactful form of community involvement. Projects are listed together, under various categories, that highlights their impact more clearly. What is not clear is whether all projects are captured and the length or year of the projects. Engaged research community of practice roundtables are held with lessons learned for the global South. A knowledge wheel depicting the three themes of well-being, sustainability and collaboration, provides strong direction to the institution and considers the SDGs, the African Agenda 2063 and the National Development Plan.

University 8 demonstrates the importance given to ACE through their requirement to have all community interaction projects by faculties and student structures registered on the conditional acceptance of a code of ethical conduct when there is engagement with the community. Apart from a social impact knowledge platform where staff and student activities are registered, the institution also have 7 impact themes that are broadly linked to the SDGs. This tracking allows them to report on their initiatives not only by faculty, but also partner category, target group and themes, for both staff and student activities.

University 9 identified nine contact points a community could have with the university as teaching and learning, research, CE, SL, work-integrated learning, community service, field education, internship; and volunteerism. ACE is structured around the notion of knowledge creation driven by a CE unit that lies within the office of the deputy vice-chancellor. Engagement and responsiveness are embedded in their values statement and institutional operating plan. While the institution has an online CE portal linking to each faculty, those redirected pages are the general faculty pages and does not highlight the specific CE activities. The CE training opportunities provide overviews of programmes, workshops and courses, including a course on preparing applications for the CE awards and promotion. Community liaison is indicated with civil society, the student and scholarly community, while CE partnerships are sparsely described in terms of its purpose, types and special projects, although finding a concise list of ACE activities and their impact is challenging.

With university 10 there were surprisingly little website hits with the keyword search. One of the faculty disciplines linked to community work was the first find and the page referred to active citizenship being integral to the institution's strategic framework. It also mentioned a new 'for good' focus, but no detail could be found on this. Under a more general CE page, five philanthropic projects are listed with a request for donations. While a knowledge hub entity links SL programmes with communities and service providers, it is not clear in what context the entity functions. Like university 8, this institution also focused their ACE under social impact, but for the latter a focus on democracy and governance was also highlighted, not only the concept of social justice.

4. Conclusion and Implications for Practice

Centres, directorates, CE specialists, donor relations managers, prospect researchers, or site facilitators for communities, employed by the university, who focused on aspects of transformation, inclusivity and change, were evident in universities with strong evidence of various CE activities. Institutional policies of these institutions would also specifically stipulate mandatory inclusion of SL projects within disciplines. One university

without an impact ranking, but who successfully demonstrated their vast reach through various projects, also provided asset-based-community-development training adapted to their various institutional stakeholders. Initiatives like these could very well be the key to success in the institutionalising of ACE. To drive projects towards sustainability and development, institutes, foundations, divisions, units or consortiums with targeted strategies were in place. Those with the strongest evidence of their ACE had platforms where the activities were registered and tracked. Key to the mobilising to fast-track action, include targeted resourcing of the mission within the institution. For a strong sustainability drive it seemed conducive if the university joined initiatives like becoming signatories to 'green' campus strategies.

Some projects that would seem to be key innovative solutions for communities were evident, but it was difficult to determine how well known or how widely shared these were. Without sufficient exposure, brilliant ideas and many manhours will not be effectively used by the community to meet their needs. While a university linked action research to the CE pages of the institution, nothing has been posted on there about such projects in the past 12 years. From the last Global Sustainable Development Congress, integration through partnerships were highlighted as a critical requirement towards the 2030 Agenda (Times Higher Education, 2024). It raises the question whether the different universities have sufficient cross-campus and inter-institutional agreements in place to fast-track the utilisation within communities to meet their needs. The only partnerships driving the ACE agenda between universities evident, were university 4 that established a partnership between their CE departments, with a university that is not part of the 10 selected for this study; a community-based research partnership between universities 3 and 5; and a visit by a university of technology to glean best practices from university 7. The length of these and details about the partnerships were not clear. Universities 3 and 7 have their own internal centres for social development with which CE work is linked in some way. It is possible that more partnerships may exist on faculty and discipline-level, but these may not meet the criteria for an institutional level integration of authentic ACE principles.

Many diverting sections emerged with a study like this that is focusing on such a broad theme. Recognition is given to reactive outcomes to redress through, for instance, student protests to have honoured colonial figures removed from the grounds of certain universities. An observation made without the researcher having clarity around the reason, is that university 1 and 2 had their engagement linked to the corporate section of their institution. While an assumption cannot be made as to the reason, a potential concern can be that CE is too intrinsically linked to social corporate responsibility and that the link with academics needing to provide the required expertise and contextualising, may not sufficiently be involved in, or consulted on the projects, or at least the manner of reporting on these. Not all institutions' websites had equal quality and functionality with their websites, pointing to the importance of internal networking with the marketing departments to sufficiently display the impact of the university. Most universities did split CE and SD activities, with roughly similar definitions of engagement, SL and sustainability. Of concern is the remaining lack of one comprehensive conceptualisation of ACE. While some universities link to civic engagement and SL, others link the activities to philanthropy and social corporate responsibility. Social responsiveness could be implied if the outputs were considered, but details were not sufficient to determine if all levels of responsiveness were getting attention.

Fifteen public universities were not selected for this study, also limiting the findings from universities with less resources for driving CE. Potentially there can be a comparative aspect if the study is extended to these universities, based on characteristic differences. Some of the universities not selected are universities of technology for instance. A similar study-focus over a longer-term can offer a deeper evaluation of the true state of authentic civic engagement and this paper does not claim to fully represent all current projects and planned endeavours in this space. While the findings did show that some universities linked their ACE to internationalisation through international student placements, this element did not form part of the study and was not reported on or explored further. The majority of universities in this study did link sustainability to the ACE drive, but not in equitable measures. To fast-track the SD agenda, tools exist such as the framework for sustainable universities (UN Environmental Programme, 2021).

While impactful work by private HE institutions is being done within ACE, the magnitude of the projects facilitated by public universities are likely not yet matched. An analysis of private HE institutions were not the focus of the study, but the results provide insights into requirements for a socially responsive institution. In the supplementary guideline document for audits of private HE institutions, the mature audit level outcome, beyond the requirement for a coherent quality management system to be in place to ensure student success, requires: "instituting good teaching and learning practices, supporting ground-breaking research, including local research, as well as managing impactful, integrated and ethical community engagement, good governance and sustainability" (Council on Higher Education, 2021, p. 11). Even though funded projects like CHESP focused

exclusively on public universities to expand the integration of ACE, the opportunity for equal university status provided through the Amended Higher Education Act (Republic of South Africa, 2016) place the private HE institutions on a pathway that requires a stronger adoption of the 3rd mission into their academic structures. Considering the challenges of the population served in SA, balanced with the market ideology of globalisation, Preece (2017, p. 15) encourages the exploring of opportunities for how HEIs can position themselves as “porous, rather than ivory towers for community engagement”. At a panel discussion on the Carnegie classification of CE in the SA context, the chairperson of SAHECEF, Prof. Lortan, highlighted that “CE is an unfunded mandate for universities, and the implications of this for sustained CE initiatives and the proposed CE framework. ‘If the participation becomes contingent upon funding, the benefits may deepen the divide between the CE-haves and CE-have nots’” (Rhodes, no date). While this inevitably create a barrier to ACE, the findings show that some universities use the third-stream income from short courses and continuing professional development courses, to fund ACE activities. Various local and international networks for CE exists, and these should be optimised for relevant impact.

Four common themes for the shaping of social entrepreneurship that differentiates it from corporate enterprise, are the: emphasising of social goals as opposed to economic goals; the social activist role of the yp; elements of innovation; and the using of economic profit, not as a means in itself, but for the solving of social problems (Moore et al., 2011). Initiatives that involve students to address development challenges need to be included in the strategy of the institution. Not all universities in the study highlighted where student voices on CE were included. Although it was more useful to see the vast number of ACE activities provided, than not, a missing feature was that of seeing a concise summary of the combined impact of all the endeavours, and how these are meeting the ACE aims of the institution. Considering that the celebration of ACE is seen as part of the process of institutionalising impact, it will contribute substantially to its cause, if HE institutions concentrate their efforts on coordinating, resourcing, monitoring (tracking) and sharing of this third mission. The majority of universities included in this study showed a firm understanding of the need to include ACE in their institution and publicly defined their positions in terms of the related concepts of SL and ES. While the synthesised protocol of authentic ACE elements is newly developed, it represented literature on the diverse concepts that should have been incorporated into the third mission by now. The need for community partnerships in ACE seems well incorporated, but practical guidelines on how to manage such partners are not equally represented, and not showing for instance if legal requirements, such as the Protection of Personal Information Act (POPIA) guidelines are followed. An interesting phenomenon observed was that universities will have CE in provinces outside of those they serve, and in provinces where there is another strong university presence. It is not clear whether there is concern about this, as it seems to be accepted based on the networks individual academics establish.

Although many ACE concepts are addressed in the work of the selected universities, it can be concluded that overall, the activities described did not consider all of the extensive aspects involved in authentic ACE, or was not publicly available. Starting with an agreed set of elements as a benchmark for ACE is a good place of commencing to standardise the scholarship of engagement in HE institutions, while incorporating SDGs. This requirement is enhanced with the President of SA assenting the Climate Change Act on 23 July 2024 (South African Government, 2024). Aligning where policies may be contradictory, HE institutions will inevitably need to revisit and demonstrate the effectiveness of their policies. Those who already linked their ACE with sustainability aims, are likely to be well positioned to do this.

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The Perceived Impact of Leadership Practices of Academic Leaders on Student Success in a Higher Education Institution in South Africa

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Abstract: The research reported on in this paper was motivated by the need to investigate student complaints in the higher education sector in South Africa regarding the poor quality of teaching and learning which has resulted in low student success rates in many institutions in the country. To mitigate poor student success rates, higher educational institutions in South Africa need to consider implementing effective leadership practices of academic leaders to support students in their academic journey. This study identified how academic leaders' leadership practices are perceived by students in a higher education institution in South Africa, and to identify which leadership practices are more impactful in supporting student success. According to Hoadley, Christie and Ward (2009) and Hallinger (2011), leadership practices are indeed aligned to academic performance. Grajfoner (2024) suggests that effective academic leadership is a key contributor to attaining academic excellence. However, Bryman (2007: 14) asserts that "one of the key problems in Higher Education is that not enough is known about exactly what makes an effective leader and what, in turn, may make them ineffective". The theoretical framework upon which the study is based was developed by Mukan, Hawryluk and Stolyarchuk (2015: 42), who suggest that "leadership is a derivative quality of people collaborating, co-operating and supporting each other. It is characterized by openness and is a dynamic, inclusive, collegial process that occurs in a particular context". In this research, a quantitative study was conducted using a purposeful sample selected from the target population of students at a higher education institution in South Africa. The final sample included 78 undergraduate students from the selected institution. The analysis undertaken in the study revealed that perceived leadership practices of academic leaders do have an impact on student success and that student success is not based on any one element of leadership practice alone; instead there are various perceived dimensions of leadership practices that play a role in promoting student performance. The findings of the study highlighted three key leadership practices that impact on student success, namely engagement, support and communication.

Keywords: Leadership, Academic leaders leadership practices, Student success, Teaching and learning

1. Introduction

According to scholars such as Maddock and Maroun (2021) and Awung, *et al* (2024), there are numerous challenges faced in the provision of successful support for students in higher education in South Africa. Tewari and Ilesanmi (2020) pose the question as to what the weak link may be in ensuring student success for South African tertiary students. The literature, relating to the effective leadership practices to support students in their academic journey according to Bush (2008), Leithwood and Louis (2011) and Leane (2020) is inconclusive. There is a great deal of ambiguity regarding which particular leadership practices of academic leaders are most likely to improve instruction and student achievement. In the studies conducted by Ruben, DeLisi and Gigliotti (2023) and Tewari and Ilesanmi (2020) it was found that high achieving academic institutions can attribute a part of their success to the high expectations of academic performance that are articulated to both lecturers and students by their academic leaders. Balkrishen and Mestry (2016: 46) affirm that "there is a tangible link between the leadership role of the academic leader and student achievement. Replicating the leadership roles of academic leaders of high performing higher educational institutions has the potential to impact on improving student achievement". Lumby (2012), however, highlighted the fact that research on effective leadership in higher education is not as abundant as that on school leadership. She suggested that "school effectiveness literature has reached a point where it is able to claim an assessment of the percentage of variance in student outcomes related to the principal's leadership and to the concerted leadership of all those contributing to leadership. Research on leadership in higher education has no such equivalent body of work" (Lumby, 2012: 9). This study addressed the abovementioned gaps in the existing literature by identifying how leadership practices are perceived by students in a higher education institution in South Africa and what measures could be taken to improve leadership practices of academic leaders at the institution to promote student success.

2. Literature Review

"Higher education institutions are complex and continuously-evolving organizations that require effective leaders who understand and embrace the preferences of their followers," (Mews, 2019: 63). The perceived responsibility of leadership is to provide students with the necessary resources and continuous academic support to ensure that they are on track to success. According to Wyatt (2019) stress that there is a strong

correlation between academic leaders leadership and student academic success. The institution's academic leaders are responsible for guaranteeing the quality of teaching and learning within an institution, and have a significant responsibility to the overall academic performance and outcomes for students and (Grajfoner 2024). The measures that may be implemented are largely dependent on the motivations of the institution's leadership. Thus, effective leadership must be considered to be of paramount importance to guarantee successful academic success within an institution.

Kawar (2012) further states that the key to successful leadership is through the implementation of best leadership practices, as applicable to the particular institution. McGill (2013) argues that leadership practices are activities and approaches leaders will take in order to steadily help their team better understand themselves and attain growth. Kerns, (2016) proposes that leadership practices are implicit and explicit actions and behaviours which those in position of academic authority exhibit while focusing on students towards achieving their academic expectations. Andy-Wali and Wali (2018) go onto suggest that the literature is not clear on the exact nature of the leadership practices that impact on student success in higher education. Therefore, further studies that investigate these specific practices, such as the current study, are necessary to clarify which leadership practices would have the greatest impact on promoting student success in higher education institutions.

The theoretical framework underpinning this study was based on a framework developed by Mukan, *et al* (2015), who contend that leadership is a derivative quality of people collaborating, co-operating and supporting each other. It is characterized by openness and is a dynamic, inclusive, collegial process that occurs in a particular context. In higher education research, student success cannot be attributed to any one element of leadership practice but must be conceptualised as being influenced by various dimensions. Bryman (2007: 14) argues that "one of the key problems in higher education is that not enough is known about exactly what makes an effective leader and what, in turn, may make them ineffective". Mukan, *et al* (2015) suggest that the fundamental leadership practices can be summarised into three simpler themes:

- the practice of collaboration and engagement;
- the practice of support;
- the practice of openness.

3. The Practice of Collaboration and Engagement

A study by Andy-wali and Wali (2018) on leadership practices and their impact on student experiences in a higher education institution in the United Kingdom identified four key themes that have a positive impact on student academic excellence, namely: (1) lecturer accessibility; (2) academic versatility; (3) teaching and learning quality; and (4) supportive academic leadership. The accessibility and supportive of academic leaders' practices had a positive impact on students' ability to achieve higher grades in their studies. The study also highlighted the positive impact on student participation and motivation through ongoing feedback and engagement between students and lecturers both in and out of the lecture room. "This implies that when academic leadership activities are supportive, students get positively involved in academic activities, which leads to positive academic performance", (Andy-Wali and Wali, 2018: 45). In a study by Kawar (2012), it was evident that the practices of motivating, collaborating, supporting and stimulating people have a positive effect on performance. This is important in educational institutions as student academic excellence depends highly on the motivations of the academic leaders (Grajfoner 2024).

4. The Practice of Support

In a study by Moodley and Singh (2015), it became evident that a key reason for poor academic performance in the first year of higher educational studies was poor academic counselling and support offered in higher education institutions. In Moodley and Singh's (2015) research, it was found that students felt lecturers were unapproachable and not willing to assist them to unpack challenging academic content. Furthermore, students felt that they were not guided through assessments sufficiently and therefore did not know what was expected of them when answering assessment questions. Bitzer (2011) advises that successful academic and social incorporation of students in higher education remains important with regard to study commitment, study success and averting early student withdrawal. Academic leaders need therefore, need to oversee first year students with this integration and adaptation into a higher educational environment.

Robinson, Lloyd and Rowe (2008: 664), in advocating for the notion of academic support, suggest that "leadership also includes creating an orderly and supportive environment for both students and staff that makes

it possible for important academic and social goals to be achieved". Furthermore, in the study by Moodley and Singh (2015), students felt that they were not given adequate customer service and academic leader support when issues arose and felt that this lack of support had impacted their academic performance negatively. Wyatt (2019: 3) maintains that "leadership's level of customer service and support to students from academic leaders sets the tone for other faculties and staff that inevitably trickles down to student success".

5. The Practice of Openness and Communication

Communication in any organization is fundamental to enhancing leadership effectiveness which, in turn, assists in achieving desired organizational results (Kerns, 2016). Kerns (2016) further emphasizes the importance of academic leaders ensuring that they are competent in interpersonal influence skills, as this assists leaders in motivating people and providing them with direction to achieve the institutional goals. "Communication is a fundamental practice area within the interpersonal influence domain that can contribute to effective leadership" (Kerns, 2016: 11). Conrad and Newberry (2011, cited in Kerns 2016: 12) concluded that "communication is connected to all organizational activities and business leaders and teachers/trainers concur on how important it is to organizational effectiveness". In a study conducted by Spendlove (2007) on effective leadership competencies in higher education, amongst other competencies, the attributes of openness and honesty were highlighted as most important. This attribute of openness was supported in the findings of the study undertaken by Andy-Wali and Wali (2018) where the researchers identified four themes summarising student experiences with regards to lecturers and academic leaders leadership practices. One of the themes that emerged in their study was to do with participants' experiences in terms of lecturers' openness and accessibility towards their academic pursuit. Andy-Wali and Wali (2018) found that this practice positively influenced students' sense of academic commitment, which ultimately contributed to their academic success.

Considering the literature reviewed above and the findings of previous studies, there is a need to investigate in more depth what specific and effective leadership practices can be implemented in higher education institutions in South Africa to support students in their academic journey.

6. Research Methodology

A positivist philosophy underpinned the quantitative research method employed in this study, the aim of which was to measure student perceptions of the impact of key leadership practices of academic leaders in a higher education institution in South Africa (Creswell and Creswell 2018). The positivist approach was of value as it afforded the researcher the opportunity to make a quantitative connection between student perceptions of the impact of academic leaders leadership practices on student success. The University of KwaZulu-Natal's (UKZN) code of ethics for conducting research was used by the researcher to compile an application for ethical approval before commencement of data collection. The data collection instrument used in this study was a questionnaire which was designed and distributed, to a sample of 78 undergraduate student participants, in a higher education institution. The discussion of the findings aims to highlight the perceptions, from the sample group around the relationship between key leadership practices and student success. A purposeful sampling approach was implemented and all data analysis was carried out using the Statistical Package for the Social Sciences (SPSS) (Creswell and Creswell 2018).

7. Data Analysis

The data from completed survey questionnaires was coded and captured in SPSS and used for descriptive and inferential analysis. The tests used in the analysis were:

- A repeated measures ANOVA test;
- Descriptive statistics including means and standard deviations, tables and graphs;
- One sample t-test, which tests for significant agreement or disagreement to the Likert scale items;
- Cronbach's alpha, which tests for reliability of scales.

A one-sample t-test was applied to test whether the average agreement score is significantly different from a central score of 3.5 (halfway between 1 and 6 which is the Likert score range). If the score is significantly different and above the mean score (>3.5), it is interpreted as "significant agreement", if the score was significantly different and below the mean score (<3.5), it is interpreted as "significant disagreement". (Creswell and Creswell 2018).

8. Results and Findings

The student responses from the questionnaire on student success in relation to the academic leaders on leadership practices are illustrated in Table 1 below.

Table 1: A consolidated summary of results from the student questionnaire on academic leaders impact on student success

Question	Student success will improve if the academic leaders...	Results as Frequency (%)						n	Mean (SD)	t	df	P-value
		Strongly disagree	Disagree	Slightly Disagree	Slightly Agree	Agree	Strongly Agree					
1	Is easily accessible and available to listen and advise students who have concerns or questions regarding their higher education experience.	0	0	1 (1.3)	5 (6.4)	38 (48.7)	34 (43.6)	78	5.35 (.661)	24.663	77	<.0005
2	Is known to the student body by name.	1 (1.3)	2 (2.6)	3 (3.8)	17 (21.8)	29 (37.2)	26 (33.3)	78	4.91 (1.071)	11.626	77	<.0005
3	Provides support programmes specifically for first generation students.	0	1 (1.3)	1 (1.3)	17 (21.8)	26 (33.3)	32 (41.0)	77	5.13 (.894)	16.003	76	<.0005
4	Provides adequate suitable residential accommodation for "out-of-town" students.	2 (2.6)	11 (14.1)	7 (9.0)	19 (24.4)	13 (16.7)	25 (32.1)	77	4.36 (1.504)	5.040	76	<.0005
5	Ensures that there is adequate transport between campus and student residences.	4 (5.1)	6 (7.7)	7 (9.0)	21 (26.9)	20 (25.6)	18 (23.1)	76	4.33 (1.418)	5.097	75	<.0005
6	Regularly sits in on lectures to observe instruction.	1 (1.3)	3 (3.8)	5 (6.4)	19 (24.4)	26 (33.3)	23 (29.5)	77	4.75 (1.149)	9.572	76	<.0005
7	Regularly meets with students to discuss progress and get class feedback.	1 (1.3)	1 (1.3)	5 (6.4)	14 (17.9)	22 (28.2)	35 (44.9)	78	5.05 (1.104)	12.413	77	<.0005

8	Offers facilities that will give support and guidance to students who need it.	0	0	12 (15.4)	0	24 (30.8)	42 (53.8)	78	5.38 (.743)	22,414	77	<.0005
9	Communicate s clearly about what the minimum passing requirements are for each module.	0	1 (1.3)	2 (2.6)	14 (17.9)	22 (28.2)	38 (48.7)	77	5.22 (.927)	16,297	76	<.0005
10	Communicate s clearly about what support programmes are available to students on campus.	0	1 (1.3)	2 (2.6)	3 (3.8)	35 (44.9)	37 (47.4)	78	5.35 (.787)	20,726	77	<.0005
11	Provides psychological support for students who are feeling discouraged.	0	3 (3.8)	1 (1.3)	7 (9.0)	30 (38.5)	37 (47.4)	78	5.24 (.956)	16,108	77	<.0005
12	Communicate s clearly the expectation of self-directed learning.	0	1 (1.3)	0	14 (17.9)	30 (38.5)	33 (42.3)	78	5.21 (.827)	18,200	77	<.0005
13	Provides a platform for students to give feedback on their learning experience.	0	0	2 (2.6)	18 (23.1)	29 (37.2)	29 (37.2)	78	5.09 (.840)	16,708	77	<.0005
14	Communicate s clearly to the students the individual roles and responsibilities of the management team.	0	2 (2.6)	5 (6.4)	12 (15.4)	32 (42.0)	27 (34.6)	78	4.99 (1.000)	13,136	77	<.0005
15	Provides learning skills and time management skills to learners to help them to navigate the workload in higher education.	0	0	1 (2.6)	9 (11.5)	28 (35.9)	39 (50.0)	77	5.36 (.742)	22,046	76	<.0005

(Source: Compiled from analysis of data collected in the study)

From the analysis results in Table 1.1 it is evident that there is significant agreement for all the statements. The mean scores ranged from 5.38 to 4.33. The item perceived to have the biggest effect on student success, with a mean score of 5.38, is the offer of facilities and resources that will provide support and guidance to those students who may require it. This was followed by the provision of learning and time management skills with a mean score of 5.36. Next in importance to improve student success, with a mean score of 5.35, is the accessibility and availability of leadership to advise students, as well as the communication of available support programmes.

The two questions which are perceived as being of 'lowest importance' regarding the effect they have on student success, with mean scores of 4.36 and 4.33 respectively, were the provision of adequate and suitable residential accommodation to students and having transport arranged between the higher education institution and the student residences.

The 15 items included in the questionnaire were grouped into three basic themes – communication, engagement and support. Items that fall under each theme were combined into a single composite measure by finding the average of the agreement scores across the items. These single measures were tested for reliability using Cronbach's alpha. A value for alpha that exceeds .7 indicates a reliable single measure. The results pertaining to the composition and reliability of these constructs are summarized in Table 2 below.

Table 2: The themes/leadership practices identified as important to student success in a higher education institution

Theme	Items included in each theme	Cronbach's alpha - Reliability
Engagement	1... Is easily accessible and available to listen and advise students who have concerns or questions regarding their higher education experience.	.681
	2... Is known to the student body by name.	
	6... Regularly sits in on lectures to observe instruction.	
	7... Regularly meets with students to discuss progress and get class feedback.	
Support	3... Provides support programmes specifically for first generation students.	.767
	4... Provides adequate suitable residential accommodation for 'out-of-town' students	
	5... Ensures there is adequate transport between campus and residence	
	8... Offers facilities that will give support and guidance to students who need it.	
	9... Provides psychological support for students who are feeling discouraged.	
	11... Provides learning skills and time management skills to learners to help them to navigate the workload in higher education.	
	15... Communicates clearly about what support programmes are available to students on campus.	
Communication	10... Communicates clearly about what the minimum passing requirements are for each module.	.795
	12... Communicates clearly the expectation of self-directed learning.	
	13... Provides a platform for students to give feedback on their learning experience.	
	14... Communicates clearly to the students the individual roles and responsibilities of the academic leaders	

(Source: Compiled from analysis of data collected in the study)

The questionnaire included items relevant to best practice in leadership, with specific focus on measuring the importance of engagement, support and communication from the academic leaders.

The above findings support the researcher's anticipated outcomes of the research process which, based on the review of relevant literature, was designed to evaluate whether academic leaders' leadership practices were perceived as impactful on student success, from a student's perspective:

- The value of the support offered by the academic leaders to the student body;
- The importance of the accessibility of availability to and overall engagement of the academic leaders with students;
- The communication by academic leaders with students regarding issues that concern them.

The overall feedback from the student sample demonstrates that they agree that these academic leadership practices do have a positive impact on student success.

9. Discussion

As a result of grouping the different statements into themes/practices that evolved from the analysis in each of the questionnaires, three key leadership practices emerged namely engagement, support and communication. By applying different tests, it became apparent that these leadership practices were perceived, by the students, as being impactful on student success. These findings from the current study confirm what was established in an earlier study by Wyatt (2019) where it was found that support from academic leaders does impact student success. Wyatt (2019: 3) noted that “leadership’s level of customer service and support to students sets the tone for other faculties and staff that inevitably trickles down to student success”. The results of this study also confirm the findings from research undertaken by Kwarar (2012) in which it was observed that key practices to attain student success include: effective communication; support and development; engagement; and motivation of people.

A study by Shertzer and Schuh (2004) also uncovered similar findings to those generated in the analysis of the data collected in this study, that is, that communication was very important for student success. The overall feedback from students included in this study that was undertaken at a higher education institution in South Africa is that the three key practices, engagement, support and communication, if implemented correctly by academic leaders, would certainly have a positive impact on student success. A recommendation to support the relationship between academic leaders and student success would be for academic leaders have regular engagement with students by developing clear communication channels which encouraged student feedback on the learning experience. This would enable academic leaders to intervene to ensure strategies were implemented to promote student throughput rates and academic excellence.

10. Conclusion

The purpose of this study was to explore the perceived impact of leadership practices of academic leaders on student success at a higher education institution in South Africa. The research aimed to investigate the perceptions of students at the higher education institution with regards to their understanding of the impact that leadership practices of academic leaders have on student success. The quantitative analysis undertaken on the data obtained from the questionnaire administered to students in the study showed that the students were in strong agreement that the three themes that were identified during analysis, namely engagement, support and communication, which were practices which contribute positively to student success. To mitigate low student success rates academic leaders, need to engage and communicate directly with students and provide personal support in terms of mental support, skills development, facilities and resources to support learning. In particular support for first year students who may demonstrate a lack of confidence, a lack of interest in leadership, a self-perceived deficiency in leadership qualities, and encourage opportunities to lead with the university community.

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Reflections on Research and Research Intelligence in a Private Higher Education in South Africa: A Collaborative Autoethnographic Study

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Abstract : Globally, higher education remains a highly competitive environment, where striving towards good institutional reputation, as well as academic and research stature is high on the agendas. As such, research intelligence is fast becoming a topic of discussion. Measuring progress and success is a strategic and data-driven process. This paper reports on a collaborative autoethnographic study on a research capacity development project. It further explores the importance of the management of research towards creating, managing and utilising data-driven research intelligence in a private higher education institution in South Africa. Reflecting on this project, stretching over a five-year period, the study aims to shed light on further implementations by exploring how available data could translate into research intelligence. The study considers the role of research intelligence by comparing it to the strategic value of strategic and business intelligence. It explores how reliable research intelligence could inform and support strategies in developing a maturing academic environment, and how current and potential solutions could be applied for strategic decision making. The study adds knowledge to an under-researched area in higher education in South Africa. It offers recommendation for more effective management of research data and research intelligence.

Keywords: Private higher education, Research culture, Research intelligence, Maturity models, Data analysis, Collaborative autoethnography

1. Introduction and Background

Higher education remains a highly competitive environment (Engelbrecht, Van Greunen & Ramgovind, 2023), where striving towards academic stature and reputation is high on the agendas. As such, research intelligence (RI) is fast becoming a topic of discussion. Measuring progress and success is a strategic and data-driven process. Albeit the subject of much debate and criticism (Iping et al, 2022; McKenna, 2023), research metrics and university rankings are at the core of this competition. Despite the prevailing opinions, it is significant that private higher education institutions (PHEIs) in South Africa are currently ranking significantly lower than their public counter parts on most ranking systems (Van Wyk & Mostert, 2014). Historically, private higher education in South Africa do not have the same research intensity and research competitiveness as compared to the research- and comprehensive public universities (Deacon, 2014; Sithole, 2024).

For PHEIs in South Africa, this competition has escalated with the recent changes to the Higher Education Act (Act 101 of 97, as amended), as it opened the possibility for PHEIs to attain university status, and to use their research output to their competitive advantage. In 2024 the Department of Higher Education and Training (DHET) issued a Draft Policy on the requirements to qualify. The report states:

“A University: must undertake research and produce knowledge contributing to the national development needs and international scholarship and demonstrate a culture of sustained scholarship evidenced in peer reviewed academic publications which inform teaching and learning in all its academic fields”. (DHET, 2024: 36)

This invariably requires a higher research and research output profile, with evidenced data on research trends to inform policies and strategies. It begs PHEIs to do forecasting and strategic planning, beyond traditional research administration and information management.

2. Contextualising This Study

In 2019 the PHEI in this study launched a project to develop its research capacity and research culture to drive research output. The two researchers were both involved in the planning and roll-out of this project. Using research output towards competitive advantage is not yet an established culture among PHEIs, but the recent changes in legislation created the impetus for further research and initiatives.

2.1 Review of Literature

PHEI in South Africa's core business is that of teaching and learning through which income is generated (Engelbrecht *et al.*, 2023) given the increase in student numbers due to the lack of capacity within public higher education institutions (Pramjeeth, Engelbrecht, Mooney & Ramgovind, 2022). As noted earlier by Van Wyk and Mostert (2014) limited research has been produced by PHEI, however since the possibility of being called a university, the largest PHEI are driving research initiatives to ensure they meet the DHET's criteria of a university. Considering the increasing competitive landscape of the PHEI landscape in South Africa, it's essential for PHEI to understand the importance and relevance of research to elevate the institutional strategic imperatives and meet required standards and targets as determined by the DHET.

2.2 Background to Business Intelligence and Research Intelligence

In a corporate environment, business intelligence (BI) is generally explained as the use of technologies, applications, and practices for the collection, integration, analysis, and presentation of business information to advise strategy (Cordosa & Su, 2022). It involves the gathering and processing of data from various sources within and outside an organization. Equating RI to BI can be useful, but also complex, yet comparable. Research output and scholarly communication generated in higher education institutions (HEIs) are seen as valuable knowledge capital and must be managed for a return on investment. Moreover, research is essential to add new knowledge for further innovation for the greater good and the development of society.

There is a difference between research administration and RI. Research administration manages the research processes, and research data management looks at past inputs, while RI uses various sources of information to predict and plan for the future. Invariably this is a data-driven process involving the systematic collection of reliable data, analysis, and application of information to support decision-making, strategic planning towards achieving a competitive advantage. RI relies on the availability of purpose-driven data analytics and technologies that can be obtained from systems such as research management systems and research repositories.

Data that will inform HEI research progress include publication counts and research output quality measurement, citation counts, altmetrics, indexes and impact factors. Finding or developing information systems capable of addressing all these areas can be challenging and costly (Stivilia, Lee and Han, 2020). Actionable insights on the BI could assist strategic decision making, support and drive research output (Cordosa & Su, 2022), not only in public universities, but also in PHEIs. This information can aid funding and budgeting and could potentially improve research impact.

Ultimately, the aim of using BI and RI is to reach a state of institutional maturity (Duarte & Martins, 2013; Cordosa & Su, 2022). There are several frameworks to explain institutional maturity, of which Gartner's model are well-suited for an academic environment. Maturity models are applied across industries, and it interrogates the strength and weaknesses of initiatives taken to increase competitiveness and measure intelligence by analysing available data (Cordosa & Su 2022). It considers organisational maturity across multiple dimensions. Maturity models are established means to measure the strengths and weaknesses of an organisation as well as its intelligence analytics and initiatives (Belghith et al, 2021).

2.3 Research Information Management

Information and data on intelligence are obtained from several sources, including the relevant automated systems to manage information. Stivilia, Lee and Han (2020) state that systems to manage research are critically important for collecting and analysing research information for strategic decisions related to accreditation, identifying research strengths towards institutional reputation. A Research Management System (RIMS) is a comprehensive software platform designed to support the administrative, financial, and collaborative aspects of research activities within institutions such as universities, research organizations, and funding agencies. These systems could be rather costly and requires expertise. Effective RIMS is essential for research institutions, enabling them to manage their research portfolios efficiently, ensure compliance, enhance collaboration, and make informed strategic decisions. As well as creating networking opportunities for further collaboration.

2.4 Research Analytics and Impact Assessment as a Source for Research Intelligence

Iping et al (2022) remind that research impact assessment is a well-established practice, and bibliometric indicators use quantitative approaches to citation impact analysis for benchmarking purposes. The Science Citation Index was introduced in the early 1960s, resulting in the use of metrics to measure scholarly communication and evaluate research output quality. However, Wolf, Hall and Robertshaw (2021) warn that despite these early developments, HEIs' research management and analysis of research output is still in its

infancy. Matkovic, Pavlicevic, and Tumbas (2017) concurred in their studies and confirmed that HEIs lag in the practical application of process management. They explain that Gartner's Maturity and Adoption Model at the hand of six phases of organisational maturity, each phase explaining where an organisation is at any given time towards business process maturation and excellence:

- Phase 1 – Acknowledge Operational Inefficiencies
- Phase 2 – Become Process-Aware
- Phase 3 – Establish Intraprocess Automation and Control
- Phase 4 – Establish Interprocess Automation and Control
- Phase 5 – Establish Enterprise Valuation Control
- Phase 6 – Create an Agile Business Structure (Matkovic, Pavlicevic, & Tumbas, 2017, 6895)

It is mainly governments and funding agencies using these intelligence and indicators, which leaves a strategic information gap of institutional RI within universities.

3. Research Design

The research design for this study is collaborative autoethnography (CAE). Miyahara and Fukao (2022) hail CAE for its transformative qualities, creating a community of advance scholarship, and become empowered within a social context. CAE has its roots in two long-standing approaches to inquiry and meaning making: namely autobiography and ethnography (Ellis, Adams & Bochner, 2011). Edwards (2021) posits a deep emergence in self-experience and reflection. Roy and Uekusa (2020:386) argue that collaborative autoethnography as a qualitative method can be used to gain insight and a rigorous understanding of experiences.

The authors used reflection and dialogue to explore experiences pertaining to RI practices. This design enables researchers to explore the topic of RI. Narrative analysis was used to interpret and meaning of the rich data collected. Narrative research is a technique or research method that uses accounts and discussion activities as instruments of inquiry. It examines the ways in which people construct meaning through their narratives, emphasizing the content, structure, and context of these stories (Poerwandari, 2021). Miyahara and Fukao (2022) share that reflexive researchers are aware of their own role during the research process when they bring their own previous experiences, personal perspectives, theoretical knowledge, and aspirations that may impact the research results.

This study followed a concurrent or sequential systematic approach, combining the perspectives, experiences, findings, towards making sense of RI towards improved decision making and strategies. Using this design, qualitative data were collected through several sessions of online as well as face-to-face collaborative dialogues and included pre- and post-dialogue reflective writings.

4. Participant Profiles

As part of the Research and Postgraduate Department at a PHEI in South Africa, the two participants were involved in developing a research culture.

5. Data Collection and Analysis

Data for the current study have been collected over an approximate period of 4 years, starting from 2019 to early 2024, making this a longitudinal study. From the collected data themes were identified. Audio recordings assisted participants to recap and further reflect on data, whereafter post-dialogue reflective writing commenced.

6. Findings and Discussions

Leading up to the exploration of the status, value and necessity of RI, the two participants had to engage and reflect critically on research in PHEIs.

6.1 The Status of Research in Private Higher Education in South Africa

Research within the PHEI sector is new in the sense that pre-2019 most individuals within the PHEI conducted research and participate in activities for own interest. PHEIs in South Africa are not subject to government subsidy based of research outputs. As the PHEI is maturing as an organisation and as more postgraduate programmes are offered, a renewed focus on research output emerged with the first doctoral programme being accredited in 2019. This, coupled with the amendments of the Higher education Act (Act 101 of 1997) which emphasises research activities begged for a strategic revision of research management. Part of the research

capacity building plan to stimulate research output, was allowing for research incentives. PHEIs do not get any monetary incentives for research output like their public counterparts. It remains critical that any institution conducting research must do so with the aim of producing new knowledge and contributing to the existing disciplines as the main objective over and beyond the monetary incentives provided by institutions or government for public HEI.

6.2 Developing a Research Culture

The capacity development initiatives established by the institution were developed and implemented by the core research project team managed by the Dean of Research and Postgraduate Studies and a group of research managers across the institution driving and promoting the research imperatives of the institution. As a rule, PHEIs in South Africa focus more on teaching and learning, and this study could explain the lack of understanding and importance of research within the PHEI under investigation. Over the past years, there has been a deliberate attempt to promote, develop and support emerging and established researchers. The understanding and importance of research is not yet fully understood by the PHEI management and leadership. Therefore, challenges in terms of time, capacity, and outputs are not at all times a priority in operations. However, the leadership did approve the research development project which clearly stated research output targets for the PHEI. This was a strategic move to work towards meeting the requirements for university status. The PHEI therefore appointed key research incumbents between 2019 and 2021 distributed strategically throughout the organisation to establish, promote and advance the research culture as set out in the project plan.

6.3 Supporting Research Creation Activities

The competitive driver for the PHEI is to be the first private university and to offer incentives for increased research outputs in a strategic plan aimed at developing research capacity through various institutional activities. The PHEI does not get any government funding.

Research initiatives included monthly research workshops aimed at unpacking and the technical research methodological matters for staff was implemented; monthly research coffee chats; mentor and mentee programmes; monthly scholarly seminar series, writing clinics, writing retreats, peer review of research manuscripts prior to submission for publication, establishing research projects with novice researchers, postgraduate study support and development, eSymposiums, and the annual teaching and learning symposium. All these initiatives are aimed at the development and enhancement of the academic's research skills and competencies to enable successful publications.

The PHEI has a very lucrative and competitive research incentive programme based on a point system for its academics. The institution started with a R15 000 (no-taxable) research incentive for every 1 research point accumulated that subsequently increased to R25 000 in 2024. This was further substituted by a R20 000 (taxable) cash incentive for those who published 1 research output point per academic year. In addition to these incentives the institution is carrying all publication, language editing and statistician analysis fees for researchers within the institution. In addition, research and postgraduate study leave opportunities are offered, with the sabbatical leave proposal being accepted at Senate in 2022, for a maximum of 6 months. The effectiveness of this programme is yet to be determined and outputs obtained from researchers need to be carefully analysed.

As the project progressed new needs were identified. It was evident that research literacies and research statistical skills and programmes, academic writing workshops, research methods training, drafting of synthesised and well-argued literature reviews and promoting collaborative research publications aimed at trans-and intra disciplinary areas. What is lacking from a capacity development perspective is the needs for more statistical support, academic writing workshops, methodological training, drafting of a synthesised and well-argued literature review and promoting collaborative research publications aimed at trans-and intra disciplinary areas.

6.4 Initial Analysis: Strengths and Weaknesses

Initial data analysis on the progress of the project was done manually. The initial Research and Scholarship Capacity Building Plan (RSCBP) that was setup in 2019 were extremely ambitious with a 0.2 research output target per academic in year one, with an increase of 0.2 year-on-year until 1.0 point is achieved per academic in 2024. It soon became evident that capacity of academics, emphasis on teaching and learning and academic operations, institutional challenges with a new student system and overall energy levels during the 2021 – 2022 academic years that these ambitious goals will not be achieved. The team responsible for leading out the research imperatives across the institution embarked on a realistic and capacity focused research output plan

that informed the change in policy to retain 0.2 outputs per academic until 2023 where after it will increase to 0.4 in 2024; 0.6 in 2025; 0.8 in 2026 and 1.0 in 2027.

A critical assessment of the past 3 years revealed that the researchers are motivated by the incentives more than the active contribution towards the discipline field and delivering impactful, constructive, and developmental research outputs. A key finding from this reflection is that researchers are not concerned about their research output impact, rather how incentives can be generated to promote personal activities of travelling to internationally well-known destinations. This is not unique to the PHEI as the public higher education institutions as noted at the CHE's Annual Conference in 2024 discussed the nuance of publish for incentives versus the publication of outputs that contributes significantly to the discipline in question. Incentive based research programmes are therefore placing a question on the volume and quality of research outputs published within the South African higher education sector.

One of the challenges that emerged from the project was the need for technology and systems to manage all research data management, with the computational capability to derive actionable reports for strategic decision making. Initial priorities were not for costly research management systems, but rather developing the human capital of emerging researchers. As a result, initial systems included manual processes.

6.5 Creating Competitive Strategies and Policies

The first research policy was drafted and approved in 2019. The policy is informed by the DHET Research Outputs Policy (2015) and DHET Policy on the evaluation of creative outputs and innovations produced by public higher education institutions (2017; 2021). It allowed for a developmental approach, where emerging researchers received recognition for research output that would traditionally be considered as non-accredited research output. It also encouraged further upskilling of academic staff to complete doctoral qualifications. It has since been adjusted as the research profile has improved. Annual reviews of the research incentive policy indicates that the continuous reflection on best practices, additional support and financial assistance for research is considered to promote an active research culture. An unexpected result of incentivising research output has been that the researchers are more motivated by the monetary incentives than the contribution of new evidenced knowledge in their disciplines.

The RSCBP was approved by Senate in 2019. The aim of the policy is to formalise the planned research outputs targets, research capacity initiatives, areas for institutional development, main institutional focus areas, institutional research SWOT analysis, and targets for the promotion of academics to obtain their Doctoral degrees. In 2022 the RSCBP was changed with an emphasis on establishing a proactive, engaged and supportive research culture that is not secondary to the rest of the institutional activities. The promotion of research is further enhanced through the establishment of a Post-

6.6 Bench Marking and Analysis of Available Data

Annual reviews of the research incentive policy indicates that the continuous reflection on best practices, additional support and financial assistance for research is considered to promote an active research culture.

The institutional targets are informed by the DHET Research Outputs Report (2021) where the lowest ranking public higher education institution obtained a 0.21 research output per capita for the 2019 academic year. The institution under investigation obtained research output points of 0.06 equating into 19 publications in (2020); 0.07 with 59 publications (2021); 0.09 totalling 81 publications (2022); 0.19 a significant 143 publications (2023). As the institution establishes its research culture and relevance, research output increased annually with a significant increase of 0.10 points between 2022 and 2023. The minor increase in research outputs between 2020 and 2022 is possibly attributed to the COVID-19 pandemic that focused academic's attention on online teaching.

The project succeeded in shifting the focus from research incentives for non-accredited scholarship activities to an increase of publishing in journals and conference proceedings considered to be of a better academic quality equating accredited research output. This is partially due to the institution actively driving research through the appointment of research associates, research capacity development programmes, research incentive programme and aspirations to become the first private university in South Africa.

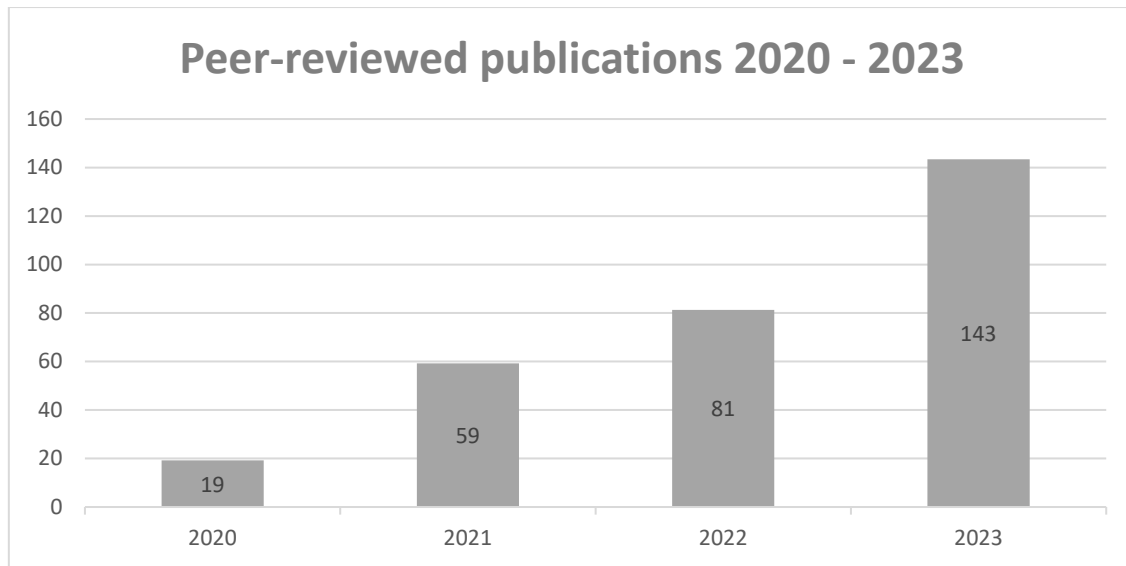


Figure 1: Peer-reviewed publications 2020 -2023

Figure 2 shows that the initial expenses claimed for research activities by researchers were few in 2021, predominantly due to the COVID-19 restrictions on travel. However, for 2022 and 2023 it is evident that the researchers are utilising their research incentives for research activities more so than three years ago.

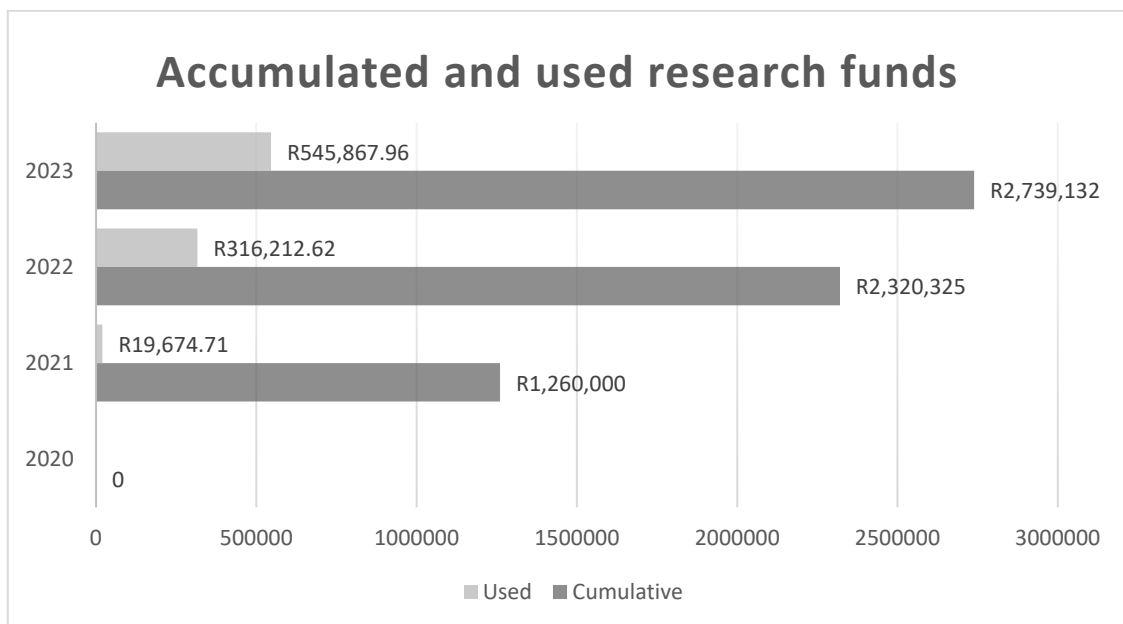


Figure 2: Accumulated and used research funds 2020 – 2023

* The institution has its own research tracking and research incentive platform designed to monitor publication points and research incentive allocations.

With the expenses in mind, it is important that PHEI are mostly concerned about costs incurred and wanting to establish the return on investment on such cost. Annually the research budget is contested and debated as huge amounts for research incentives and support is requested to enable the emerging and experienced researchers to establish a research profile for the institution.

The project resulted in availing an adequate research budget. The current research costs are less compared to public higher education institutions. What has been evident and also explained to the leadership is that research expenses are similar to the marketing budget of any organisation, the return-on-investment (ROI) is not immediate, but with time the reputation is established and that's when the ROI is significant, but only over time 5 – 10 years at least with regards to research.

Over the past years it was established that there are four main elements that underpin the management of research, which will form a source for RI of the PHEI under study.

6.7 Towards Improved Research Intelligence and Data Analytics

The concept of research analysis was not at first fully comprehended. The value and importance came to the fore when reliable data were needed to convince the leadership of the requirements to succeed in developing and sustaining a research culture. Duarte and Martins (2013) posit that HEIs are mostly autonomous organisations, but complex. The project used Microsoft SharePoint to store and organise folders and information on research profiles and output. As a beginning, this platform had sufficient data analytics capabilities. Although the velocity of initial research data could be managed in the beginning of the project, research production is a cumulative process and analysis will become more intricate over time. As Duarte and Martins (2013) warned, difficulties in procedure systematisation in this study was achieved, but the growing workflow analysis, evaluation, and optimisation will invariably be seen in information systems designs. The need for data and data management systems to evaluate the effectiveness of these steps soon became apparent, and with this the need to relook available systems and tools to derive the requisite RI. Workflow optimisation would also require attention.

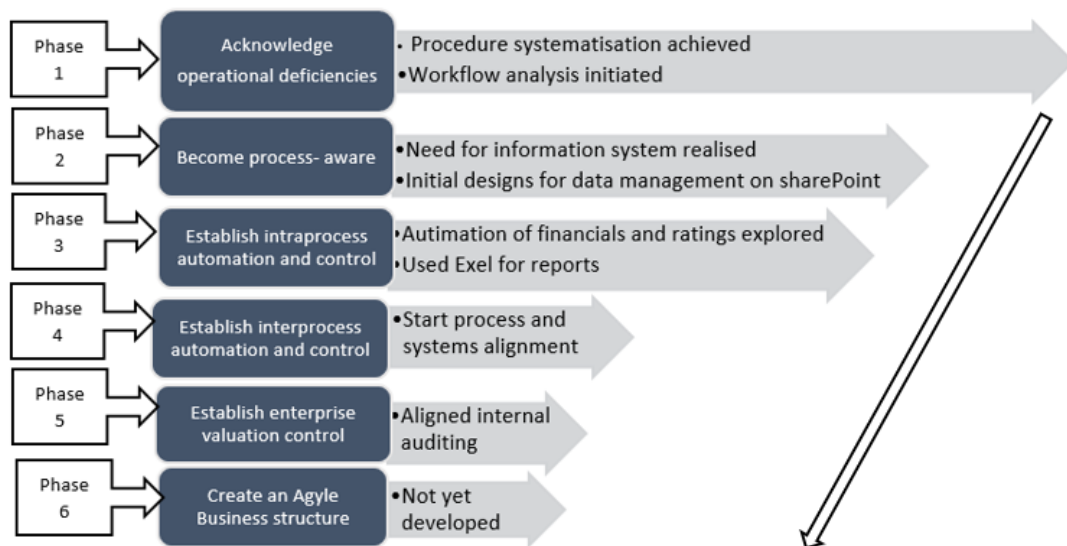


Figure 3: Mapping of Research Process Management Maturity based of Gartner's Six Phase (Adapted from Matkovic, Pavlicevic, & Tumbas (2017))

In figure 1 the findings of this study are mapped according to Gartner's six phases for success in business process management towards maturity. The processes of managing research management processes, and associated data are not yet optimised or sophisticated.

The SharePoint platform is not the only source of research related data. The PHEI also implemented an open access research repository in 2015, using the DSpace open-source platform. Furthermore, the PHEI is the publisher of a DHET accredit journal, requiring journal impact and metric analysis. Revisiting the definition of business intelligence, this study has seen the value of obtaining and analysing data from different sources for informed decision making and workflow optimisation.

The findings of this study concur with the study of Wolf, Hall and Robertshaw (2021) stating that much needs to be learnt about RI and the value of maturity models. A key finding was that a sociotechnical approach to build on the initial the success of the project, where the concepts of institutional maturity and RI are clearly understood and utilised for competitive advantage in expanding the research function of the PHEI to transition from an institution of higher learning to having full university status, as defined in the Higher Education Act (Act 101 of 1997, as amended). Although the findings of CAE studies cannot readily be generalised, it is believed that HEIs, and in particular PHEIs could benefit from experiences shared in this study. Looking at research output as capital, and managing as knowledge assets will align with business models of PHEIs.

7. Recommendation

The recommendations of the two participants who were responsible for this project is that there should be a further investment in understanding and implementing analytic frameworks and maturity models, in ensuring longevity and sustainable growth of the research capacity development initiative of this PHEI. The model in Figure 1 by Wolf, Hall and Robertshaw (2021) encapsulates the areas that the project should focus on in progressing from phase 2 to phase 3 of maturity phases as explained by Matkovic, Pavlicevic, and Tumbas (2017, 6895). With the knowledge and understanding of maturity models further roadmaps can be planned towards improving practices vital for using RI to the advantage of the PHEI and its competitive strategies. Maturity levels guide the evolution of an organisation from a state in which practices are poorly defined and incoherent to a level of innovation and continuous optimisation. A further recommendation is that an understanding and awareness of the metrics of research impact for both the PHEI and the individual academics must be realised.



Figure 4: An example of an analytics framework towards research intelligence (Wolf, Hall & Robertshaw 2021)

8. Conclusion

This study reports on the initial implementation of a research department in a PHEI in South Africa. Through a period of self-reflection, planning and observations, the two participants gathered data collaboratively on the nature and importance of RI, and its role in developing a research culture in the PHEI. The challenges and opportunities in establishing an understanding of all the components of RI are shared. The value of analysing available data to inform strategic decision making is underpinned. The value of this study lies in creating a road map for HEIs to fully understand the complexities as well the importance of understanding RI and making this the foundation of research management. There is a paucity in reported literature on the nature of RI and its importance in HEI governance. This study will add to this body of knowledge.

Not only are universities reliant on sound research process systems, but Donner (2023) furthermore warns that publicly funded HEIs are increasingly required to make use of credible research data management systems (RDMs), to manage data produced by individual research studies. This is a further development that the PHEI understudy has not yet considered, and requires further research. The study concluded that RI plays a pivotal role in research support and constructive research capacity development.

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Experiences of Early-Career Teachers in Inclusive Education: Lessons Learnt in South Africa for Teacher Training Programmes

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Abstract: Higher education institutions are increasingly challenged to prepare student teachers for a socially and culturally diverse learner population. Inclusive education is an international imperative but remains a contentious issue in education. Early career teachers enter the profession with passion and anticipation to transition from theory-based learning to practical implementation. However, they soon face many contextual challenges, especially in low socio-economic settings. This research investigates the experiences of early career Foundation Phase teachers in implementing learning support within low socio-economic schools. Using a qualitative, illustrative case study design grounded in social constructivist theory, data were collected from purposefully selected participants in the Western Cape through semi-structured interviews and document analysis. Thematic content analysis revealed five key themes: 1) contextual factors, 2) teacher attitudes, 3) perceived lack of skills, 4) proactivity and reflection, and 5) external support needs. The findings indicate that despite the prioritization of inclusive education, early career teachers encounter numerous challenges that impede effective learning support. Their experiences highlight the gap between theoretical training and practical application, impacting their confidence and ability to implement learning support strategies. These insights are essential for adapting teacher training programs to better prepare future educators for the practical realities, particularly in low socio-economic contexts.

Keywords: Early career teachers, Inclusive education, Learning support, Contextual challenges, Teacher training programmes

1. Introduction

Internationally, the rapidly changing educational landscape challenges higher education institutions to regularly review teacher training programs. This is compounded by the global emphasis on accessible and quality education for all. The landmark Salamanca Statement and Framework for Action on Special Needs Education, along with several other declarations and conventions, emphasize the need for inclusive education (UNESCO, 1994). These initiatives initially aimed to integrate students with special needs into mainstream education settings, emphasizing diversity and individualized support. However, the understanding of inclusive education has evolved to promote quality education and support regardless of age, class, sexual preference, religion, culture, gender, and language (Department of Education (DOE), 2001). Research indicates that early career teachers struggle to provide quality teaching and support in the face of contextual challenges, particularly in low socio-economic contexts in South Africa. Higher education institutions are thus challenged to learn from these experiences to improve teacher training programs and support mechanisms.

2. Policies for Inclusive Education in the Country and Abroad

Understanding the challenges faced by early career teachers in South Africa requires an understanding of the development of inclusive education both nationally and internationally. Inclusive education originated from the disability movement and gained momentum with the Salamanca Statement (UNESCO, 1994), which advocated for integrating learners with special educational needs into mainstream education. The statement promotes the inclusion of all students, regardless of their abilities, in mainstream classrooms, emphasizing diversity and individualized support.

Several countries, including South Africa, have adopted policies on inclusive education. However, South Africa faced several political challenges during this time. Apartheid policies entrenched separate education systems for mainstream and special education, with significant racial disparities (Walton & Engelbrecht, 2022). Post-apartheid reforms, particularly the Education White Paper Six (EWP6), aimed to create a unified, inclusive education system (DoE, 2001). EWP6 emphasized the capacity of all children to learn and the importance of providing necessary support, aligning with the Salamanca Statement's vision (Walton & Rusznyak, 2016). Despite these reforms, the apartheid legacy left deep-rooted inequalities in the educational system, affecting resource allocation and support for learners with disabilities (Donohue & Bornman, 2014).

EWP6 set out a framework to make the South African education system more inclusive and equitable, enabling all learners to attend their local schools, receive a quality education, and obtain comprehensive support. The Screening, Identification, and Assessment Strategy (SIAS) standardized assessment procedures to identify and

address learners' needs (DoE, 2014). The national education department also issued several guiding documents to support the implementation of learning support. Despite significant progress, many challenges remain, including managing large numbers of learners during screening and identification, lack of time, limited parental involvement, feelings of learned helplessness, inadequate techniques, and insufficient support resources (Karimupfumbi & Dwarika, 2022). Engelbrecht et al. (2015) argue that the primary challenge for teachers is the lack of practical policy implementation, hindering their ability to effectively support learners with diverse learning barriers in the classroom. Additionally, Ladbrook (2009) found that primary school teachers had a limited understanding of curriculum differentiation to support learners. Implementing inclusive practices in classrooms remains stressful due to inadequate formal support systems and a lack of knowledge on effective learning support strategies (Mfuthwana & Dreyer, 2018).

2.1 Local Frameworks and Policies for Learning Support

In pursuit to provide equitable support to address learners' diverse educational needs, the Western Cape Education Department (WCED) introduced a learning support model which included various levels of support based on learners' needs (Dreyer et al., 2012). However, this model has since been replaced by the Screening, Identification, Assessment, and Support (SIAS) policy, which provides a framework for supporting learners with diverse needs at both the school and district levels (Mahlo, 2017). In addition to this, support structures like district-based support teams (DBST) and school-based support teams (SBST) were established (DoE, 2001).

SIAS outlines the roles of teachers, parents, and support personnel in providing learning support. It emphasizes the importance of early identification of learning barriers and the development of Individual Support Plans (ISPs) (Adewumi & Mosito, 2019). The SBST and DBST play crucial roles in coordinating and providing support to both learners and teachers (Engelbrecht & Green, 2007). Furthermore, the need for flexible curriculum content, support-based strategies, and strengthened teacher skills to manage diverse classrooms is emphasised in the EWP6 (DoE, 2001).

However, despite these policies and frameworks, many teachers still face challenges in implementing inclusive education due to inadequate training, resources, and support (Mokaleng & Möwes, 2020).

3. Conceptual Framework

An early career Foundation Phase teacher is defined as someone with less than three years of teaching experience. Studies have demonstrated that early career teachers encounter numerous challenges in implementing inclusive education (Karimupfumbi & Dwarika, 2022). While they value the principles of inclusion, they often lack the requisite training and support to effectively apply these principles in their classrooms (Paguirigan, 2020). Despite being educated in inclusive education, early career teachers frequently struggle to bridge the gap between theoretical knowledge and practical application, often experiencing feelings of isolation and overwhelm due to inadequate structured support during their transition into the teaching profession (Alam, 2018; Maistre & Paré, 2010). This gap presents significant difficulties for teachers working in low socioeconomic schools, where resources and support may be limited.

Internationally, numerous countries have established induction phases for new teachers to ensure they meet core standards before being granted qualified teacher status (Malm, 2009). However, in South Africa, there is no legal requirement for schools to provide formal induction programs, leaving this responsibility to individual schools (Mahlo, 2017). Adapting to the school environment can be daunting for new teachers, who often face challenges such as managing classroom dynamics, understanding school culture, and dealing with administrative tasks (Ngwira & Potokri, 2019). International studies have highlighted the various challenges faced by new teachers, including policy demands, classroom management, and collaboration with colleagues (Spătăreanu et al., 2021). The beginning of a teacher's career is critical for their development, and a well-structured induction program can help new teachers not only survive but thrive in their roles (Hudson, 2012).

South Africa's education system often performs poorly in global comparisons, highlighting the need for better support and training for beginner teachers (Hart, 2023). New teachers must be equipped with the skills and mindset to implement inclusive education effectively (Forlin & Sin, 2017). Developing a critical mindset and self-reflection in new teachers can also help them manage unexpected challenges and adapt to the realities of teaching (Botha & Rens, 2018).

The value of this study lies in its focus on teachers' experiences, particularly the practical difficulties they encounter. This knowledge is indispensable for identifying discrepancies between theoretical models and actual practice, thereby informing the development of more effective and pragmatic training programs, support

systems, and policies (Ainscow, 2020; Florian, 2014). For instance, understanding challenges such as resource scarcity, insufficient training, and inadequate administrative support can lead to targeted interventions that better equip educators for inclusive settings (Forlin, 2010). Although this study comprises a small sample of five teachers, it is significant as it elucidates the experiences of novice teachers in low socioeconomic schools in the Western Cape. Given that educators in under-resourced schools frequently face high turnover rates, these findings can inform strategies to improve teacher retention (Haug, 2017; Lalvani, 2012). Moreover, integrating teachers' experiences into research fosters empathy and collaboration among stakeholders, thereby enhancing the overall effectiveness of inclusive education initiatives.

4. Research Question

Teachers play a critical role in creating inclusive learning environments, yet limited research exists on early career teachers' experiences with implementing learning support in low socioeconomic schools. This study investigates how early career Foundation Phase teachers perceive and implement learning support in these settings. The primary research question is: How do early career Foundation Phase teachers experience implementing learning support in low socioeconomic schools? This study aims to understand their perceptions, challenges, opportunities, and the support they receive (Dreyer et al., 2012), with the goal of informing and improving teacher training programs.

5. Research Design and Methodology

The research followed a qualitative interpretive case study approach. This approach was chosen due to its effectiveness in exploring complex topics in real-world contexts and understanding intricate issues in natural settings. The study further employed a descriptive case study to provide in-depth exploration and contextual understanding of early career teachers' experiences (Creswell, 2007; Tuytens & Devos, 2017).

The study was further guided by an interpretive constructivist paradigm, which prioritizes the exploration of subjective interpretations within social and cultural contexts (Creswell, 2007). Within an interpretive paradigm, the socially constructed nature of knowledge and the creation of truth through individual interactions within society is emphasized (Andrews, 2012).

5.1 Participants

The research population comprised of five early career Foundation Phase teachers in under-resourced primary schools in Cape Town. The study targeted teachers in their first three years of teaching in low socio-economic areas, using purposive sampling to select participants (McMillan & Schumacher, 2006). Potential participants were contacted via WhatsApp and informed about the need for written consent and a permission letter from their principal. Before the interviews, participants were briefed on the advantages and potential drawbacks and informed that they could withdraw from the study at any time without consequences.

5.2 Data Collection and Analysis

Data collection methods aligned with the qualitative interpretive paradigm included semi-structured interviews, discussions, and reflection sessions with early career teachers (Merriam & Grenier, 2019). The interview questions encompassed personal and demographic information, including participants' names, ages, academic backgrounds, and teaching experiences. They examined primary classroom responsibilities, additional duties, and their impact on teaching efficacy. Furthermore, the questions addressed teachers' strategies for managing quality education, their understanding and implementation of learning support, the support they received or required, and the challenges and opportunities encountered in low socioeconomic schools. These methods yielded rich data on the challenges, successes, and innovative approaches of teachers implementing learning support, facilitating a comprehensive analysis of their thoughts, emotions, and contextual influences (Baxter & Jack, 2010). These questions were the primary data collection method for this study.

Thematic content analysis was used to identify trends and patterns in the data through coding, categorizing, and interpreting, with categories refined based on existing literature and emergent themes (Braun & Clarke, 2006). The procedure involved coding the data by quickly identifying segments related to the study questions and potential themes (Miles et al., 2014).

6. Results and Discussion

The research was conducted in five low-resourced schools in Cape Town, Western Cape Province, South Africa. These schools are in low socio-economic areas, reflecting the lasting impact of the Apartheid system (Kahts-

Kramer et al., 2022). The focus was on understanding early career teachers' experiences within these challenging contexts. The table below provides an overview of the participants' demographics:

Table 1: Demographic Data of Participants

Participant	Age	Gender	Race	Place of study	Qualification	Formal Teaching experience	Grade
1	25	Female	Coloured	UWC	Bachelors in Foundation Phase	Three years	3
2	28	Male	Indian	UNISA	Bachelors in Foundation Phase	Three years	1
3	29	Female	White	Cornerstone	PGCE in Foundation Phase	Three years	2
4	26	Female	Coloured	UWC	Bachelors in Foundation Phase	Three years	2
5	23	Female	Coloured	Stellenbosch	Bachelors in Foundation Phase	Two years	2

The study involved five qualified foundation phase educators, aged 23 to 29. Two participants studied via distance learning, while the remaining three attended full-time on-campus programs. The group comprised mostly females, with one male participant. Four participants identified as coloured, one as Indian, and one as white, offering a culturally diverse sample that provided insights into varied experiences shaped by different backgrounds. Notably, none of the participants had additional training in learning support or inclusive education after their initial teacher qualification.

6.1 Key Themes and Subthemes

This section presents the qualitative findings based on themes and subthemes derived from the data analysis. Five themes emerged from the data collected as listed below.

Table 2: Themes and subthemes

Themes	Sub-themes
1: Implementation of teaching practices	Contextual Attitude and mindset
2: Support structures	Management and guidance
3: Proactivity	Self-reflection
4: Early career teacher needs	Personal experiences
5: External support	Role of school

6.1.1 Implementation of teaching practices

The findings show that external, contextual challenges such as overcrowded classes, lack of resources, and language barriers were significant. This is consistent with findings by Themane (2019) and (Ebersöhn & Ferreira, 2012). However, despite these challenges, participants had positive attitudes toward inclusive education, emphasizing planning and group work, despite knowledge gaps and resource limitations.

Teachers were questioned about whether certain contextual factors hindered their ability to incorporate learning support or promote inclusivity in their classrooms. During their interviews, participants voiced their worries about crowded classes, limited resources, and language obstacles as seen in the following verbatim quotes:

Participant 1: "Contextual, um, definitely the class size, like the physical building and the number of learners. I have about 40 grade 3s on different levels who can't even be supported using different means such as a play corner or using dough or like a sandpit you know because there's no money. I think teachers are creative though and can survive and make do without the fancy stuff but then at least a smaller class size would be manageable."

Participant 2: "Umm, I would say... A bit of resources basically, so lack of printers. Umm in the classroom and even in the offices and things like that, I would even say language barriers for the kids. There are

unfortunately a lot of language barriers. Some learners are foreigners. Well, so it can be. It can be a bit of an issue, you know, to communicate and then you know, just having a lot of kids in the classroom and a relatively small class, it's definitely a challenge to work around these ..."

Inclusive education aims to provide the same educational opportunities for every student, regardless of their abilities, disabilities, backgrounds, or any other factors that could typically result in their exclusion from regular education (DoE, 2001). According to literature, teachers' dedication, expertise, and commitment have a significant influence on students' learning results and educational experiences (OECD, 2009). The interviews showed that most participants had an optimistic view towards inclusive education and thought that it was achievable with the right resources when questioned about the possibility of providing a quality education to all learners. Participant 1 expressed her opinions as follows:

"So, there's a learner, let's say there are two learners that struggle with sounds. So, in grade three, it is difficult to go all the way back to those very basics. So, I think in terms of a child that lacks the very basics, that would be considered challenging but let's say another is able to sound and you know, I think that's possible in your groups. How often it is being done is something different."

6.1.2 Support structures

Teachers reported that they lacked formal training with regard to specific support to learners with high level support needs. They tend to rely on self-initiative or collaboration with colleagues, highlighting a gap between policy and actual support. While many participants believed in the feasibility of learning support, all five participants felt their experiences required additional guidance and organization to effectively implement learning support in the classroom. No structured in-service training was provided to these early career teachers, except for when the learning support teacher was consulted for guidance. These are some of their responses:

Participant 4: "No, I haven't been given support as too many learners need support and only serious cases are addressed. I actually don't know how I've gone about it. I think we learnt about it during my studies ja, but nothing outside of that."

Participant 5: "I would say nothing, really, no. Apart from at varsity. Umm. I think like there was just one workshop that we went to. It was like one last year in the year 2022. Umm ja what can what can I learn from one workshop? Basically, it was just stipulating how do we go about learning support and the importance of it. Umm, but other than that, there hasn't been any like follow-ups done."

6.1.3 Proactivity

Despite limited assistance, findings show that these early career teachers took proactive steps to implement learning support, emphasizing continuous self-education and professional development. This theme provides strong evidence that certain teachers continue to use various strategies despite facing challenges in their environment and policy requirements, and despite needing expertise. They actively tackle issues related to inclusive education in their school communities (Andrews, Gentzkow, & Shapiro, 2020). Participant 4 explains:

Participant 4: "Also, a big one is. Uh. Putting them in appropriate groups at the beginning of the term and adjust, you know if the changes occur that bump them up or need to bring them down to a different group so that they're on the right level and they're getting more continuous increases in levels instead of being in too high of a group and it's challenging them too much, so they're not actually progressing or it's too low, so they're not being challenged enough, so they're not progressing. So, it's all about groups as well."

6.1.4 Early career teacher needs

From the data collected it is clear that personal experiences have an impact on the realisation that early career teachers in these low socio-economic contexts need considerable support. The participants expressed the need for structured frameworks, resources, and professional guidance to effectively implement learning support.

"That's what I think we need in our government schools, a support system. Someone that is available to offer guidance, a program or someone to literally help solve the different problems you face."

"The assistance of a remedial teacher who is specially providing his/or services to the foundation phase to accommodate neuro-divergent learners. I don't know how to work with kids who are struggling, how can the department expect that?"

The findings from theme 4 are consistent with Spătărelu et al. (2021), who identified theory-practice alignment, limited teaching resources, lack of experience with disabled children, teamwork with colleagues, and differentiated instruction as major obstacles for novice teachers.

6.1.5 External support

Findings emphasized the need to be supported from within the school. Although all these schools have a school-based support team, participants voiced the need for more specific support. These included school-provided resources and consistent in-service training opportunities, advocating for structured programs, and upskilling of learning support teachers. Theme 5 further highlighted the need to investigate external support systems, such as the larger education system in helping teachers effectively provide learning support. Some of these concerns are presented below by participant 1 and 2:

Participant 1: "Well, help me help the learners effectively in my classroom. Really setting out a program and having like an SIT booklet."

Participant 2: "I think the school can help with resources. I know I keep saying resources for a few of the answers, and that's because we definitely need that and resources to help us so much. So even something as simple as a printer for example. There are such lovely intervention worksheets and things like that that we can find online and whatnot, but we just need resources. We need to print them. Maybe even training for the teachers. Because dealing with the learner that needs support is different to a learner that doesn't. So even training for us teachers, I think will go a long way."

The findings from this research reveal that early career teachers face a range of challenges, including limited resources, lack of formal support systems, and difficulties in implementing learning support strategies. These challenges are exacerbated by contextual factors such as the socioeconomic status of the school and community. However, teachers also expressed a strong desire for more comprehensive training and mentorship to enhance their effectiveness in inclusive education. Based on the findings, several key lessons emerged for improving teacher training programs:

1. *Understanding of Learning Support:* Early career teachers had varying levels of understanding regarding learning support, with some emphasizing its importance for students' academic success while others focused on the broader inclusive education context. While teacher programmes are already incorporating module on inclusive education, it would be beneficial to ensure that all trainee teachers understand the essence of providing support within an inclusive educational system.
2. *Challenges in Implementation:* Teachers faced challenges in bridging the gap between theory and practice. This was exacerbated by a lack of resources and support systems in their schools. Teacher training may need to place higher emphasis on the fact that most of the South African population still live in very low socio-economic contexts. Students should be prepared to be creative with the resources available in these contexts.
3. *Support Needs:* Early career teachers expressed a need for more guidance and mentorship, as well as professional development opportunities to improve their teaching practices. One way that higher education institutions can contribute to supporting students is to introduce a mentor system for early career teachers.
4. *Contextual Factors:* Teachers highlighted the impact of the socioeconomic environment on their ability to provide effective learning support, including challenges related to student behaviour and family involvement. This is unfortunately beyond the control of the teacher of the higher education institution. However, student teachers need to be taught on how to be creative and innovative in the face of these challenges.

7. Conclusion

Although, South Africa has several policies regarding inclusive education, early career teachers face significant challenges in teaching and implementing learning support in low socioeconomic schools. By understanding their experiences and needs, we can identify key lessons for improving teacher training programs and support mechanisms. It is thus important that future research should continue to explore innovative approaches to enhance early career teachers' effectiveness and well-being in inclusive education settings.

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Sustained Success: Evaluating the Enduring Effects of Leadership Training on Professional Growth

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Abstract: The focus of this longitudinal study is on the long-term effectiveness of leadership training modules on the professional growth of graduates, with a particular emphasis on the strategic management and leadership training modules in postgraduate management education programmes. The study aims to track a cohort of graduates over five years post-module completion, assessing their leadership skills, career progression, and their impact on organisational performance. The first phase of the study focused on the initial assessment of the ongoing influence of leadership training over time, highlighting the key areas of career progression. Data was collected at multiple time points—immediately post-completion, and at the 1, 2, and 5-year mark. This approach enables a comprehensive analysis of the trajectory of leadership development over time. The study employs quantitative methods, administering the same questionnaire annually to the same cohort of graduates. The consistent data collection allows for a robust comparative analysis across different years, providing insights into how the leadership training modules contribute to individual career progression and organisational outcomes over time. Initial findings revealed that six months after completing the module, 90% of respondents integrated the leadership concepts into their daily activities, with a 75% implementation rate. Additionally, 80% observed noticeable changes in job responsibilities, and 85% reported increased job satisfaction. One-year post-completion, 55% of the initial respondents participated in the study, with 29% engaging in further leadership development programs. All respondents perceived a significant improvement in job performance, and 41% received promotions or career advancement opportunities. Two years after completion, 29% of the original respondents remained employed at the organisation. Among them, 76% attributed their career advancements to the leadership module, and 80% felt confident in leading and managing teams. Additionally, 84% were satisfied with their overall career progression. Five years post-completion, only 13% of respondents remained employed, with 90% rating the module's long-term impact on their leadership abilities and career trajectory as significant. All these respondents had assumed leadership roles and rated their organisation's overall success positively. This research significantly contributes to understanding the sustained impact of leadership education and offers valuable implications for curriculum developers, educators, and organisational leaders, highlighting the importance of continuous investment in leadership development for long-term career and organisational success.

Keywords: Leadership training, Leadership development programmes, Career progression, Management education, Sustained success

1. Introduction

Success in Higher Education (HE) holds different meanings for various stakeholders. Students see success as completing all assessments within their programme, passing each one, and graduating. For academic teams, success means maintaining a high module success rate and facilitating students to graduate within the minimum time. Together, these factors contribute to institutional success (Alyahan and Düşteğör, 2020). In turn, a successful business consistently generates long-term profits, indicating profitability. However, profitability alone does not define a business's success. Sustainability, built on economic, social, and environmental foundations, ensures a business is equipped for long-term growth and success (Schoenmaker, 2020). Additionally, strategic management is crucial for the success and survival of any business, organisation, or enterprise (Hunger and Wheelen, 2020).

Central to both educational and business success is effective leadership. Leadership plays a pivotal role in steering institutions and organisations toward their goals. It involves setting a vision, inspiring others, and driving strategic initiatives that foster growth and development. To cultivate such leadership, many institutions and businesses invest in leadership training programmes. These programmes aim to enhance the skills and capabilities of current and future leaders, ensuring they are well-prepared to tackle challenges, innovate, and guide their teams to success (Avolio, 2004).

McCauley and Palus (2021) stress the importance of leadership development programmes in helping professionals develop employability skills and competencies is becoming more widely acknowledged. To better understand the long-term impacts of leadership training as it relates to postgraduate qualifications, this study concentrates on how it affects professional growth and, eventually, organisational success. Studying the topic of sustained success in higher education and business, along with the role of leadership and leadership training modules is important for many reasons (Liu, Vankatesh, Murphy, and Riggio, 2020). Firstly, to enhance

educational outcomes. Understanding how module assessments influence student success and institutional achievement, will allow curriculum developers and policymakers to better develop content and improve systems that positively influence student performance and valediction rates. Secondly, improving business performance and/or institutional success. As previously stated, profitability and sustainability can only be achieved by developing strategies to ensure long-term growth, flexibility, adaptability, and resilience in a very competitive market. The role of leadership is a third reason with the impact of leadership development programmes being the fourth reason. Leadership can positively influence education and business. Incorporating the concept and practices of leadership within an educational qualification will equip a student not only to be successful educationally but also in business. Effective leadership training can inspire teams, drive innovation, and navigate challenges. It is therefore important to measure the impact of leadership training modules to determine the effectiveness thereof on organisational success. The instructional design of leadership development modules must be to equip students with the necessary skills and knowledge to be able to apply the skills and knowledge learned in industry thereby facilitating their professional growth. Theory is important, but the practical application thereof is of great importance. Studying the impact the programme has on the student in their world of work, will assist curriculum developers and policymakers in refining the programmes to be more insightful, impactful, and successful. The fifth reason is to foster sustainability. Sustainable practices receive more and more attention daily. Understanding how to foster leadership skills and capabilities to ensure sustainable practices within an organisation and/or educational institution, can positively contribute to the economy, socially and environmentally. The sixth reason is to incorporate leadership as an aspect of strategic management. Leadership should not be practiced in isolation but should be an extension of strategic management. Teaching students how leaders can leverage organisational resources and objectives to ensure long-term objectives are met sustainably, will lead to better decision-making and effective rollout of strategies (Senge, 2006; Porter & Kramer, 2011). Lastly, change management or the adaptation to change. Educational institutions and businesses must learn how to adapt to change and how to adopt new challenges and opportunities to benefit the institution and the business, but also how to manage areas of weakness and possible threats within the industry. Leadership plays a crucial role in change management to ensure the sustainability of a business. This will ensure that a business always remains relevant and competitive in a rapidly changing environment (Coopersmith, 2022). Researchers, educators, and corporate executives can create more successful methods and systems that improve overall performance and success in their respective sectors by looking into these areas.

This study aims to evaluate the success of leadership training programmes as embedded in a postgraduate qualification, in enhancing the student's skills and capabilities in implementing leadership skills in their working environment to establish personal growth, and indirectly, or directly, influence the success of the business. Furthermore, the study emphasized the pivotal role that leadership and leadership development modules play in personal growth and ultimately business success. The study further aims to fill critical knowledge gaps in the existing literature on how leadership development modules impact personal growth and business success.

The current literature examines HE and business success separately. Although business success is multi-faceted, the study specifically focused on how leadership and leadership training modules impact personal growth and business success. The study seeks to bridge the gap between graduating with a postgraduate qualification and how knowledge is implemented in the business with a specific focus on leadership practices.

What is known in the literature about this study is the impact of leadership training. Various studies have evidenced that leadership training can increase leadership skills, job performance, and personal growth. Avolio, Avey, and Quisenberry (2010) concluded that leadership training will impact behaviour and effectiveness in the organisation. Studies by Lacerenza, Reyes, Marlow, Joseph, and Salas (2017) have further shown that there are short-term benefits such as job satisfaction and increased self-efficacy. This often leads to enhanced leadership capabilities and job satisfaction which yield immediate positive outcomes for the individual and organisation. Leadership training is also synonymous with career advancement and professional growth. As highlighted by Day (2001), individuals will embark on leadership training programmes and are more likely to experience professional and career growth, which in turn could lead to higher-level positions within the organisation. Research by McCauley and Van Velsor (2004) evidenced that leadership training is crucial for organisational competitiveness, sustainability, and adaptability.

The indefinite of the study in the current academic body of knowledge is whilst the short-term benefits are clear, it is uncertain what the long-term impact of leadership training is on personal growth and organisational outcomes. Avolio et al. (2010) note that a longitudinal study is needed to understand these long-term impacts and benefits, and how leadership skills evolve. Yukl (2013) questions if leadership skills enhancements can be

sustained over the long term and points out that there is a need for a study to determine and track the changes post-training. Day, Fleenor, Atwater, Sturm, and McKee (2014) also suggested a longitudinal study to determine how leadership training influences career trajectory. They further proposed that it is important to capture the aggregate effect of leadership training on career growth. Further research is required to determine additional external factors that influence the success rate of leadership training programmes. DeRue, Nahrgang, Hollenbeck, and Workman (2012) underline that organisational context, economic conditions and multiple other external factors also determine the success of leadership training programmes. Lastly, studies tend to focus on specific organisations, institutions, and industries. It is important to include more diverse populations within these longitudinal studies (Ely, Ibarra, & Kolb, 2011). They highlight there is a need to examine leadership training in various demographical contexts to generalize conclusions more substantively.

Existing literature provides a solid foundation for understanding the importance and benefits of leadership training programmes, and it is evident there is a gap in long-term impact studies. This study aims to address the gaps by introducing a longitudinal study over a period of 5 years which will measure the impact and effectiveness of leadership training modules. This study will provide invaluable insights to educators, curriculum developers, and organisational leaders.

2. Methodology

The research design of this study was quantitative with the research instrument used being a questionnaire. The questionnaire was designed using Microsoft Forms and comprised six sections with the first section focusing on respondent demographics whereafter each of the remaining sections was dedicated to each year of work. This approach is appropriate as it allows the researcher to use the same questionnaire over the next 5-years to fulfill the requirements of a longitudinal study. Rich, detailed data was gathered from respondents in the first phase of completion. Data collection was further supplemented by analysing documentation which comprised curricula, syllabi, and assessment strategies and tools, to gain insights into the design and delivery of the programme. The respondents for this study were postgraduate students who completed either the Bachelor of Commerce Honours or the Postgraduate Diploma in Management qualifications. Embedded in each of these qualifications is a strategic management and leadership module which very strongly focuses not only on the theoretical aspects of strategic management and leadership but also on the practical application of the theory in the world of work.

A convenience sampling method was used based on the availability of the respondents and their willingness to participate in the study over the next five years. The alumni are diverse in terms of size, demographics, and location, and they are easily accessible via the institution's alumni channels. This method was further chosen as it was readily available to the researcher, cost-effective, and less time-consuming. The questionnaires were distributed via institutional email addresses with a timeline of two weeks for completion. One round of reminders for completion was sent out halfway through this period. Responses were stored in a password-secured cloud database to which only the researcher has access, and this also ensured data security.

The data analysis for this study involved a combination of descriptive and inferential data analysis to determine the interaction between the variables. The independent variables are identified as the completion of the leadership module, and the time since module completion. The dependent variables are the integration of leadership concepts, professional growth, job performance perception, perceived organisational success, and employment status. The data was triangulated with the document analysis to provide a comprehensive understanding of how the theory affected the practical application of knowledge gained during the leadership training programme.

The research followed ethical principles of research. All respondents were informed of the purpose and nature of the study, and how their input would contribute towards expanding the current body of knowledge on how leadership training programmes aid in professional growth and subsequently organisational performance. Informed consent was gained before the respondent could continue with the questionnaire. The respondents' privacy and confidentiality were upheld throughout the study, and no identifiable information was required from the respondents. There was no harm or risk to the respondents in completing the study, and they could withdraw from the study at any point in time.

3. Results

To provide context to the findings, it is important to understand the demographic characteristics of the study respondents. One of the key demographic variables examined was the age range of the respondents. Understanding the age distribution helps to contextualize the results, as leadership development needs and career progression can vary significantly across different age groups. Figure 1 below illustrates the age range distribution of the study respondents at the time of the initial data collection.

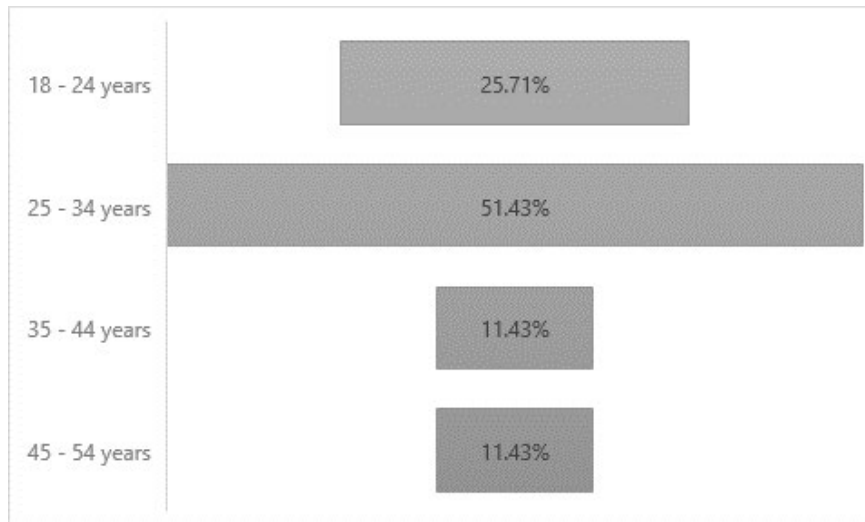


Figure 1: Age Range Distribution of Study Respondents

Fifty-one percent of those surveyed fall within the 25 to 34 age brackets, while 25.71% are aged 18 to 24. 11.43% were between the ages of 35 and 44 years with the remaining 11.43% of the respondents being between the ages of 45 and 54 years. As shown in Figure 1, the study cohort included a wide range of ages, from early-career professionals in their twenties to more experienced individuals in their forties and fifties. This diversity in age range is significant because it reflects a broad spectrum of career stages, which can influence both the perception and impact of the leadership training module. In terms of gender, 52% identified as male and 49% as female. Most respondents, 71%, live in Gauteng, with contributions from KwaZulu-Natal, Eastern Cape, and the Western Cape as well. Additionally, 6% of respondents reside outside of South Africa.

As depicted in Figure 2 below, the respondents in the study possess varying levels of educational attainment, ranging from bachelor's degrees to postgraduate qualifications. This variation in the educational background is significant as it highlights the diverse academic experiences of the cohort, which may influence their perception and integration of leadership training.

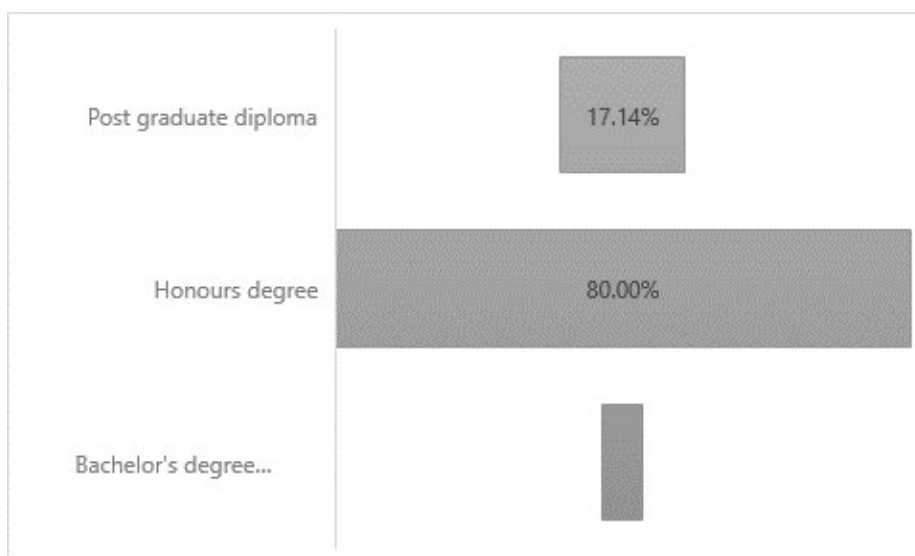


Figure 2: Highest Level of Education

Eighty percent of the respondents completed the Bachelor of Commerce Honours qualification with 17% being Postgraduate Diploma in Management graduates and the remaining 2.86% holding a bachelor's degree. Understanding the educational qualifications of the respondents provides insights into their preparedness and potential benefits from the leadership development modules. For example, those with higher educational qualifications might have more advanced theoretical knowledge, which could affect how they apply leadership concepts in practice. Conversely, respondents with less formal education might bring a different perspective and practical experience to their leadership role.

It is essential to examine the characteristics of the organisation where the respondents are employed. This includes analysing the current field of employment of the respondents as well as the size of the organisation. Participants were asked to specify their current field of employment, which varied widely from aviation, aerosol, and supply chain industries to human resources, education, and beyond. Job roles encompassed controllers, supervisors, administrators, managers, analysts, and assistants. Figure 3 presents the distribution of the organisational size where the respondents are employed. This demographic information contextualizes the findings, as the organisational size can significantly impact leadership development and progression.

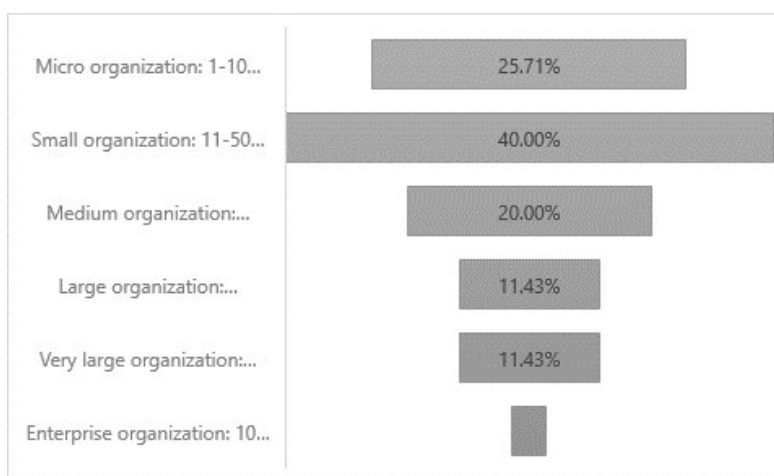


Figure 3: Organisational Size where the Respondent is Employed

Regarding the organisational size, 25.71% of the respondents are employed in micro-organisations with less than 10 employees, 40% in small organisations with 11 to 50 employees, and 20% in medium-sized organisations with 51 to 250 employees. Additionally, 11.43% work in large organisations (251 to 1000 employees), with a further 11.43% working in a very large organisation (1001 to 10,000 employees), and 2.86% in enterprise-level organisations (10,001+ employees). Understanding the organisational size helps to create a framework for the effectiveness of leadership development modules. Respondents from a larger organisation may have more formalized leadership resources, which could influence their perception and implementation of their training. On the other hand, respondents from smaller organisations might experience more direct and immediate impacts from the training due to less involved structures.

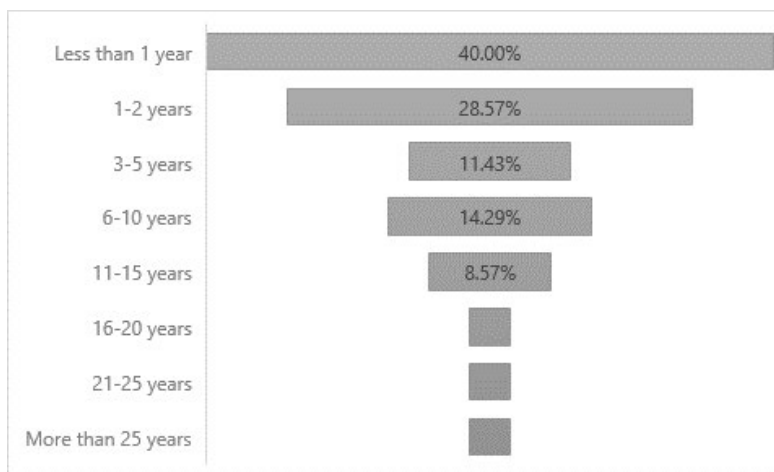


Figure 4: Years of Experience in the Organisation

Understanding the respondents' years of experience within their organisation and the length of time can influence their ability to implement and benefit from the leadership training modules. Figure 4 illustrates the distribution of respondents based on their years of experience in their respective organisations. Experience levels vary, with 40% of respondents having less than one year of industry experience, while 5.71% have been in the industry for 10 or more years. The majority, comprising 54.29% of respondents, have between 2 and 10 years of industry experience. Employees with extensive experience might have established leadership networks with the organisation, which can either facilitate or hinder the adoption of new leadership practices as introduced in the leadership training module. On the contrary, less experienced employees might be more adaptable to new concepts but might lack the organisational knowledge and relationships to fully leverage the training.

Participants were asked to gauge their confidence in applying the concepts learned in the strategic management and leadership module to their current roles. Of the respondents, 52% expressed confidence or high confidence, while 48% felt neutral or lacked confidence. On average, the response rate equated to 3.61 out of five, indicating a confidence level of 72%. After completing the module, 88% of respondents reported a significant increase in their leadership skills, while 71% stated that they adjusted their career goals or objectives; the remaining 29% did not. Within six months of completing the module, 65% of respondents had secured employment.

The subsequent questionnaire sections were categorized to determine the duration of employment following the completion of the modules: 6 months, 1 year, 2 years, and 5 years. After 6 months of employment post-completion, 90% of respondents reported integrating the leadership concepts learned into their daily activities. The response rate for this question was 3.75 out of five, indicating a 75% implementation rate. Additionally, 80% of respondents noticed significant changes in their job responsibilities, and 85% reported increased job satisfaction. After 1 year of employment, 55% of the initial respondents contributed to this section of the study. Of these, 29% participated in additional leadership development programmes. All respondents (100%) perceived a significant improvement in their job performance after completing the strategic management and leadership module. Furthermore, 41% received promotions or opportunities for career advancement.

Two years after completing the module, 29% of the original respondents were still employed at the organisation. Among these, 76% credited their career advancements or achievements to the leadership development module, and 80% felt confident in leading and managing teams. Additionally, 84% were satisfied with their overall career progression.

Five years after completing the module, only 13% of the respondents remained employed. This may be due to not having reached the 5-year mark yet or leaving the organisation. Among those still employed, 90% rated the long-term impact of the module on their leadership abilities and career trajectory as significant. All these respondents had taken on leadership roles and responsibilities since completing the module and rated their organisation's overall success over the past 5 years as positive. One respondent added a notable insight: "Leadership capabilities play a significant role in any organisation."

4. Discussion

These findings suggest that the leadership module has a substantial and positive impact on job performance, career advancement, and leadership confidence, both in the short-term and long-term. The module not only improves individual career trajectories but also contributes to the overall success of the organisation by fostering strong leadership skills. The implications of this study are multifaceted, impacting both individuals and organisations. For individuals, the study suggests that participation in leadership development modules can significantly enhance job performance and lead to career advancement. Individuals who complete such modules may be more likely to receive promotions and take on greater responsibilities. Increased job satisfaction and confidence in leadership abilities highlight the personal benefits of leadership training. This can lead to greater motivation, engagement, and overall job satisfaction among employees. A substantial percentage of respondents pursued additional leadership development opportunities after the initial module. This indicates a potential positive feedback loop, where initial training encourages ongoing personal and professional growth.

Organisations can view the findings as evidence that investing in leadership development programmes yields substantial returns in terms of employee performance, satisfaction, and retention. Such programmes can be integral to talent management and succession planning strategies. The positive correlation between

leadership training and perceived organisational success suggests that fostering leadership capabilities within the workforce can contribute to overall organisational effectiveness and a positive workplace culture. Despite the decline in response rate over time, the study highlights that leadership training can play a role in retaining employees, especially those who feel confident in their roles and see a clear path for career progression within the organisation. Understanding that various stages of employment may require several support initiatives, and development can help organisations tailor their programmes. For instance, initial modules might focus on fundamental leadership skills, while later programmes could address advanced strategic management and specialized leadership challenges.

This study can also guide researchers and policymakers. The study provides a framework for future research on leadership development. Researchers can build on these findings to explore long-term impacts, compare diverse types of leadership programmes, and identify best practices. Policymakers in education and workforce development can use these insights to advocate for the inclusion of leadership training in professional development curricula, emphasizing its role in economic growth and workforce competitiveness.

5. Limitations

There are potential limitations to the study that must be mentioned. The response rate declines significantly over time, with only 13% of the respondents contributing to the data at the 5-year mark. Although this attrition could be an indication of bias, it is important to note that most of the respondents are between the ages of 18 and 34, of which 67% of the respondents indicated that they were employed less than 1 year in their organisation at the time of the survey. Thirty-two percent of the respondents confirmed at the marker of 6 months, that they were not employed 6 months after completion of the module. A further limitation is that the study relies on self-reported data, meaning that the data could be subject to biases such as social desirability, recall bias, and subjective interpretation of job performance and satisfaction. The absence of a control group of individuals who did not participate in the leadership development module makes it difficult to attribute improvements solely to the leadership development module. External factors such as economic conditions, organisational changes, and personal circumstances could also influence job performance, satisfaction, and career advancement. The respondents who have experienced positive outcomes are also most likely to participate in follow-up surveys, potentially leading to an overrepresentation of positive impacts and an underrepresentation of neutral or negative outcomes. The study will be measured over the long term based on respondents' perceptions. While perceptions are valuable, they might not fully capture actual performance or organisational success. The study mentions that only 13% of the respondents were still employed after five years of completing the module. It is unclear whether this low percentage is due to respondents not having reached the 5-year mark yet or having left the organisation. This limits the researcher to conclude long-term employment retention. Addressing these limitations in future research could provide a more robust understanding of the impact of the leadership module on career and organisational outcomes.

Future research can address the limitations identified, such as including control groups, using larger and more representative samples, and incorporating objective performance metrics. This can lead to more robust and generalizable conclusions.

6. Conclusion

The study reveals important findings about the impact of the strategic management and leadership module on participants' careers. In the short term, six months after completing the module, 90% of respondents integrated the leadership concepts into their daily activities, with a 75% implementation rate. Eighty percent observed noticeable changes in job responsibilities, and 85% reported increased job satisfaction. Medium-Term Professional Development and Advancement: One-year post-completion, 55% of the initial respondents contributed to this section of the study. Twenty-nine percent participated in further leadership development programmes. All respondents (100%) perceived significant improvement in their job performance. Forty-one percent received promotions or career advancement opportunities. Long-Term Employment and Leadership Confidence: Two years after module completion, 29% of the original respondents remained employed at the organisation. Among them, 76% attributed their career advancements to the module, and 80% felt confident in leading and managing teams. Eighty-four percent were satisfied with their overall career progression. Long-Term Impact and Organisational Success: Five years post-completion, only 13% of respondents were still employed, possibly due to not reaching the 5-year mark or leaving the organisation. Of those still employed, 90% rated the module's long-term impact on their leadership abilities and career trajectory as significant. All

respondents had assumed leadership roles and responsibilities and rated their organisation's overall success positively. A respondent highlighted the critical role of leadership capabilities in organisational success.

Potential future research contributions could include analysing the generational composition within the organisation. In this study, most respondents have been employed at the organisation for less than five years, with most of the respondents belonging to Gen Z or Millennial cohorts (Dimock, 2019). An estimated 26% of the respondents are Gen Z with 65% of the respondents being Millennials. According to Arun (2024), there are distinct differences between Gen Z and Millennials: Millennials, the first generation extensively exposed to technology, are considered more tech-savvy, highly educated, and collaborative. They prioritize work-life balance, continuous learning, and career advancement. Gen Z, having been exposed to technology from an early age, seeks efficient and smart ways to complete tasks using online techniques and takes a pragmatic approach to work-life balance. Both generations seek job satisfaction that aligns with their values and strive for continuous learning to advance their careers. They are unlikely to stay in 'dead-end' jobs and do not respond well to a 'command-and-control' leadership style, preferring not to be micromanaged. Workplace mentorship and feedback are crucial for them to foster innovative, growth-oriented career paths.

The study underscores the critical role of leadership development in enhancing individual career outcomes and contributing to organisational success. Phase 1 of data collection yielded evidence that substantiates the importance of leadership training programmes to develop and equip alumni with leadership skills and practices in industry. The data further demonstrates that there is a compelling case for sustained success in equipping a student with the necessary leadership skills through the strategic management and leadership programme offered in management education programmes. It provides a compelling case for continuous investment in leadership training and highlights the need for ongoing research over the next 5 years to enable educators and curriculum developers to optimize these programmes to further enable alumni to leverage the benefits of leadership training and development. By understanding and leveraging these findings, individuals, organisations, and policymakers can work together to foster environments that support leadership growth and organisational excellence.

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Exploring Metacognitive Awareness and Metaliteracy Skills Towards Becoming a Self-Determined Postgraduate Student: A Case Study

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Abstract: Research and scholarly output are essential in the advancement of knowledge and society as a whole. In South Africa, the Council for Higher Education (CHE) requires that learning and teaching at higher education institutions (HEIs) must be informed by research done by universities. With high dropout rates these aspirations are not attainable. The question that this study addresses is: firstly, what motivates emerging researchers and postgraduate students to enrol for research and postgraduate programmes at a South African higher education institution, and secondly, what motivates them to complete their studies. Following a qualitative approach, this case study explores self-determination awareness among a group of master's students in a supervisory context. It interrogates requisite metaliteracy competencies and the core metacognitive attributes underpinning human motivation. The aim is to ascertain how students doing research could be supported and developed to become self-directed and motivated to conduct and complete quality research. The value of the study lies in adding new knowledge to an under-explored area and to propose steps to close the current gap.

Keywords: Postgraduate supervision, Metacognition, Metaliteracy, Supervision pedagogy, Online supervision

1. Introduction and Background

Higher education institutions (HEIs) in South Africa have been focusing on transforming all sectors of education since 1996, and to redress past injustices and inequalities. The general need to enhance research output numbers and quality remains an area for further research (Engelbrecht & Van Wyk, 2022; CHE, 2023). Research and scholarly output play a crucial role in the advancement of knowledge and society as a whole. Ideally, the development of a strong research culture will foster an environment conducive for academic success, where intellectual curiosity, critical thinking, and the pursuit of new knowledge can flourish. Here, the research culture of a HEI is a pivotal component in the academic maturation of its students, researchers and faculty members. However, literature continuously alludes to the challenges and complexities that particularly early researchers and postgraduate students face to develop research skills, and complete research degrees in good time. Research and knowledge generation are critical focus areas in HEIs to add new knowledge, build institutional reputation and also to contribute to national development (Sebola, 2021).

Although it was hoped that transformation of South African HEIs would have been more impactful, the Report (DHET, 2023) shares a marginal improvement of 10, 45% research output of public universities over the last decade. Authors (McKenna, 2010; Van Wyk, 2021; Sebola, 2022,) allude that epistemological injustice to higher education has not been achieved to its fullest. There are still aspects in the South African higher education ecosystem where historically negative power relationships are evident. In addition, Sebola (2021) points out that previously disadvantaged HEIs are comparatively not yet on par in research production. Some of the older research HEIs in South Africa have a long history of research output, positive student outcomes, faculty development, and the overall good standing of the institution within the national and international academic communities. Vargras, Mac-Lean and Hugu (2019) contribute these achievements to institutional maturation.

As there is still much more to be achieved in the equitable development of young researchers, a starting point must be to relook what is required to attain postgraduate success. Emerging researchers must be supported by all means necessary. Should postgraduate students face disparities in background knowledge, cognitive fluencies and requisite motivators, research cultures cannot be cultivated sufficiently. The question is how could postgraduate students be supported more effectively in becoming more self-determined? The rationale of this study is to study a selected group of postgraduate students in order to understand what motivates them and to promote and support their efforts.

2. Overview of Recent Literature

Globally, studies (including Zhou, 2023; Valencia Quecano, Rincón, & Moreno, 2024) report that the dropout rate of postgraduate student remains a concern. It has a detrimental effect on the institution, the countries socioeconomic conditions and most importantly, on the students' academic success and wellbeing. Reportedly (Amani, Myeya & Mhewa, 2022) 45% of doctoral students in South Africa fail to complete their studies, while

29% drop out within the first 2 years. Factors attributed as cause of these dropouts are reported include motivation, negative outcome expectations, low self-efficacy, lack of academic interest, problems in supervisor relationships and a lack of mentorship and support. Several South African studies (including Ungadi, 2021) raise concerns on the readiness of students to transition from honours level studies to adapt to the increased complexities of doing research on master's level. Additional concerns mentioned in recent studies include factors such as lack of postgraduate support, lack of a range of literacies, knowledge and understanding of research ethics are all mentioned as impacting the success rate (see Dawood & Van Wyk, 2021; Ungadi, 2021; Van Wyk, 2024). Ungadi (2021) postulates that supervision styles play a role in preparing and supporting postgraduate research students. He explains that an inability to write with the required academic tone and rigor, as well as searching, selecting and interpreting the literature are among challenges that postgraduate students are facing. Coupled with these barriers are inadequate knowledge and understanding of the research process itself, particularly when decisions must be made on relevant research methods, explaining the rationale of their studies, and designing their research. Research supervisors generally expect students to already have these skills, and finds this frustrating as students are unable to work independently and require much mentoring and reskilling. Very few studies looked at the psychological factors that motivates students in a South African context. Moreover, there is a notable paucity in South African studies on metacognition and metaliteracy as contributors to postgraduate success.

2.1 Supervisor Pedagogy and Online Supervision

The role of supervisors is instrumental to the success of postgraduate students (Amani, Myeya & Mhewa, 2022). Ungadi (2021) explains that the professional relationship between a student and the supervisor should ideally allow for sufficient time, coupled with supervisory expertise, to foster the right attitude and skills to complete studies that ideally should result in quality research output. Motivation, attitude as well as student disposition are mentioned as factors that may influence student success in producing quality research output (Amani, Myeya & Mhewa, 2022). Supervision as pedagogy plays a central role in research supervision, but supervisors seldom get formal training on what this entails. Supervisors often lament the lack of time to mentor students and to nurture acceptable social, research and intellectual skills.

2.2 Metacognition, Motivation and Self-Determination

As a basic concept in cognitive psychology, metacognition points to the responsiveness of an individual's thinking process. While a number of studies (Chugh et al., 2021; Dawood & Van Wyk, 2021; Braad et al., 2022) refer to personal readiness and related factors, not many studies explore what motivates students to remain dedicated to completing their studies. A student's success depends on their ability to self-regulate studies and learning, which in turn depends on requisite cognition. Student's cognitive processes must translate into reflection and knowledge in order to derive at the product or outcome that they signed up for. This process is metacognition and is the cornerstone of motivation (Flavell, 1979). Metacognitive strategies can ignite one's thinking and can direct to much deeper learning and improved performance, especially among learners who are struggling. Understanding and managing cognitive processes can be one of the most crucial skills that teachers can conduct students to increase their achievement

Braad et al (2022) researched how digital tools could offer support to enhance metacognition of students. They looked at embedding metacognitive support within the digital learning environment. They refer the three types of support being direct instruction, metacognitive scaffolding, and metacognitive prompting. These should assist the student to become autonomous and self-regulate studies. In a recent South African study, Pelser and Swanepoel (2022) underscore the importance of information literacy knowledge to develop metaliteracy fluency in an online teaching and learning environment.

2.2.1 Self-regulation as a subset of self-determination

Self-determined learning and its subset of self-regulation is a deliberate and planned process. It is whereby students, and in this case emerging researchers set goals for their progress and then attempt to monitor, regulate, and control their cognition, motivation, and behaviour, guided and constrained by their goals and the contextual features in the environment. The theory of self-determination is founded in the prior research done by Bandura on social cognitive theory (Bandura, 1986). Here, interactions between personal factors (such as cognitions, feelings, competencies, and skills), behavioural factors (e.g., strategy use, help-seeking actions), and environmental factors (e.g., organisational culture, work environments). Bandura (1986) calls this behaviour a triadic reciprocal causality, as these factors determine the success of the student. (Usher & Schunk, 2018). Self-regulation in the context of this study refers to the wisdom and capacity to make the best choices. Usher and

Schrunk (2018) stress that it is particularly important to regulate behaviour when there is a strong desire to do the opposite and mentions procrastination as an example. Ungadi (2021) laments that the South African schooling system does not prepare students for tertiary studies, and after completing undergraduate qualifications, this problem is still evident and causing concerns when students embark on postgraduate research.

2.3 Metaliteracy and Metacognition

Mackey and Jacobson (2011) explain the concept of metaliteracy as a pedagogical model. In later studies, Fulkerson, Ariew and Jacobson (2017) the importance of connecting information literacy teachings to pedagogical praxis has been reaffirmed. Metaliteracy develops students to become reflective and critical thinkers, and are competent and able to do research both in individually studies and in collaboration with others. Jacobson and Mackey (2016) state that metaliteracy forms the foundation of a range of literacies including visual literacy, digital literacy, and media literacy, among others. The model focuses on how students can be empowered by being reflective and informed, within a connected world using technology. Metaliteracy framework reframed traditional information literacy frameworks (ACRL, 2015) and expands to include four domains of metaliterate learning, metaliterate learner roles, and metaliterate learner characteristics.

“Metaliteracy challenges traditional skills-based approaches to information literacy by recognizing related literacy types and incorporating emerging technologies. Standard definitions of information literacy are insufficient for the revolutionary social technologies currently prevalent online” (Mackey and Jacobson; 2011, p.62)

Typically, a metaliterate student will be able to form networks coupled with a level of literacy fluency to succeed in a connected world. As such, metaliteracy combines the cognitive, behavioural, procedural, and motivational, and other practices towards more context-specific and context-appropriate applications. Metaliteracy focuses on metacognition, which basically translates to thinking about thinking (Jacobson & Mackey, 2014). Where students develop the ability to reflect on their own strengths and weaknesses, and actively and collaboratively build these skills, their chances for success multiply. More importantly, students who develop metacognition and metaliteracy skills are better equipped act autonomously and to take responsibility for their own success and become self-reliant and will be able to take responsibility for their own academic growth. They have a sense of mastery and a growth mindset. Ideally, these competencies are developed where students are sufficiently challenged but also supported in a structured academic. In this environment students experience a sense of belonging, and they feel valued.

2.4 Framing a Lens to Guide This Study

This study is informed by a number of theories and frameworks. Firstly, the self-determination theory (SDT) is a broad theory of human personality and motivation concerned with how the individual interacts with, and depends on the organisational environment. SDT explains intrinsic and several types of extrinsic motivation and outlines how these motivations influence situational responses in different domains. SDT moves from the premises of the basic psychological needs of autonomy, competence, and relatedness (also known in literature as connectedness), and their necessary role in self-determined motivation, well-being, and growth. Finally, SDT describes the critical impact of the organisational, social and cultural context in either improving or hampering people's basic psychological needs, perceived sense of self-direction, performance, and well-being. SDT is a social psychology meta theory. The Self-Determination Theory argues that students and researchers need to experience a sense of autonomy, competence as well as relatedness to foster and sustain the requisite motivation to succeed (Ryan & Deci, 2000).

3. Research Methodology

Vaismoradi *et al* (2016) state that qualitative research, as a group of approaches for the collection and analysis of data, aims to provide an in-depth, socio-contextual and detailed description and interpretation of the research topic. It is an established research design that is used extensively in a wide variety of disciplines, particularly in the social sciences. The research design of this study is rooted in an interpretivist paradigm. The research design is naturalistic (Salkind, 2010), in this case, the current postgraduate master's students at a South African University. Interpretivist designs emphasise the analysis of qualitative data. In this study, qualitative data were collected from the participants by means of interviews and observations. This design was chosen as it allowed for consideration of the actual experience and input of the target group. Qualitative research is a form of social inquiry that targets the way that people make sense of their experiences in the world (Salkind; 2008). This research follows a cumulative case study design. A case study is a research approach that is used to generate an

in-depth, multi-faceted understanding of a complex issue in its real-life context. Case study, as a bounded system, explores a phenomenon in context by consulting using multiple data sources. In this case, an intrinsic case study design is used. Lucas (2018) describes an intrinsic case study as the action to understand the case. Here, eleven postgraduate master's students formed part of the case study. The case study sets out to identify and evaluate what motivates the students. It furthermore looks at existing skills, knowledge and practices among a group of postgraduate students. Researcher reflexivity refers to the researcher's ability to make and communicate nuanced and ethical decisions amid the complex work of generating real-world data that reflect the messiness of participants' experiences and social practices (Olmos-Vega et al, 2022). For this study a participatory approach was followed, where both the researcher and the participants were identified as reflexive participants. This required the researcher to constant evaluate and interpret collected data. The potential influence of power dynamics was managed by entering into memorandums of understanding to serve as reflexive strategy.

Qualitative data collected were analysed using reflexive thematic analysis. Data were analysed and coded. This allowed for comparison and the identification of recurring themes. It allows for observation and discussion of a real-life environment in its natural setting. Thematic analysis is a technique for analysing qualitative data that entails searching for and analysing repeating patterns in a collection of data, as well as reporting on them (Braun & Clarke 2022). It is a data representation approach that also involves interpretation in the form of resolving codes and theme creation.

3.1 Data Collection and Discussion of Findings

Students who formed part of the intrinsic case study were all successful in undergraduate and post graduate honours courses. They were enrolled for an online course master's programme, with a research mini dissertation in their second year of studies. Yet, there were two students that dropped out. In South Africa, only a small percentage of the students complete their studies in the minimum two years. Six students extended their studies. It is notable that students who ask for an extension of studies lacks motivation to finish, and generally feel discouraged. From the initial coding the following themes were identified. The themes have a strong theoretical underpinning. The initial motivation for students was to obtain a master's degree. Students reported that it may be considered for employment promotion. A smaller number indicated that they consider continuing towards doctoral studies.

- Cognition, metacognition and research-readiness

Although students gained entry into the research master's programme, they were not from the onset ready to embark on a next level of research. The transition period varied from person to person. In some instances, they took criticism or comments on their initial proposals very personal.

Thinking about their own thinking was a skill that had to be developed, and thinking about their studies, was secondary and it was only when this was discussed that the students considered the metacognition reflection of their actual research process.

- Self-directedness

Competence:

as a sense of mastery and of being able to succeed and have a growth mindset. Competence is established in an environment where optimal challenges exist, positive feedback, and growth opportunities, are supported within well-structured working environment. The belief that actions (e.g. research activities) will be impactful in shaping academic/research success must be present;

Autonomy:

In the early stages of their research, students did not feel in control, as the transition from honours to master's research were overwhelming. The process to get the research proposal approved as well as the cumbersome process to get ethics clearance added to these feelings. Students varied in the way that they mastered autonomy.

Relatedness:

Even though the supervisor and students had regular meetings, students reported that moving out of the online class environment to only sessions with the supervisor, impacted their sense of belonging negatively.

As one participant shared:

"I feel isolated now that we do not have classes any longer. We often discussed assignments – we had that in common – we learnt from each other, and often encouraged each other..."

- Self-regulations

Students are encouraged to take ownership of their studies and to develop their own realistic and attainable milestones. It remains their responsibility to adhere to these milestones. Built into these written milestones are logistical issues such as getting ethics clearance for the research. As part of the memorandum of understanding, students were responsible to set up a range of meetings with the supervisor and had to agree to present tangible progress to the supervisor well before the meetings. This changed the behaviour to a more blended approach, and compelled students to take charge of their progress.

- Metacognition and metaliteracy

Observations of the four domains of metaliteracy namely: metacognition, cognition, affective and behavioural became evident when the student progressed and their different roles in the process transpired. It was interesting to observe how the different roles of the metaliterate research student emerged as the student progressed and became more aware of their own thought processes. They became active participants and producers of new knowledge. Once they stepped up to the role of emerging researcher their self-confidence improved. The master's programme requires that a journal article must be prepared. Students found this last step more challenging. Only one student managed to present at a conference and publish research results.

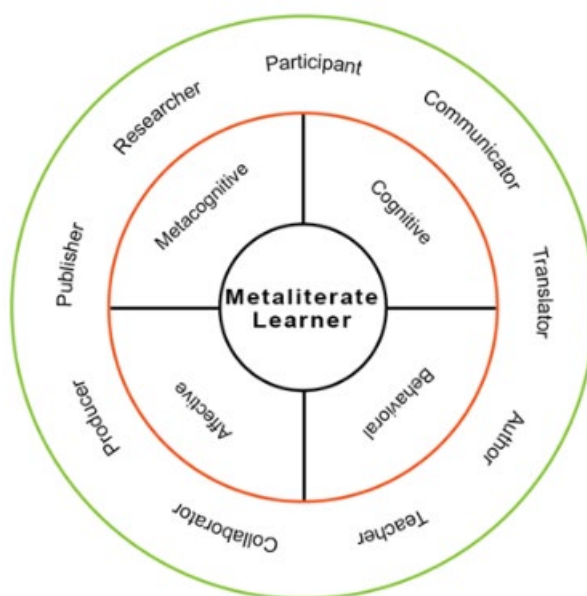


Figure 1: The Metaliteracy Domains (Mackey, T & Jacobson, T.E. 2014).

- Research ethics, research- and eResearch literacy

The rigour and seriousness of the research ethics clearance process often overwhelmed and demotivated some students. The participants did not have requisite research literacy skills in the beginning, and these were developed throughout the research process, either by self-study or by realising that they needed to attend workshops. Even though the coursework master's included research methodology modules, the application of this knowledge on a chosen topic proved to be complex. A fair amount of revision of research design principles had to be repeated by the supervisor.

- Advanced reading, writing and literacy skills

With English as a second language students, most students struggled with academic writing. While some (3 student) tried to use academic acumen and words that they found in readings, most started their first draft with conversational language and tone. Students were encouraged to read critically and were mentored to be more

analytical in synthesizing sources. Some students used digital writing tools, that retracted from the opportunity to deeply engage with their content.

- Sociotechnical and socioeconomic factors

Although support services for emerging researchers are offered at the HEI in this study, being distant online students, was one of the reasons that these services were not utilized in full. Most of the students did not have the technical skills to make use of digital technology and tools to assist their research process. Four students made use of online referencing tools. In addition, students experienced a number of socioeconomic problems such as research funding issues. A shortage of funds was a factor of dropouts. Sociotechnical problems included

- Supervision pedagogy

This study found that students need a more vested commitment from the supervisor, and indications are that students benefit from a pedagogical and motivational approach supervision approach in addition to discipline and research competencies. This is in line with the findings of Amani, Myeya and Mhewa, (2022). Two South African studies, another intrinsic case study by Okeke-Uzodike, (2021) and a systematic literature review by Costa (2019) reported the lack of current praxis of supervisor skills and further corroborated the importance of knowledge of supervisor pedagogy towards postgraduate success and research scholarship output. There is a need to better prepare postgraduate supervisors to understand what motivates students to complete their studies.

4. Conclusion and Recommendations

This study explored the level of metacognitive awareness among 11 individual postgraduate master's students enrolled at a school of IT. The students were supervised and observed over a period of 14 months. Metacognitive awareness had to be cultivated through the mentoring in addition to postgraduate supervision. Students varied in their ability to respond and become self-regulated and self-determined. Although there were still two students that did not complete their studies, most responded positively to being exposed to the principles of metacognition and metaliteracy.

The recommendation is that supervisors should be more aware of the affordances of metacognition and metaliteracy, and build this into their supervision praxis. Supervisors must cultivate metaliterate students to become self-determined. The findings of this study are similar to the study of Filipovic and Jovanovic (2016), who found that postgraduate research must not merely focus completing a dissertation, but that students must reflect on the roles they have academically and in the broader community as part of metacognitive empowerment. It stands to reason that HEIs must support both supervisors and students by looking at supervisor capacity and workload. Metacognitive strategies should be cultivated earlier in studies to improve the readiness of students enrolling for postgraduate research programmes.

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A Participatory Method to Business Model Innovation for Students

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Abstract: The past few years have been a period of intense transformation. Pandemics, innovative technology like chatbots, and the ever-evolving needs of society serve as a powerful illustration of the world's constant evolution. Equipping students with business model innovation (BMI) skills across disciplines is crucial as it fosters their ability to innovate not just products and processes, but entire businesses, which is essential in an everchanging environment. Furthermore, integrating remote participative modelling (PM) into the curriculum is essential as it enhances students' online collaboration skills, vital in today's modern team dynamics. A previous study at a research-intensive university explored the usability of online platforms during BMI within a Business Engineering module focused on entrepreneurship and innovation. MURAL, a virtual whiteboard software application, was used in this study to facilitate remote PM sessions utilising the Business Model Canvas (BMC). While this study found that MURAL is easy-to-use within this specific context, a key limitation emerged. The built-in BMC template within MURAL was found to be insufficient for guiding students through a systematic transformation of a traditional business model into a new iteration. To address this limitation, this current study focuses on enhancing a well-established Business Model Development Tool (BMDT), the BMC, within the context of undergraduate engineering education. We propose a method, called EDU-BMI, specifically designed to support students during PM sessions focused on BMI activities within the MURAL platform. Drawing inspiration from PICO, an educational personal ideation companion, EDU-BMI incorporates features that address educational, social, and motivational aspects. The method is embedded within MURAL and validated through a two-group participant study. Observations of the modelling sessions were used to gather valuable insights into the method's effectiveness and will inform future teaching practices. Integrating EDU-BMI into MURAL has the potential to improve the effectiveness of remote PM sessions for students engaged in BMI activities. Accessibility for modellers will also be ensured by leveraging a free, online tool like MURAL. Future research will focus on evaluating the method in an undergraduate engineering education context, refining EDU-BMI based on the feedback received from participants.

Keywords: Business engineering, Business model development tools, Engineering education, Entrepreneurship, participative modelling

1. Introduction

Our world is continuously changing. According to Shah et al. (2022), among the transformational forces shaping our world are two concurrent trends that continue to change how we look at and approach problems: (1) A surge in user-friendly and widely available technologies that cater to a digitally savvy generation and (2) A growing need for businesses to develop solutions for problems confronting society. This changing landscape confronts educators with significant challenges, but also opportunities to explore innovative teaching methods.

Entrepreneurship can bring change in the society and the economy of a country (Hameed & Irfan, 2019). Supported by the belief that entrepreneurship can serve as a catalyst for economic growth and development, *entrepreneurship education* is becoming increasingly established and prominent (Bell & Bell, 2023) and is considered an important skill for engineering students (Chikasha et al., 2021). The importance of idea generation (Schlimbach et al., 2024) and developing methods to guide and practice the relevant skills, is therefore critical (Hameed & Irfan, 2019).

At a research-intensive university in South Africa, undergraduate engineering students explore entrepreneurship and innovation in a Business Engineering module. In a study by Venter and de Vries (2024), students used the virtual whiteboard software "MURAL" (Mural, 2023) for remote participative modelling (PM) of a Business Model Canvas (BMC). MURAL is freely available and provides other useful templates, making it a versatile tool well-suited for achieving multiple educational objectives. The study by Venter and de Vries (2024) found that the BMC templates within MURAL were insufficient for the systematic transformation of a traditional Business Model (BM) into a new iteration. This is not surprising as, according to Szopinski et al. (2020), the usefulness of a Business Model Development Tool (BMDT) depends on several factors, which include a user's prior knowledge, the number of users, team location, and the user's workload. As an example, beginners need more guidance whereas experts may find this restricting/frustrating. According to Gottschalk et al. (2022), various Business Model Development Methods (BMDMs) have been proposed, but do not cover the existing, constantly changing context.

The need was therefore identified to develop and validate a *method* that can be used to support Business Model Innovation (BMI) during PM on the MURAL platform. In a literature review of methods used to support BMI in digital learning environments, a promising recent development by Schlimbach et al. (2024) was identified. Their novel artefact, referred to as the personal ideation companion (PICO), assists students as they navigate through five common ideation phases (Schlimbach et al., 2024). Limitations of PICO include its web-based construction, not being easily accessible, and inability to embed it within a free PM platform like MURAL, which is an important requirement in our teaching context.

2. Literature Review

This section provides an overview of important concepts and literature.

2.1 Business Model Innovation

Business Models (BM) pose a valuable unit for analysing a current business as well as providing a starting point for innovation (Schlimbach et al., 2024), defined as “the blueprint of an organisation’s logic for value creation, delivery, and capture” (Schwarz & Legner, 2020). The development of BMs is a complex and creative activity that consists of different phases (Gottschalk et al., 2022) with terms such as “innovation”, “adaptation”, and “evolution” mostly being used to identify BM dynamics (Vatankhah et al., 2023), in some cases, with overlapping meaning (Balboni et al., 2019).

Business Model Innovation (BMI) can be defined as the process of designing a new or modifying an existing way of doing business (Schneider & Spieth, 2013) and consists of four generic phases (Frankenberger et al., 2013), i.e. initiation, ideation, integration, and implementation. In the *initiation* phase, the ecosystem is analysed to understand the environment, followed by the *ideation* phase, where new ideas or solutions are generated. Research often focuses on advanced phases of BM innovation, i.e. integration and implementation, leading to a need for investigating the early phases which are relevant to prepare future innovators and entrepreneurs to develop, refine, and validate ideas (Schlimbach et al., 2024).

2.2 Business Model Development Tools

Tasks that are creative and collaborative, such as process modelling and BMI, can benefit from the support of software tools (Szopinski et al., 2020). Bouwman et al. (2020, p. 413) define BM tooling as “the use of methods, frameworks or templates to facilitate communication and collaboration regarding BM analysis, (re-)design, adoption, implementation and exploitation”. A number of software-based business model development tools (BMDTs) have been developed in research and practice and can support users during BMI. An example of a BMDT is the Business Model Canvas (BMC) (Szopinski et al., 2020), which consists of nine basic building blocks that summarise the main areas of a business (Osterwalder et al., 2010). Despite the growing availability of BMDTs, there is limited research on their abilities in educational settings (Schlimbach et al., 2024).

2.3 BMI in Engineering Education

Building on theoretical foundations like Bloom’s taxonomy (Bloom & Krathwohl, 1956) and Flow Theory (Csikszentmihalyi, 1975), Schlimbach et al. (2024) designed a novel artefact, referred to as the PICO, for teaching BMI in digital learning environments. Their web-based educational BMDT aims to provide a user-centred and engaging experience, by considering the interplay of educational, social, and motivational layers (Schlimbach et al., 2024). Within these three layers, five design requirements were identified. In the *educational* layer: (1) A common base of knowledge on business model (ideation) needs to be provided, (2) Learners should be guided through the ideation process and thinking modes, and (3) Learners should be prompted to connect and recombine ideas. In the *social* layer: (4) Learners should be enabled to interact and collaborate with real/digital entities, and in the *motivational* layer, (5) Different types of learners and their drivers for motivation should be considered. Each of these design *requirements* have been translated into design *features* by Schlimbach et al. (2024) to help meet the requirements.

2.4 Design Science Research

According to Hevner and Chatterjee (2010), Design Science Research (DSR) creates an innovative solution to the problem, which often builds on existing parts of a solution and combines, revises, and extends extant design knowledge. The objective of DSR is not necessarily to develop an optimal solution, but a satisfactory solution compared to existing ones that is capable of generalisation to a certain class of problems (Collatto et al., 2018). Peffers et al. (2018, p. 131) indicate that a DSR effort may start in many different ways, including “a

research problem, with a client request, or even with an already designed version of an artefact". The DSR cycle's explicit stages according to Peffers et al. (2007), are to (1) Identify a problem, (2) Suggest a solution, (3) Develop the artefact to satisfy intentions, (4) Demonstrate and (5) Evaluate the artefact against intentions, concerns, and/or criteria, and (6) Communicate the results.

3. Methodology

This section applies the first four stages of the DSR cycle to our study. *Evaluation* of the artefact is suggested as future work.

3.1 Identify a Problem

Our *problem* was that the previous BMDT used, i.e. the BMC, did not provide sufficient support for undergraduate engineering students when using PM to explore new BMs. Even though a recently developed BMDT that is relevant to our context (i.e. the PICO) is available, it is not easily accessible. The method used should be embedded within a free, online, modelling tool like MURAL, improving method accessibility. March and Smith (1995) define four types of prescriptive knowledge: constructs, models, methods, and instantiations, whereas a design theory can include a combination of these to convey knowledge (Gregor & Hevner, 2013). A *method* is a set of steps used to perform a task and are based on a set of underlying constructs (language) and a representation (model) of the solution space (March & Smith, 1995).

3.2 Suggest a Solution

Suggesting a solution, we propose a *method* as our solution. To define *intentions* of the solution, we extracted relevant design requirements and features from the educational BM ideation tool PICO presented by Schlimbach et al. (2024). Our method, referred to as *EDU-BMI*, adopted *twelve* of the *fourteen* design features included by Schlimbach et al. (2024), employing them in a similar manner to PICO. The EDU-BMI does not include a built-in chat interface (feature 4) or image generator (feature 10) as we acknowledge that students can leverage their preferred chat/artificial intelligence (AI) tools for assistance during the ideation process and thinking modes, regardless of the EDU-BMI's integration of these features.

3.3 Develop the Artefact

In this section, we discuss how the five *requirements* proposed by Schlimbach et al. (2024) are addressed as well as how the 14 *features* have been incorporated into the EDU-BMI.

A common base of knowledge on BM ideation (requirement 1) is provided via text and videos, e.g. a video created by Gassmann (2013) is included. Participants are guided through the ideation process and thinking modes (requirement 2) via the outline functionality in MURAL (Tactivos Inc DBA MURAL, 2021). Participants are prompted to connect and recombine ideas (requirement 3). This is done by encouraging participants to add their own ideas, using the similarity and confrontation principles of BMI, and then having them discuss and vote for the best ideas. Participants are also encouraged to combine ideas and motivate their suggestions ("If you have a strong argument for a different category, use an elevator pitch to convince the team!"). Participants are enabled to interact and collaborate with real/digital entities (requirement 4) as they can consult chatbots such as ChatGPT (Jiang et al., 2024) and also interact with their team members during the modelling process. Different types of participants and their drivers for motivation are considered (requirement 5) as participants reflect on what motivates them and are prompted to consider these motivations during the modelling. For the *educational* layer, introductory video tutorials (feature 1) are embedded into MURAL and groups work through examples together, defining BMs and applying the gained knowledge to a predefined company (feature 2). EDU-BMI presents participants with a predefined challenge, i.e. in this study, a fictitious public tertiary education institution facing enrolment decline and budget deficits. This eliminates the need for students to spend time identifying their own problem, as advised by Venter and de Vries (2024), allowing students to focus more on BM ideation. Additionally, by providing a standardised case study, we ensure that all participants work from the same foundation, minimising variability in the starting point and maximising comparability of the perceived usability of the BMDT and MURAL between groups.

The purpose and use of an innovation library (feature 3) is unclear in Schlimbach et al. (2024). We understand that students should be able to explore what other participants have submitted, and that ideas from all users create a common knowledge space. The EDU-BMI therefore leverages MURAL's "private mode" (Butler, 2023) for feature 3. This allows students to work collaboratively while keeping their individual work hidden until the private mode is ended. This fosters independent application of knowledge, followed by a valuable learning

experience of seeing and discussing others' ideas and suggestions. This learning takes place using real-life examples/case studies for Uber and Amazon (feature 6) before it is applied to the predefined company.

For the *social* layer, questions for each business logic's core dimension (what, who, how, why) are used to initiate discussions, and ideas are aligned with a BM's core elements to merge new ideas (feature 9). Depending on the selected BM patterns (Csik et al., 2014), individualised and more detailed examples help inspire creativity (Feature 11) and participants are prompted to interact with each other by evaluating their ideas using icons and templates available in MURAL (feature 12). For the *motivational* layer, different types of students and their drivers for motivation are considered. In an initial icebreaker, participants can add what motivates them as well as their "favourite little thing that brings them joy" (feature 13). Participants can also give each other badges/awards and rate each other's ideas. Lastly, participants can customise their profile pictures in MURAL (feature 14). Where possible, functions within MURAL were used to support the features identified, e.g. by using available templates and the aforementioned "private mode". As another example, advice is provided for each phase along the initiation and ideation process (feature 5) using the outline function in MURAL. Each step has been included to assist the participants, navigate them to the right place on the canvas, and provide a time estimate for each activity. The BM pattern cards (Csik et al., 2014) are included (feature 8) and unconsidered BM patterns are suggested via the outline, encouraging the use of identifiers (IDs) (feature 7). The EDU-BMI therefore consists of seven main sections: (1) An introduction to MURAL and how the outline functionality works, (2) An introduction to the participants (i.e. who the four team members are and what motivates them), (3) Background information on BMs and BMI, (4) Information on the initiation step, including examples (Uber and Amazon) and the fictitious public tertiary education case study (i.e. EduC), (5) Information on ideation, focusing on the business model pattern cards (Csik et al., 2014) and the similarity and confrontation principles (Gassmann et al., 2013) to innovate EduC, (6) Idea prioritisation, where the participants decide which idea is most relevant and how the idea impacts the current BM of EduC, and (7) Translating EduC's new business model onto the business model canvas. The EDU-BMI method is used as a learning tool and transfers the participants' *newly designed BM onto the BMC*, which is not currently included in the PICO. The EDU-BMI method embedded in MURAL is shown in Figure 1. The left side includes the workspace, and the right side includes the outline and steps. Clicking on a step takes you to that section, as shown in Figure 2. These figures are for illustration only, i.e. to demonstrate the core concepts and how they're applied in MURAL.

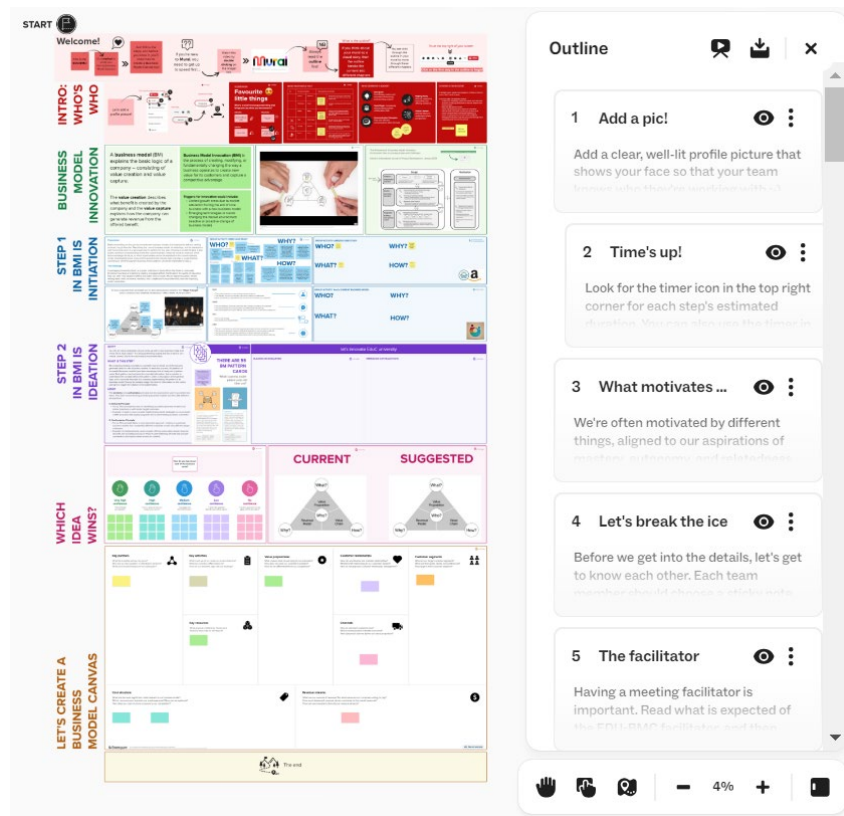


Figure 1: A visual overview of the method embedded in MURAL and the outline available on the right

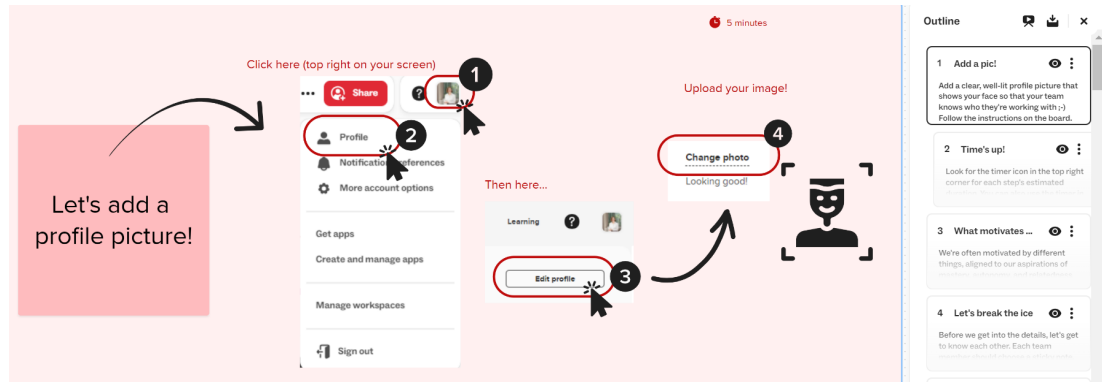


Figure 2: An extract of Step 1 and how one is navigated to a specific section on the canvas

3.4 Demonstrate

According to Peffers et al. (2007, p. 54), *demonstration* “could involve its use in experimentation, simulation, case study, proof, or other appropriate activity”. Seven undergraduate engineering students agreed to participate in our study. The main researcher grouped these participants into two groups. Since one group only had three participants, the main researcher decided to participate in their modelling session as the fourth participant, enabling the researcher to witness issues and shortcomings first-hand. During the first cycle, the first group of participants used EDU-BMI to guide them during the BM ideation process, applying and simulating the steps of the new method, spending about 11 hours in total. The modelling sessions were recorded, using an application embedded within the web-based learning management system ‘Blackboard’ (Bradford et al., 2007), called Blackboard Collaborate.

The main researcher made notes of the issues/concerns identified during the modelling e.g. insufficient guidance on facilitation, confusion as a result of the layout, and some uncertainty in some steps' instructions. Other changes required included various formatting updates (e.g. improved colour coding to group steps and locking some of the items preventing their re-location), clearer instructions for users (e.g. changing the reading order and notifying users when to share their screens), and adjustments to specific steps (e.g. changes to the recommended time allowance per step). The participants also suggested that an additional video, explaining the "4I" concept (Frankenberger et al., 2013), is included, as well as a video summarising how EDU-BMI should be used.

A second cycle of *design* was therefore initiated, and the changes were incorporated into the method embedded on MURAL. The video explaining how to use EDU-BMI was not included yet. Instead, more instructions were added to the welcome section. Other changes included the removal of the Kudos wall as it did not add value and was not used in the first demonstration cycle, an added indication of where to start, and additional information on how the outline works. The updated method was *demonstrated* and this second group of four participants were asked to use the new version of the EDU-BMI, without the main researcher's presence. Their process of following EDU-BMI was also recorded and observing the recordings was useful to identify any issues or confusion that students experienced whilst following the method by themselves. The results of the *second* demonstration cycle is included in section 4 and are based on findings from observing and listening to the recording of the modelling session as well as some comments made by the participants after the modelling.

4. Results

The second group spent ten hours in total to complete the EDU-BMI. An extract from the introduction section is included in Figure 3. One of the steps from the outline is shown on the right of the image (Step 3: Let's break the ice), as well as the answers provided by the participants. Note that the names of participants have been blocked out for confidentiality. In Figure 3, you can also see that the facilitator, who added their answer on the bottom right, was awarded the 'Helping Hand' badge and 'Communication Champion' badge during the process (feature 13).

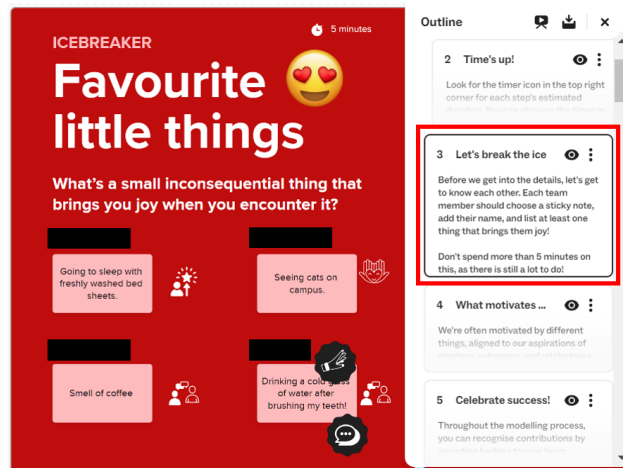


Figure 3: An extract from EDU-BMI to showcase the “Favourite little things” section

Even though changes were made to the initial outline to improve the flow and wording, there were still instances where the participants were not sure what to do. As an example, students struggled when applying the similarity and confrontation principles as there were long instructions included per step in the outline (shown in Figure 4). After completing the modelling session, one participant said “I think the outline guidelines really helped, especially with navigating to different sections on the board. Some of the more wordier instructions however, needed a little more time unpacking and weren’t so intuitive. Had to reason what the exercise expected from us”. Participants were also not always sure whether to conduct the activity for Uber or for EduC (the predefined case). It is therefore important to emphasise the difference between the examples and the case study at hand.

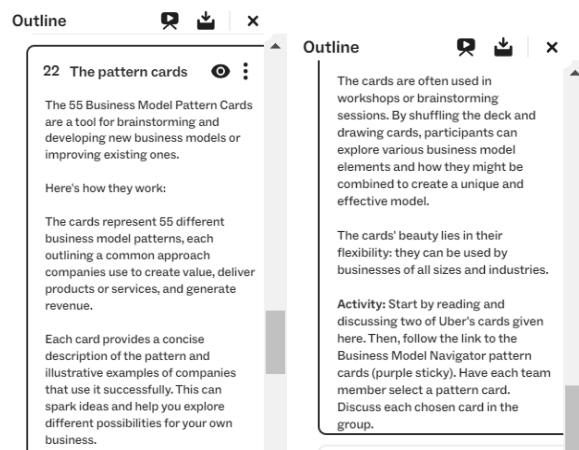


Figure 4: An extract from EDU-BMI to showcase one of the wordier instructions included in the outline

Participants indicated that the time allocated per step, was mostly sufficient to complete the step. One participant, however, mentioned that “It would be helpful to have more time to go through the business model patterns”. When there was indeed time remaining, the participants read through the example again or tried to force additional discussion points. The voting process was also misunderstood by the participants. The outline states that ideas should be voted for by adding icons to the sticky notes (e.g. a thumbs-up icon). When the participants weren’t able to figure out how to add icons, they easily pivoted, using the ‘voting’ functionality in MURAL instead, which served the same purpose. MURAL’s voting functionality is shown in Figure 5, with the small circle at the top of certain sticky notes indicating the number of votes per idea.

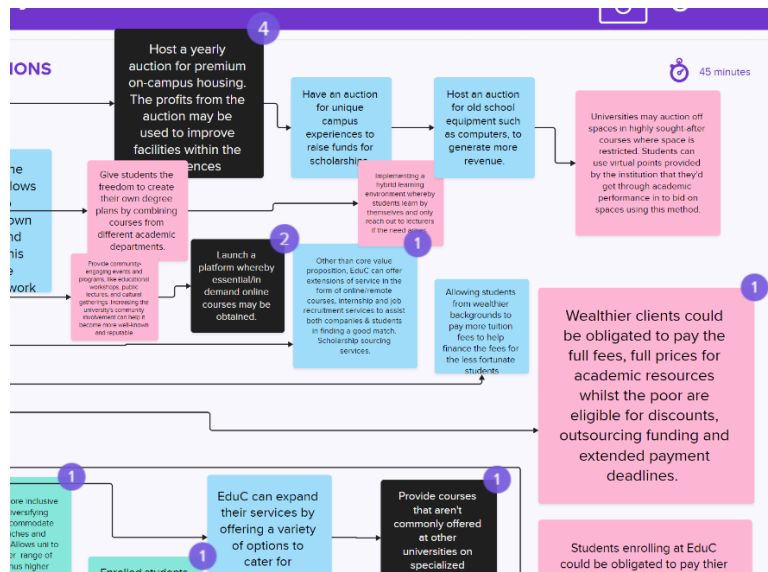


Figure 5: An extract from EDU-BMI to showcase how the voting was used to select the best idea

Participants connected and recombined ideas (i.e. requirement 3) at different points in the process and not just by using the similarity and confrontation principles as initially expected. As an example, by allowing the team members to discuss their learnings in a structured way with the help of the facilitator and prompts in the outline (such as Step 10 and Step 11 shown in Figure 6), they discussed the “4I” video. One participant said “Just to add on how I understood it from a different perspective...” and another responding “Oh that makes so much sense... I didn’t know how to explain it, that’s a great explanation”. The participants also linked concepts from the EDU-BMI back to previous modules in the curriculum, commenting on how the learnings build on each other, i.e. they were able to see how BMI links to the Define, Measure, Analyse, Improve, and Control (DMAIC) process (BNP Media, 2014).

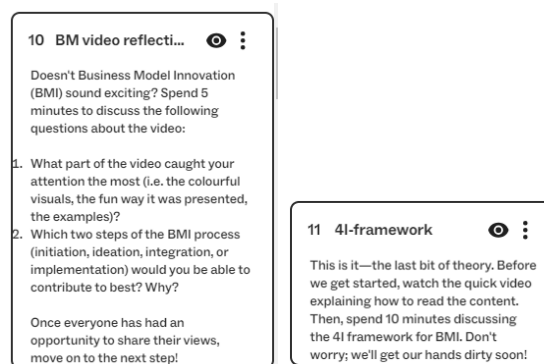


Figure 6: An extract from EDU-BMI to show how participants are prompted to discuss/reflect their learnings

Lastly, the participants in the second demonstration, similar to the participants in the first demonstration, expected the outline to follow a specific process. When the outline jumps too far down the MURAL, they are unsure what to do as they expect the outline to navigate them from left to right and then start from the left again, similar to how one would read. One participant however remembered that the outline should always be read first, and the group were able to continue with the process as expected.

5. Discussion

Even though the participants commented on the EDU-BMI afterwards saying, “It was interesting and fun” and “it was very engaging”, one participant added “it was a lot of work”. The modelling process took longer than expected to complete and it is suggested that more time and effort is spent on *training* the students how to use the concepts beforehand. The EDU-BMI could then be used as a *practical* application of the innovation process instead of a method to teach many/most of the concepts and individual processes. The EDU-BMI could be divided into more manageable sections to guide participants through the process and inform them of logical breaks where they could easily pick up again at a later point in time. Some steps could also benefit from

additional sub-steps to enhance comprehension and clarity. As an example, the first sub-step could include a summary, the next an example, and the last an activity that needs to be conducted.

The EDU-BMI method should be further refined based on the feedback received from the second demonstration cycle, e.g. participants should be informed that the timer only serves as a guideline and the expectation isn't that all of the time must be utilised per step. For future research, the latest version of the EDU-BMI should be evaluated with a larger group of undergraduate engineering students by providing them with a usability survey. The focus of the survey should be on the usability of the method *and* the tool (i.e. MURAL) as we want to develop a method suitable for the relevant educational context. We also suggest that the method is refined after each evaluation instance and should follow an iterative design process.

6. Conclusion

Our work contributes to research as well as educational and entrepreneurial practice by (1) Presenting a BMDT contextualised to engineering education, and (2) Advancing online formats for entrepreneurship education. EDU-BMI addresses the limitations of PICO, as it offers a flexible and accessible method. The method can easily be saved and imported as a template in MURAL and changes can be made without needing technical expertise.

Our study was subject to certain limitations. The researchers were not able to access the artefact used to inform our method directly (i.e. PICO) and only made use of the article in which PICO is described (Schlimbach et al., 2024). The possibility therefore exists that some requirements and/or design features were misinterpreted in our study. Considering that the students knew that the main researcher was involved in the modelling, reviewing their modelling sessions afterwards, their behaviour/suggestions during the modelling could have been impacted. The method was validated with seven participants that were grouped into two teams. A more representative sample is required to evaluate the method before any concrete conclusions about EDU-BMI can be made, including how usable/understandable it is within our context.

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PhD Research Papers

Exploring Social and Intellectual Isolation Among Postgraduate Researchers: Implications for Inclusive Teaching and Learning Initiatives

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Abstract: Inclusive teaching and learning initiatives aim to foster supportive environments that cater to students' diverse academic and social needs. Within the context of postgraduate research, students often confront significant levels of solitude, experiencing both social and intellectual isolation. While existing literature predominantly addresses social isolation, a distinct form of isolation inherent to postgraduate research, termed 'topic-related loneliness', has been largely overlooked. Despite its historical acceptance within academic culture, attrition rates of up to 70% point to the possible detrimental impact of isolation on student retention. Understanding the levels and determinants of isolation amongst postgraduate researchers is important for developing effective interventions. This study investigates whether social and intellectual isolation present prevalent challenges within the research community of a university in Ireland. The main aims are to understand the causes of research postgraduate isolation, explore potential links between isolation and attrition rates, and propose viable interventions, such as online communities of practice for researchers. To address these dimensions, the study adopts an explanatory sequential design, reframing the phenomenon of intellectual isolation within the context of inclusive pedagogy. Data collection includes a survey capturing the lived experiences of current and former research postgraduate students, followed by thematic analysis. Departing from traditional research paradigms, this sequential study integrates qualitative and quantitative methods, offering a nuanced understanding of the experiences and perceptions of postgraduate researchers. The findings aim to address existing deficiencies in research postgraduate education, elucidate the underlying causes of student challenges, and provide insights into proposed support systems and interventions that may be useful to university research communities, the development of higher education research policy, and the improvement of retention rates at research postgraduate level.

Keywords: Communities of practice, Knowledge sharing, Intellectual isolation, Postgraduate research, Inclusive teaching and learning

1. Introduction

Undertaking postgraduate research (PGR) at many universities can be confusing due to poor organisation and ambiguous guidelines (Mewburn, 2022, Gardner, 2009a). Consequently, postgraduate researchers (PGRs) may lack the necessary preparation or resources to handle the diverse demands of their academic programmes effectively (Hunter and Devine, 2016). Metcalfe, Levecque and Wilson (2018) suggest that there is a lack of clarity in the expectations for research students and PGRs do not associate themselves with the general student body. According to Mewburn (2022), many PGRs experience significant challenges navigating their PhD studies due to a lack of clear guidance and support structures. Similarly, Gardner (2009a) highlights the pervasive confusion among new PGRs stemming from poorly defined processes and expectations. Hunter and Devine (2016) suggest that the quality of the learning environment of PGRs can either foster well-being and success or lead to negative emotions and withdrawal. Communication breakdowns, inadequate feedback, and absent supervisors further exacerbate these issues (Buttery, Richter and Leal Filho, 2005). Mewburn (2022) describes her confusion and uncertainty in navigating her PhD, where she often had to seek out information to support her research education independently. This highlights a broader issue of inadequate support networks, and the lack of opportunities for building networks and connections further isolates PGRs (Sawir, et al., 2008, Janson, Howard and Schoenberger-Orgad, 2016). Ali and Kohun (2006) also identify communication issues as underlying causes of student isolation, emphasising the need for effective communication channels.

Completion rates for PGRs are generally accepted to be considerably lower than for undergraduate students. For example, Litalien and Guay (2015) found that attrition rates for doctoral students in North America are estimated at between 40% and 60% and Lovitts (2012) describes it as a silent epidemic in the United States. Bednall (2018) indicates even higher attrition rates at Australian universities and Jones (2013) cites international studies on PhD attrition rates at between 33% and 70%. Williams (2019) found that 26% of PGRs across 107 UK higher education institutions (HEIs) considered quitting. Ireland has no specific PGR attrition statistics, but the HEA is reviewing this. Most PGRs also take longer than the prescribed time to complete their degrees. van De

Schoot, et al. (2013) found that only 10% of PhD candidates in the Netherlands finish within four years, with an average completion time of five years. This suggests that many of the 10,500 PGRs in Ireland will not complete their degrees on time, and some never will. A 2021 HEA and Union of Students of Ireland (USI) survey revealed that 36% of PGRs were unaware of available supports, and 30% doubted they would finish on time (HEA, 2021). PGR numbers in Ireland are projected to grow by 30% by 2030, increasing challenges for HEIs and policymakers (Hunt, 2011).

Undertaking a PGR program is demanding, with significant levels of stress, compromised mental well-being, and burnout reported (Desa, Yusooff and Kadir, 2012, Kato, et al., 2019, McLaughlin and Sillence, 2018, Sawir, et al., 2008). Feelings of loneliness, caused by both social and intellectual isolation, can be significant contributing factors to these stressors (Conrad and Phillips, 1995, Crick, et al., 2021, Janson, Howard and Schoenberger-Ordag, 2016, Lee and Chan, 2007, Lewis, Wolff and Bekker, 2021). According to the Irish Higher Education Authority (HEA), PGRs who lack social connections are more prone to isolation and loneliness HEA (2021), and Sawir, et al. (2008) suggest that a lack of social networks exacerbates isolation. Unlike undergraduates, PGRs often engage in solitary research, and transitioning to an autonomous PGR setting can increase feelings of loneliness and detachment (Gardner, 2009b, Hunter and Devine, 2016). A HEA (2021) survey found that only 47% of PGRs regularly engage in research discussions with peers, and just 45% have someone to discuss day-to-day issues with. PGRs working from home or lacking a dedicated workspace experience heightened isolation and only 60% of PGRs in Ireland have adequate access to necessary on-campus resources, indicating a higher likelihood of isolation.

Postgraduate isolation and loneliness are well documented and often seen as inevitable parts of the research journey due to its autonomous nature (Lin and Huang, 2012, McLaughlin and Sillence, 2018, Sawir, et al., 2008). Ray, et al. (2019) surveyed 427 PGRs and found that up to 41% felt isolation and 50% experienced burnout. Lin and Huang (2012) found that PGRs who feel loneliness are more prone to experiencing burnout during the learning process. Investigations of the PGR experience have primarily concentrated on social isolation with limited exploration of intellectual isolation, although it is perceived as detrimental to PGR progress (Mills, 2002). Intellectual isolation is caused by a lack of intellectual stimulation, discourse, or engagement with knowledge-sharing opportunities (Mills, 2002). This form of isolation, called 'topic-related loneliness' by Sawir, et al. (2018, p.18) occurs when PGRs cannot discuss their study topics because of their novelty and unfamiliarity to others. As PGRs explore narrower fields, finding peers with similar interests becomes challenging, reducing opportunities for discussions and collaborations, which are essential for academic advancement (Pyhältö, Stubb and Lonka, 2009). Other factors that increase intellectual isolation include geographical separation and reduced availability to share ideas due to increased workload pressures (Mills, 2002). Social isolation significantly impacts PGRs' welfare and persistence (Ali and Kohun, 2006, Hawley, 2003, Lewis, Wolff and Bekker, 2021). The literature indicates that the combined effect of social and intellectual isolation harms retention (Valencia Quecano, Guzmán Rincón and Barragán Moreno, 2024), with higher attrition among female candidates (Lovitts, 2002). Isolation decreases academic achievement and damages mental health, reducing motivation and connection (Gardner, 2009b, Ali and Kohun, 2007). Addressing retention requires an understanding of the causes of isolation and developing comprehensive strategies to deal with the issues, including peer support, mentorship, and intellectual engagement opportunities.

Inclusive teaching and learning (T&L) initiatives design accessible and engaging educational environments for all students, regardless of background (Guimarães Junior, et al., 2023). These initiatives aim to eliminate exclusion by integrating students into regular educational systems and communities (Ioannidi and Malafantis, 2022). Strategies include active learning, diverse assessments, and collaborative learning support (Tinto, 2012). Universities should provide extensive support programs for PGRs to address social and intellectual isolation (Lovitts, 2002) by designing them around inclusive T&L strategies. Successful implementations at Columbia University (CTL, 2017) and Vanderbilt University (Greer, 2014) show peer mentoring and support groups reduce isolation and improve outcomes. Comprehensive training for supervisors, clear communication protocols, and structured support systems can also significantly enhance the PGR experience (Cekiso, et al., 2019). While autonomy is essential in research, community and peer engagement are crucial (Janson, Howard and Schoenberger-Ordag, 2016). Pyhältö, Stubb and Lonka (2009) highlight that the quality of PhD training depends on a supportive scholarly community. Organised student groups can reduce loneliness (Sawir, et al., 2008) and Vygotsky (1978) emphasised that learning is enhanced through social interaction and cultural context. Community inclusion fosters peer engagement and knowledge acquisition, boosting retention and satisfaction (Osterman, 2000, van Rooij, Fokkens-Bruinsma and Jansen, 2021), and promoting inclusive T&L initiatives is vital for PGR student success (Tinto, 2012).

University research offices support supervisors and PGRs by developing programs on research procedures but often overlook community-based approaches such as support and peer groups. Toneva, Doncaster and Bravenboer (2012) suggest that group learning is more effective than solo learning and establishing a community of practice (CoP) could be beneficial (Yusuf, et al., 2021, Janson, Howard and Schoenberger-Orgad, 2016, Wisker, Robinson and Shacham, 2007, Scott and Schofield, 2022). According to Rosaline (2020), CoP have the capacity to impact academic performance and enhance learning outcomes. CoP are based on constructivist learning theories and contextual learning (Lave and Wenger, 1991) and provide a platform for knowledge exchange and interpersonal contact (Bolisani, et al., 2020). These communities foster a sense of belonging and offer crucial emotional and intellectual support, helping PGRs who often work in isolation (Janson, Howard and Schoenberger-Orgad, 2016). Virtual CoP (vCoP) extend traditional CoP into the digital realm, using social media technologies for online interactions that surpass geographical limits (Corcoran and Duane, 2018, Murphy, 2016). These virtual communities enable collaboration and active learning at any time and in any place, creating inclusive and supportive learning environments and have the potential to reduce isolation and increase engagement among PGRs (Dawson, Heathcote and Poole, 2010, Guimarães Junior, et al., 2023). Understanding isolation factors is important for developing interventions to improve the PGR experience, and vCoP are seen as a promising solution (Spaulding and Rockinson-Szapkiw, 2012).

2. Research Design

The primary objective of this study is to investigate social and intellectual isolation among PGRs and propose possible solutions. The study aims to explore the link between perceived isolation and thoughts of leaving PGR education programmes and develop strategies to enhance the PGR experience. The research design combines an explanatory sequential approach and thematic analysis. Explanatory sequential research is a design combining quantitative and qualitative methods. It begins by collecting and analysing quantitative data to provide a broad understanding of the research problem and identify key areas that need deeper exploration. Qualitative data is then used to further explore the quantitative findings. This methodology is especially beneficial where initial quantitative findings require additional investigation (Creswell and Creswell, 2017, Plano Clark, 2017, Ivankova, Creswell and Stick, 2006). This study commences by gathering quantitative data through surveys and the analysis aims to discern patterns in the data (Creswell and Clark, 2017). Following a comprehensive analysis of the survey data, qualitative data will be gathered using semi-structured interviews. According to Ivankova, Creswell and Stick (2006), this phase offers a contextual, comprehensive, and profound comprehension of the quantitative findings. The data will be evaluated using thematic analysis to discover themes that provide explanations or further insights into the quantitative findings (Creswell and Clark, 2017). The qualitative analysis results will be combined with the quantitative data and this integration facilitates verifying and enhancing the quantitative findings with qualitative observations (Hanson, et al., 2005).

Thematic analysis is a qualitative research technique employed to detect, analyse, and report on recurring themes present in data. The method is versatile and valuable for interpreting the viewpoints of various research participants, emphasising commonalities and disparities, and may produce unexpected findings. The researcher engages with the data, carefully studying and reviewing it to comprehensively understand its content (Braun and Clarke, 2006), where themes emerge as data is systematically categorised (Jones, 2013). A theme encapsulates a significant aspect of the data concerning the research topic (Boyatzis, 1998). The last stage involves integrating the analytical narrative with data extracts to construct a logical and compelling account of the data and presenting a persuasive argument (Braun and Clarke, 2006). This study integrates the breadth of quantitative analysis with the depth of qualitative insights by applying the explanatory sequential technique and thematic analysis. As a result, the research design will provide a platform for a thorough understanding of the research problem. By integrating numerical data on isolation with detailed qualitative narratives of PGRs' lived experiences, the study explores the extent of isolation, the underlying reasons, and the contextual factors contributing to it. Taking this holistic approach allows for a nuanced perspective on complex issues, a richer interpretation of the data, and more robust conclusions.

A survey instrument was designed to collect data on the prevalence and nature of social and intellectual isolation among PGRs at a university in Ireland. A comprehensive investigation of validated scales on isolation is detailed in Table 1 and the survey includes questions from these standardised measures, some of which have been modified to assess levels of PGR isolation. The survey was distributed electronically to current PGRs and staff who have completed PGR education. An incentive to participate was offered both to increase response rates and to reduce any potential bias that may be introduced by the increased likelihood of those who feel strongly about the core issues to respond. The data was cleaned to reduce errors in reporting, converted into a numeric

format, coded, and analysed. The quantitative phase is complemented by thematic analysis to understand the underlying reasons and implications of the phenomenon of PGR isolation (Pearse, 2019).

Table 1: Validated Scales Mapped to Survey Questions

Citation	Scale	Question from Paper	Survey Questions
Tarazona-Santabalbina, 2016	Duke Social Support Index-10	Duke Social Support Index-10	11. How often are you in contact with peers in TUS - including all campus locations (online or in person)?
Chan, 2017	Lubben Social Network Scale-6	How many relatives/friends do you see or hear from at least once a month?	
	De Jong Gierveld Loneliness Scale	"There are plenty of people I can rely on when I have problems"; "There are many people I can trust completely"; and "There are enough people I feel close to."	12. There are people I know who I can talk to about my research.
	Revised Social Support Questionnaire (SSQ6)	"Who can you count on when you need help?"	
Pynnönen, 2018	Social Provisions Scale	Scale from 1 (strongly disagree) to 4 (strongly agree). Larger final score indicates greater degree of perceived support. Examples of statements include: "There are people I know will help me if I really need it"; "I have close relationships that make me feel good"; and "I feel a strong emotional tie with at least one other person."	
Pynnönen, 2018	Measure for loneliness	Participants were asked "Do you feel lonely?" Answer options were: very rarely or never, sometimes, and often or almost always	17. Do you experience (or have you previously experienced) intellectual isolation/loneliness as a research postgraduate? 20. Do you experience (or have you previously experienced) social isolation/loneliness?
	Social Provisions Scale	24-statement scale, split into six dimensions: attachment, social integration, reliable alliance, guidance, opportunity for nurturance, and reassurance of worth	15. How often are you in contact with peers in TUS including all campus locations (online or in person)?
Coll-Planas, 2017	Subjective Social Participation Index	Do you find it easy to make friends?	14. Do you find it easy to make friends?
Phinney, 2014	Multidimensional Scale of Perceived Social Support	Statements in the family factor group include: "My family really tries to help me"; "I get the emotional help and support I need from my family"; "I can talk about my problems with my family"; and "My family is willing to help me make decisions." Statements in the friend factor group include: "My friends really try to help me"; "I can count on my friends when things go wrong"; "I have friends with whom I can share	18. What do you think the reasons are? (Pick as many as you like) 19. What do you think the reasons you do NOT feel isolation/loneliness are? (Pick as many as you like)
Bartsch, 2013	Care Manager Survey	The survey measured five potential isolators: emotional disturbance, cognitive impairment, social isolation, physical impairment, and economic disadvantage.	
Coll-Planas, 2017	Subjective Social Participation Index	This study used to the four questions asked in the social participation factor: During the week and on weekends do you call other people to go outside? Do you go to any park, association, or home of the pensioner (retirement home) where you relate to other elders? Do you like to participate in leisure activities that are organised in your neighbourhood/town?	21. What do you think the reasons are? (Pick as many as you like) 22. What do you think you do NOT feel social isolation/loneliness? (Pick as many as you like)

Qualitative data will be collected through semi-structured interviews with a subset of survey participants. Purposive sampling will be used to select PGRs with diverse experiences of social and intellectual isolation, a method commonly used in research to choose participants based on specific characteristics relevant to the study's objectives. It involves intentionally selecting individuals or groups with particular traits or experiences to provide in-depth insights (Palinkas, et al., 2015). Interviews will be conducted in person or via video conferencing, allowing for a rich, in-depth exploration of participants' experiences, perspectives, and coping strategies. Qualitative data from interviews will be transcribed and subjected to thematic analysis, which identifies recurring themes and patterns, providing a nuanced understanding of the challenges faced by PGRs.

The study is based in an Irish university and spans a period during which two institutes of technology (AIT and LIT) amalgamated to form a new technological university (TUS). A vCoP for PGRs was established at LIT in 2022 with 45 members. The community was hosted on Microsoft Yammer, but technical issues arising from merging the institutes' domains led to the deletion of the online community. However, the vCoP demonstrated some success, with participants forming personal and professional connections, using Microsoft Teams and face-to-face meetings to create smaller, informal communities for research activities and discussions. The final phase of the research involves the establishment of a pilot vCoP for PGRs in TUS. The implementation strategy for the vCoP involves developing an online platform tailored for PGRs, facilitating regular virtual meetings and discussion forums, providing training for PGRs on effective online engagement, and monitoring and evaluating the impact of the vCoP on reducing isolation and improving academic outcomes. Regular evaluations will be conducted to assess the effectiveness of the proposed interventions. Feedback will be collected through follow-up surveys and focus groups, allowing for continuous improvement of the support systems in place. The goal is to provide valuable insights to research communities, influence research policies, and improve the PGR student experience and retention rates.

3. Findings

Pilot surveys were conducted at the European Conference of Social Media (ECSM) in 2022 and LIT in 2023. During a presentation at ECSM 2022, attendees participated in a survey using Mentimeter, polling software that facilitates participation in real time polling activities using a mobile device. Microsoft Forms was used for the LIT survey and emailed to PGRs, with 32 responses. A more extensive survey was conducted in the new university

in 2024 and received 301 responses from individuals who had completed or were currently engaged in PGR programmes.

The survey results align with the literature which highlights a significant level of both social and intellectual isolation among PGRs, demonstrating that isolation is widespread and impactful, and the consistent reporting across different groups underscores the pervasive nature of the problem. The survey data indicates a consistent pattern where many PGRs experience isolation, with intellectual isolation being more dominant. For instance, the ECSM 2022 survey found that 62% of participants experienced isolation, with intellectual isolation predominant (see Figure 1). The LIT survey showed that 78% of PGRs felt social isolation, and 82% felt intellectual isolation. The TUS survey revealed that 51% of PGRs felt social isolation, and 61% felt intellectual isolation (see Figure 2).

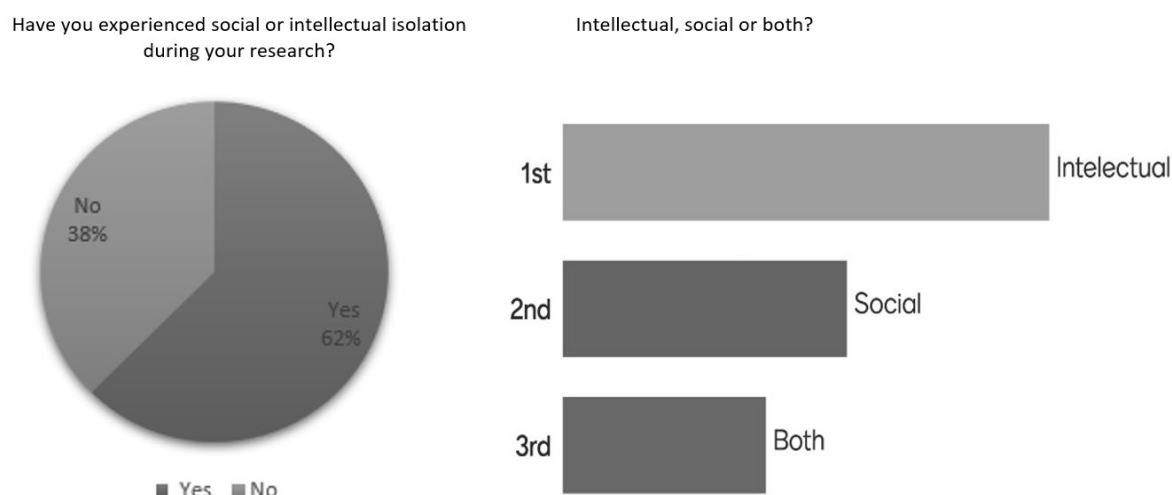


Figure 1: ECSM Survey Results

In the TUS survey, participants who thought about leaving their studies cited several reasons, such as burnout and fatigue, stress, work-life balance, lack of finances, and loneliness and isolation, suggesting that a combination of issues may impact on PGRs intention to complete. Lin and Huang (2012) show that loneliness and academic burnout are connected and negatively affect the student experience. 60% of PGRs had considered leaving their studies, which is comparable to attrition figures in the literature. Among those contemplating leaving, 28% reported intellectual isolation, and 21% reported social isolation. This equates to 49% who felt isolated and thought about leaving their studies. In addition, 20% of those considering leaving also experienced both social and intellectual isolation, suggesting that isolation is a significant contributing factor to PGR attrition (see Figure 2).

PGRs were asked to rate the level of isolation they felt on a Likert scale from 1 (not at all) to 5 (very isolated). The average rating for social isolation was 3.59, and the average for intellectual isolation was 3.63 (see Figure 3). Figure 4 illustrates factors that influence feelings of isolation, reflecting the need for connection, belonging and a sense of community. PGRs who reported no isolation cited good support networks, regular interactions with staff and PGRs, and a strong sense of community. These interactions provide opportunities for feedback, collaboration, and social engagement. In contrast, PGRs who felt isolated mentioned a lack of support networks, limited interactions, and no sense of community as major contributors to their isolation. Without a network of peers and mentors, PGRs may struggle to find the necessary support and encouragement. The survey results indicate that supportive supervision is important in mitigating intellectual isolation and this is comparable with the findings of Bednall (2018). 33% of PGRs indicated that having a supportive supervisor and adequate interaction time significantly reduced their feelings of intellectual isolation. This underscores the importance of supervisory relationships in providing guidance, feedback, and encouragement, positively impacting PGRs' education and experience (Bednall, 2018).

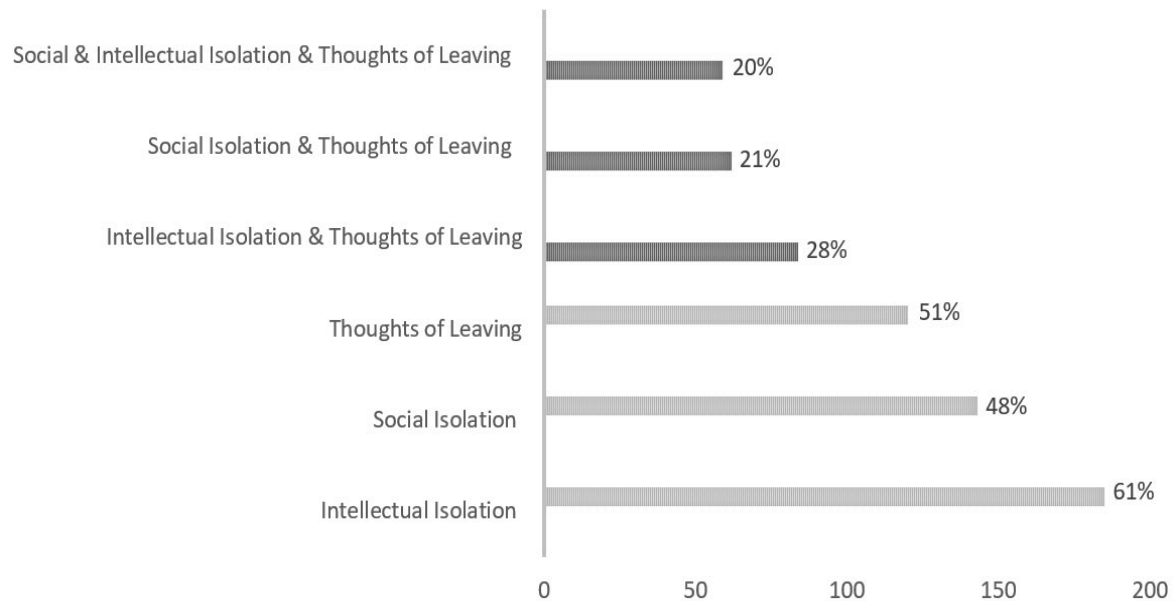


Figure 2: TUS Survey Results – Isolation and Thoughts of Leaving

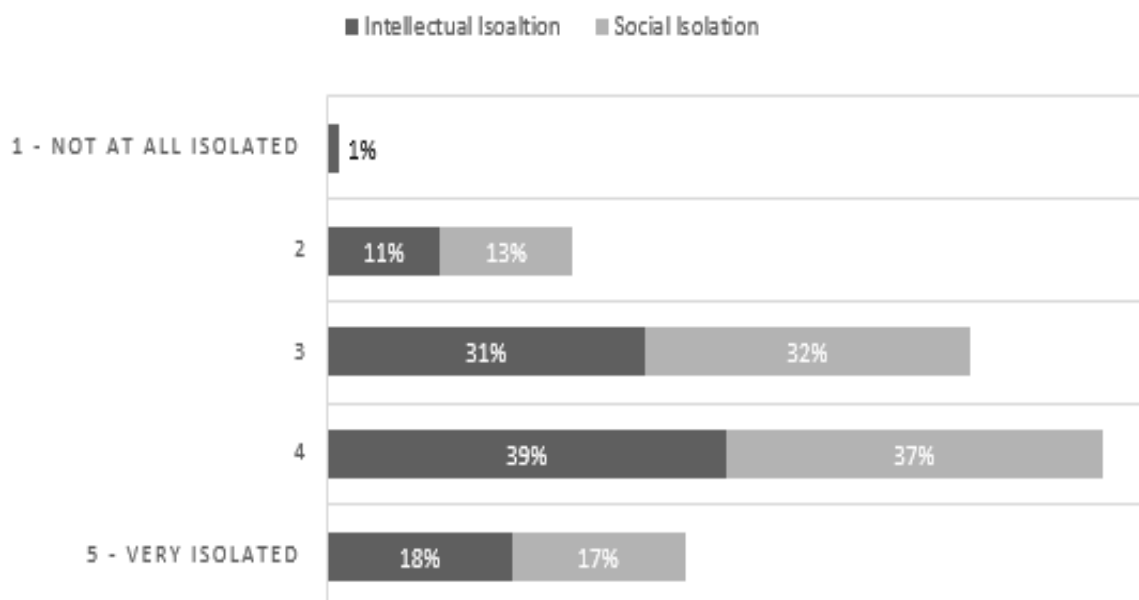


Figure 3: TUS Survey Results – Levels of Isolation

Implicit isolation while conducting research is generally expected and often dismissed as a rite of passage in academic culture. However, over half of those surveyed experienced loneliness because of the independent nature of research, and 81% felt included and connected when they were part of a research group. Several strategies to alleviate isolation were proposed by respondents, including a desire for in-person events (44%), an available PGR community (43%), opportunities to meet other students (40%), more collaborative work (37%), and more specific PGR clubs and societies (35%). These suggestions indicate that collaborative environments and group activities may reduce isolation and improve the PGR experience. Establishing a vCoP for PGRs to provide a space for academic discussions, peer support, knowledge sharing, and professional growth is one way of addressing these needs.

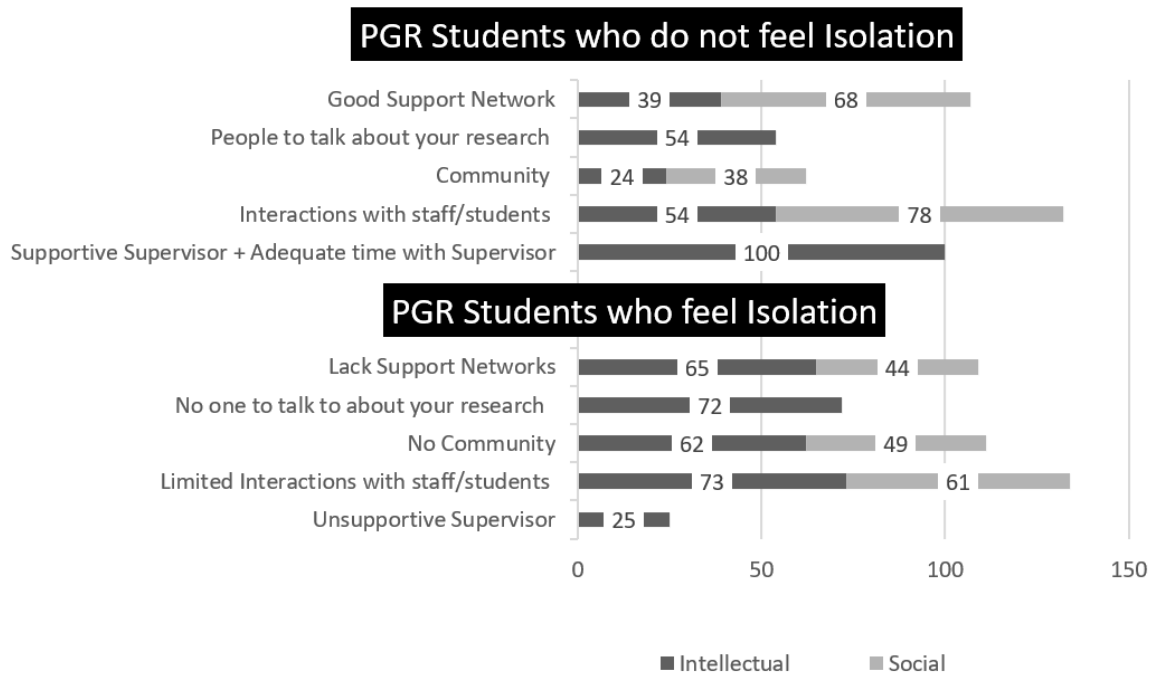


Figure 4: TUS Survey - Factors Influencing Isolation

4. Conclusion

This study examines the pervasive issue of isolation among PGRs, focusing on its social and intellectual aspects, and its impact on academic success and attrition. The findings point to a possible link between burnout, isolation, and high attrition rates, with intellectual isolation, or topic-related loneliness, being a particularly unrecognised, yet detrimental, factor. By addressing the causes of isolation and implementing comprehensive support programs, HEIs can significantly enhance the educational experience of PGRs and the findings may provide guidance for HEIs to formulate effective research policies and support systems. The findings advocate for innovative, inclusive T&L initiatives and community-based approaches, such as online communities, to foster a supportive research culture that can alleviate isolation, and which may positively impact attrition rates. This study contributes to the broader discourse on PGR education by highlighting the important role of inclusive educational programs in addressing isolation. The findings may inform practice, policy, and further studies, helping to create a more inclusive and supportive environment for PGRs. As the postgraduate journey continues to evolve and the number of PGRs increases, HEIs must explore and implement strategies that support student engagement, satisfaction, and retention, thereby improving the chance of academic and personal success. Although the study is conducted within the context of a single technological university in Ireland, the findings may be generalizable to similar institutions in Ireland and other jurisdictions. Future research that replicates the study in diverse educational contexts, such as universities in other countries or institutions with different academic cultures, and at a larger scale, would provide a more comprehensive understanding of PGR experiences.

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Enhancing Engagement in Business Communication Course Content Development Through Stakeholder Mapping and Analysis at South African HEIs: A Review of Literature

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Abstract: The role of stakeholder engagement in higher education institutions has received attention from academics and industry practitioners. This paper thus aims to gain insights into the assumption of stakeholder mapping and analysis by South African higher education institutions in the course content development activities of business communication modules. Although stakeholders are assumed to form an integral part of decision-making in HEIs, questions have been raised about the efficacy of engagement initiatives that are directed towards them, and whether or not the said initiatives are delivered to the relevant constituents. Within the context of course content development, effective stakeholder engagement is the cornerstone of curating educational experiences that enhance the learning experiences of students. A desk research methodology was undertaken to explore data from existing studies that are centred on stakeholder analysis and mapping, in order to examine findings from studies that have investigated utilising this approach to enhance engagement with stakeholders for module development purposes. The researcher analysed articles, e-books, reports and websites, extracted from electronic databases such as Google Scholar, EBSCOhost and ResearchGate. The findings conveyed the value of involving stakeholders in course content development, they also highlighted the importance of stakeholder mapping and analysis in getting Higher Education Institutions to classify their stakeholders accordingly. This promotes an inclusive approach, ensuring that no one is left behind in conversations, relating to business communication course content development, it also ensures that the requirements of all stakeholders are fulfilled. Collaboration with stakeholders leads to the creation of effective business communication modules that meet contemporary workplace demands.

Keywords: Stakeholder engagement, Higher education institutions, Business communication, Collaboration, Course content development

1. Introduction

The term 'stakeholders' emerged and gained popularity in the 1980s as a response to the increasingly dynamic and complex environments organisations were operating in at the time (Langrafe et al., 2020). Stakeholders include all individuals or groups who are known to have an interest in an organisation, they are central to strategic management functions, all organisations are managed with the intention of generating value for communities, employees, customers and suppliers (Freeman et al., 2020). Within the context of higher education, the term 'stakeholders' refers to a number of people and groups who have an influence or vested interest in institutions of higher learning, these include students, parents, staff members, statutory bodies, professional bodies, suppliers, and governance bodies, to name a few (Marshall and Marshall, 2018). Institutions value and recognise these stakeholders as they are crucial to their success (Makwambeni et al., 2023). Furthermore, stakeholders are critical to the operational and strategic objectives of institutions, hence their support is imperative. Higher education, as a sector not only requires knowledge about the relevant stakeholders, there also needs to be clarity regarding what the expectations of these stakeholders are, and which strategies are suitable for delivering on their respective needs (Shah et al., 2021).

An important element of stakeholder management, also pivotal in identifying relevant stakeholders, is called stakeholder mapping. It is defined as the process of creating a visual representation of individuals or groups who have an interest in an organisation. Stakeholder mapping is one of the fundamental tools that are utilized in various disciplines such as human resource management, integrated marketing communication, higher education, strategic management, finance, and healthcare (Hewett et al., (2021); Slabá et al., (2014); Prisacaru et al., (2021); Newcombe (2003); Gianotti et al., (2021) and Nieder et al., (2020). Stakeholder analysis on the other hand, entails recognising the expectations and needs of the identified stakeholders. Reed et al., (2009); Guise et al., (2024) argue that over and above identifying stakeholders, stakeholder analysis categorises stakeholders according to their attributes, interests and level of power, the process of stakeholder analysis is furthermore conducted to understand the relationships constituents have with higher education institutions and to comprehend their significance and influence.

Stakeholder analysis provides extensive clarity regarding the stakeholders of an institution. This form of analysis entails providing information about the needs, roles, and relationships of stakeholders, acquiring this knowledge is crucial for effective decision-making and organisational success (George et al., 2021). According to (Cottafava

et al., 2020; Sayer et al., 2023) effectively analysing stakeholders, requires organisations to adopt a holistic and participatory approach to stakeholder engagement, this generates a comprehensive understanding of the network of relationships among stakeholders that are involved in a project or institution.

Business communication education is offered by institutions of higher learning as a compulsory module for most undergraduate students to teach them about the basic principles of workplace communication and to expose them to writing business documents such as letters and reports, to name a few (Mdletye and Usadolo, 2024). Engaging stakeholders in the development of course content for business communication modules is critical as it guarantees the alignment of course content to the values, goals, and priorities of higher educational institutions (Beerens et al., 2017). This promotes a common vision for education and endorses consistency in curriculum implementation (Hayward et al., 2017). Effectively engaging stakeholders in the development of business communication modules at South African higher education institutions requires a comprehensive approach that includes communication, listening, and collaboration (Tomaselli et al., 2002). Consequently, consulting several stakeholders on this process may generate diverse knowledge, inspiring course teams to assume teaching, learning, and assessment approaches that were introduced in collaboration with stakeholders. Researchers have found this approach to improve the authenticity of modules and the value students attach to their learning experiences (Jagielski, 2016).

2. Literature Review

2.1 Stakeholder Mapping and Analysis in South African Higher Education Institutions

According to Syed et al., (2024) the theoretical roots of stakeholder mapping and analysis in higher education institutions dates back to the mid-1990s, at this time research was centred on sustainable development and the role of Higher Education Institutions (HEIs) in society. Post-apartheid, the emphasis for stakeholder involvement in South African higher education institutions was highlighted in a 2020 report by the Council on Higher Education (2000) cited in (Bitzer, 2006). The report suggests that to protect the welfare of the country and to develop the economic, political, cultural, and social competence of citizens, countries must depend on higher education institutions to administer effective change (CHE, 2000). Scholars such as Khanyile (2018) and Makwambeni et al., (2023) have also stressed the need for HEIs to involve diverse stakeholders in policy as well as operational processes, suggesting that it is important for South African HEIs to understand how their different actors and stakeholders are engaged.

Some researchers have looked into the challenges South African higher education face with effectively engaging stakeholders. Bidandi et al., (2022) posit that a challenge a majority of South African higher education institutions experience a wide array of financial difficulties, they suggest addressing this is to exceptionally cater to the needs of their stakeholders and to collaborate with constituents that best fit their strategic intentions, presently and in future. While a majority of South African higher education institutions depend on the state and students for sustenance, hence these are considered to be their most important stakeholders. Bidandi et al., (2022) argue that rapport with stakeholders should be maintained to enhance the student experience, provide effective management, and improve decision-making in South African HEIs. Thus, stakeholder engagement should not only be centred on survival and sustenance.

At times there is little or no clarity on which stakeholders can aid institutions to survive, it is thus important for institutions to extend their engagement beyond internal stakeholders. In some instances, South African Higher Education institutions have struggled to identify and analyse their stakeholders (Khanyile, 2018). Hence Borwick (2013) created a map to demonstrate a multitude of the internal and external stakeholders of higher education institutions as well as to depict how these relate and interconnect with each other (shown in **Figure 1**). Stankevičienė et al., (2016) incorporated additional stakeholders to this map, to present a more comprehensive overview. According to the authors, the linkages assist HEIs to manage their operations through distribution channels and to involve all their constituents in internal and external practices, including course management and development.



3.3 Stakeholders and Business Communication Course Content Development

Processes that enhance course content development for new programs and f

Within the context of the current study, the findings for B and C are consistent with the findings of D. In contrast,

and achieve the four dimensions of work readiness, namely, personal characteristics, social competence, work competitiveness and organisational acumen.



Figure 2: The four dimensions of work readiness (Ma et al, 2024)

Similar to other institutions of higher learning around the world, internationalisation has pushed South African higher education institutions to integrate diverse knowledge into teaching and research (Singh, 2015). This requirement has generated debates about the sustainability of universities in their domestic countries, forcing them to find innovative ways of maintaining relevance through the courses they produce (Msweli, 2013). According to Park (2022), the emerging stakeholder management paradigm of management studies requires new dimensions and approaches to business communication. The responsibility lies with both HEIs and business scholars to capitalize on the power of the stakeholder paradigm and business communication to overcome today's complex sustainability crisis (Bezuidenhout and Kloppers, 2023). In the era of stakeholder management business communication courses have to be purpose-driven, this is achieved through communication between different members of a community, within the context of this paper that community refers to South African HEIs.

In South Africa, consideration has to be given to barriers such as the digital divide and language capabilities, especially English which is predominantly used in teaching business communication modules. Southwood et al., (2020) stress that university students are not always equipped with knowledge about what communication is, from a language and cultural perspective before joining HEIs. This implies that institutions of higher learning need to be sensitive to such challenges when facilitating stakeholder engagement about business communication modules.

3. Conclusion

The findings of this research show that relationships that are maintained by effectively engaging with stakeholders generate additional value for both South African higher education institutions and their stakeholders. It is also worthwhile to highlight that although the implementation of stakeholder mapping and analysis differs across institutions, providing adequate attention to understanding and appropriately catering to the needs of internal and external stakeholders gives HEIs a competitive advantage, which makes them appealing to their constituents. By collaborating with stakeholders Higher Education Institutions generate constructive business communication modules that meet the demands of contemporary students and employers. The literature moreover demonstrated that exchanging information with all stakeholder groups leads to improved decision-making as well as the production of educational experiences that are relevant and responsive to the evolving needs of industries (Vreuls et al., 2023). The relevance of modules like business communication cannot be maintained without consulting key stakeholders, modules of this nature play a large

role in preparing students for the workplace, they thus need to be attuned to the evolving needs of their stakeholders and dynamic work environments. Business communication modules are encouraged to be purpose-driven and contribute to the sustainability of higher education institutions and within the broader context, societies.

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Work in Progress Papers

Evaluating Anatomy Learning of First-Year University Students: A Pilot Study

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Abstract: Many students find anatomy concepts overwhelming and difficult to grasp, therefore, understanding how anatomy is learned, and the influences thereon is important to ensure academic performance. To evaluate student diversity and anatomy learning, this study presents a pilot study on how first-year students at the University of the Western Cape (South Africa) learn anatomy. A mixed-methods approach was implemented using a Google Form questionnaire. Data was obtained from 20 first-year anatomy undergraduate students in 2022. The findings revealed participants preferred face-to-face practicals (60%) and specimens (55%). Face-to-face practicals, teaching slides and 3D models were identified as effective learning measures, with 3D models showing significant differences across academic degrees. Students perceived greater benefits from face-to-face practicals, 3D models and specimens. Students strongly preferred the visual modality and spaced practice strategy. Differences in aural and writing modalities were observed across degrees, where BSc in Medical Bioscience and BSc in Sports and Exercise Science had higher scores, respectively. Learning barriers included content overload, loadshedding, and less student-lecturer interaction. Overall, face-to-face teaching with teaching slides remains important, with online methods playing a supplementary role. Further research on anatomy learning in different degrees and the impact thereof on academic performance is needed.

Keywords: Anatomy, Pedagogy, Learning modalities, Learning strategies, Learning barriers

1. Introduction

Human anatomy is fundamental in all undergraduate medical and health science degrees, requiring a robust understanding of complex anatomical structures and terminology. Teaching aims to simplify complex content while maintaining its integrity to encourage learning and enable students to solve simple and complex anatomical concepts (Abrahamson and Langston, 2017). However, challenges in the learning of anatomy include limited access to clinical hours, cadavers or 3D models (Moro et al, 2017); content overload, complex terminology, and grasping concepts (Lieu et al, 2018); as well as interactive engagement and emotional well-being (Abrahamson and Langston, 2017). Addressing these challenges and optimising the learning experience in anatomy education is important. Therefore, this study evaluated how first-year students at the University of the Western Cape (UWC) learn anatomy by determining their experience and preference for various pedagogies, learning modalities and strategies, and potential barriers to learning.

2. Literature Review

The need for improving anatomy education has motivated several studies on curriculum reform, learning modalities and strategies, students' perceptions, and innovative resources. For example, Johnston et al (2015) introduced interactive activities aimed at understanding learning modalities and promoting discussion and observed that most of the students found these activities helpful and learned best kinesthetically. Furthermore, an evaluation on how teaching strategies and external factors affect anatomy learning highlighted the effectiveness of practical lectures and the negative influence of strikes on memory retention (Phaswana, 2021). Determination of students' perception of teaching resources and learning outcomes have shown that cadaveric dissections paired with active learning clinical tutorials was helpful in achieving learning outcomes (Abdullah et al, 2021). Regarding the use of immersive technologies, an augmented reality (AR) educational application for the musculoskeletal system has shown that students expressed a willingness to integrate such an application into their studies and most students would recommend it (Boomgaard et al, 2022). To our knowledge, research

concurrently exploring these factors in SA is lacking, hence, to bridge the gap in existing literature this research is expected to provide a comprehensive understanding and improve educational anatomy practices at a tertiary-level.

3. Methodology

This pilot study, was conducted with ethical approval and informed consent, involved 20 first-year volunteer students enrolled for anatomy modules at UWC during 2022 when teaching and learning was predominantly conducted online. The sample size ($n = 20$) was calculated at $\pm 10\%$ of the main study sample size ($n = 243$, projected population size = 660). A mixed-methods approach integrating both closed- and open-ended questions in a Google Form questionnaire was implemented to obtain quantitative and qualitative data, respectively (Zohrabi, 2013). Firstly, a Google Form questionnaire was developed using face and content validation, then shared via Ikamva (learning management system) to recruit participants. The questionnaire collected data on students' demographics, and their experience and preference regarding pedagogies, learning modalities, and learning strategies. Lastly, the quantitative data was analysed with SPSS (version 28.0.0; Armonk, NY: IBM Corp) using descriptive statistics (all results), multiple response sets (most/least preferred pedagogies), chi-square statistics (effectiveness of pedagogies), and Kruskal-Wallis test (learning modalities and learning strategies). Qualitative data underwent thematic coding (adapted from Shead et al, 2019), with the findings reported based on number of responses per theme.

4. Results and Discussions

Participants were predominantly female (75%), 18-years-old (40%), and were English (home language; 55%) and Afrikaans (first additional language; 55%) speaking. Most participants represented the Bachelor of Nursing degree (30%), and 50% received bursaries. These demographic factors are known to affect how students assimilate anatomical concepts, academic performance, or enrolment to university (Mitchell, 2015; Mail & Guardian, 2014).

All students utilised live online lectures and YouTube/online videos to learn anatomy; face-to-face practicals (85%) and specimens (85%) were also widely used (Figure 1). This agrees with Kramer et al (2008) suggesting that many African tertiary institutions offer anatomy education comparable to western countries with similar hours and adequate resources (e.g. cadaveric dissection). Learning barriers related to the pedagogies used (40%) included challenges with online learning formats due to experiencing decreased cognition (4 responses) and lack of hands-on learning (2 responses). Other general influences included lecture content overload, less student-lecturer interaction, and loadshedding (13.2% each).

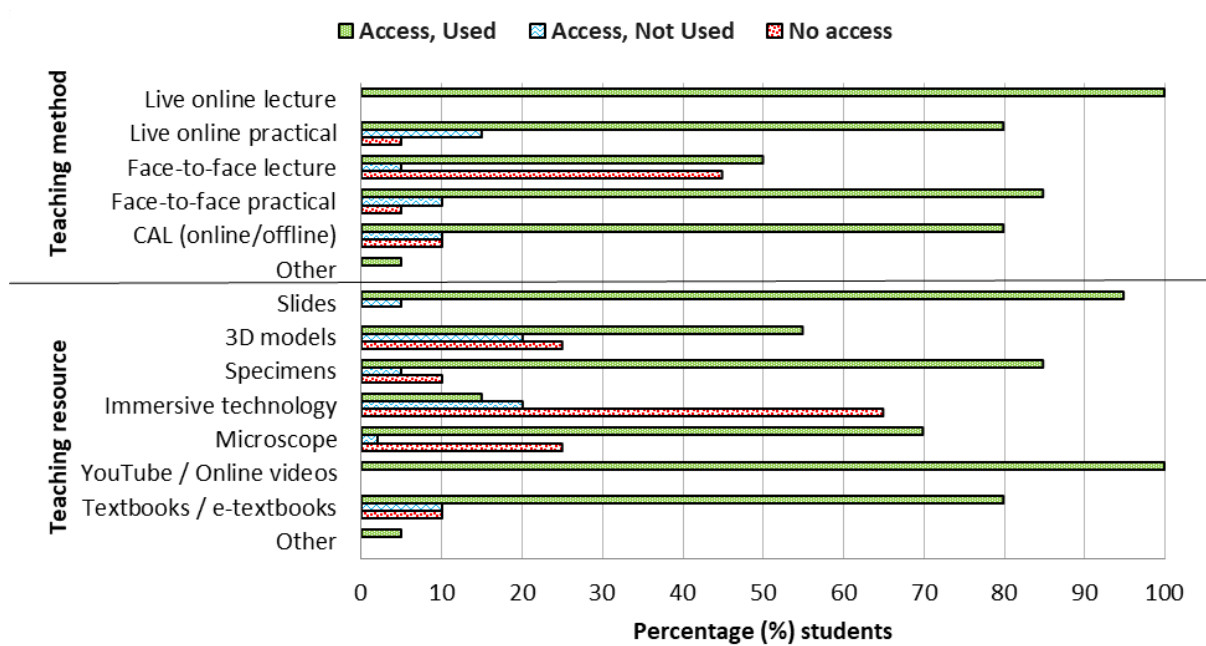


Figure 1: Accessibility/usability of pedagogies

Participants preferred face-to-face practicals (60%) and specimens (55%) (Figure 2). This agrees with Totlis et al, 2012 where students preferred traditional anatomy lectures to online alternatives like online lectures, pre-

recorded anatomy lectures and self-study using lecturer's presentations. Live online lecture teaching methods (70%), textbook and e-textbook teaching resources (20%) were least preferred. Conversely, Yoo et al (2020) showed that students preferred online lectures as it increased autonomous time, accommodated studying/learning preferences, and allowed repeated viewing of recordings.

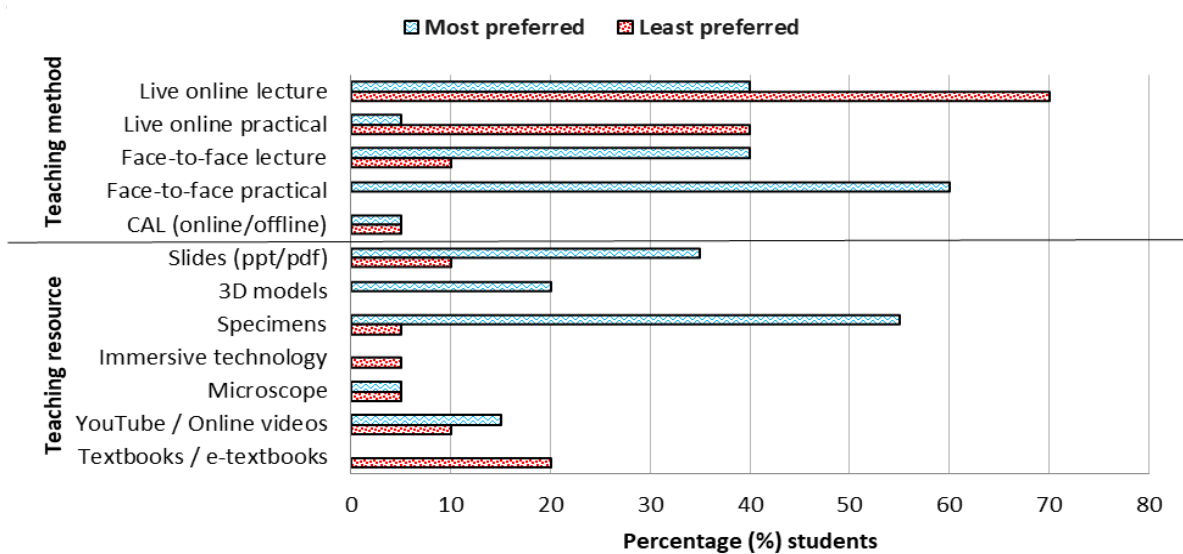


Figure 2: Most/least preferred pedagogies

This study identified effective teaching methods for anatomy learning including face-to-face practicals (95%), live online lectures (85%) and the associated resources like teaching slides (90%) and 3D models (90%) (Figure 3). Phaswana (2021) also highlighted practical lectures (93%) and YouTube videos (77%) as effective teaching and learning methods. A significant difference ($p = 0.013$) was observed in effectiveness of 3D model resources across academic degrees, where Bachelor of Nursing students had the highest indications (33.3%, $n = 6$).

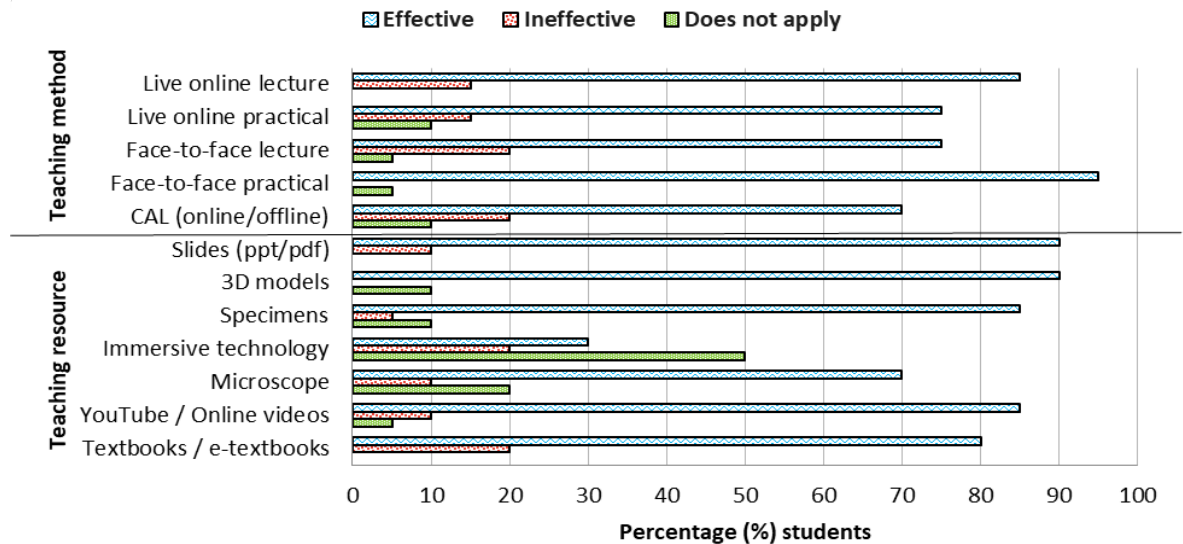


Figure 3: Rating effectiveness of pedagogies

Several learning benefits were associated with the various anatomy pedagogies (Figure 4). For example, the perceived benefits for face-to-face anatomy practicals (23.9%) included enhanced and increased interest in learning anatomy (27.5%, $n = 14$), 2D/3D appreciation of the body (15.7%, $n = 8$), and anatomical variation (15.7%, $n = 8$). Students found 3D models and specimens (19.0% each) to be beneficial, with perceived benefits including enhanced and increased interest in learning anatomy (22.2%, $n = 10$ each) and 2D/3D appreciation of the body (26.7%, $n = 12$ and 22.2%, $n = 10$, respectively).

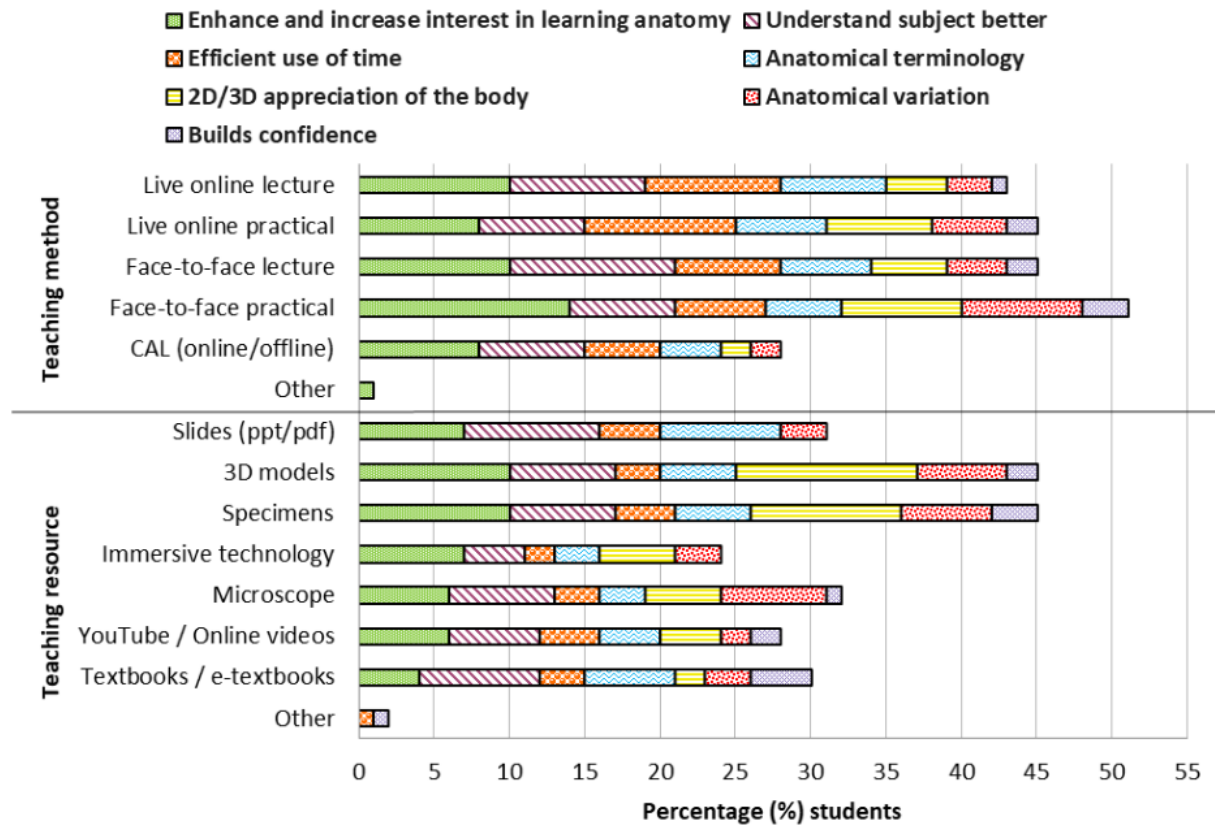


Figure 4: Benefits derived from pedagogies

According to the visual, aural, reading/writing, kinesthetic (VARK) inventory and students' perception thereof, the visuals (provided) (35%, 3.95 ± 1.82) and writing (30%, 4.30 ± 1.60) sensory learning modalities were strongly preferred (Figure 5). Contrary, Johnston et al (2015) showed kinesthetic/by doing (28%) to be the most preferred and visual/reading (9%) learning modalities to be the least preferred among students. Learning modalities can be influenced by sensory preferences (Johnston et al, 2015), cognitive processing (Kolb and Kolb, 2013), and personality/characteristics (McCardle, 2010).

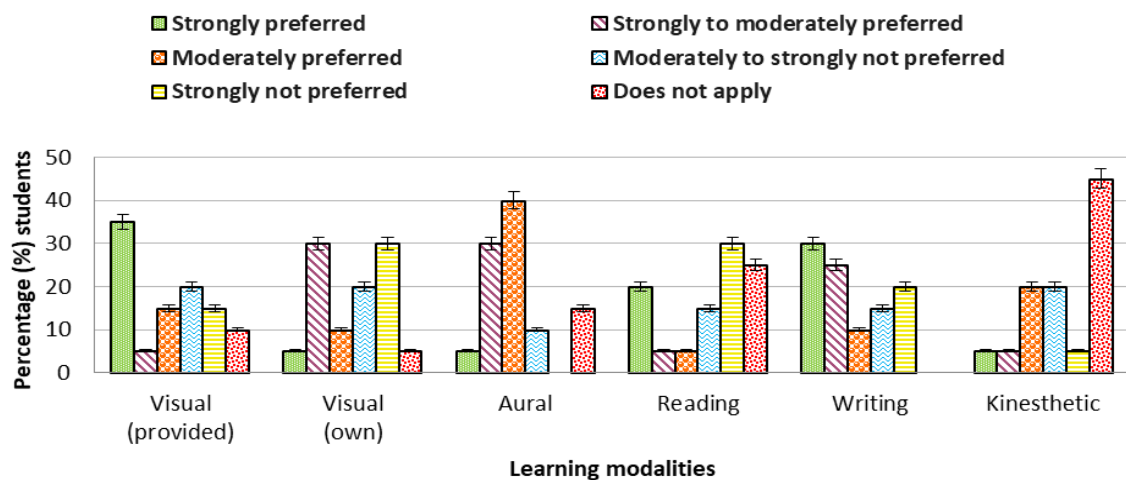


Figure 5: Students' perceived ratings of learning modalities

Significant differences across the degrees were observed for the aural ($p = 0.017$) and writing ($p = 0.020$) learning modalities. Bachelor of science (BSc) in Medical Bioscience (5.00 ± 0.00) and BSc in Sports and Exercise Science (5.00 ± 1.00) students had higher mean ranks for aural learning, while BSc in Sports and Exercise Science (5.67 ± 0.58) and Bachelor of Nursing (5.30 ± 0.82) students had higher scores for the writing learning modality.

Most students (70%) indicated that their learning modality preferences were accommodated through hybrid learning (3 responses) and availability of various pedagogies (3 responses).

Learning strategies refers to the way students go about organising and implementing their respective skills to learn content or complete activities (Weinstein et al, 2018). In this study, the spaced practice learning strategy (40%, 4.45±1.85) was strongly preferred (Figure 6). However, students predominantly used dual coding (28.2%) and elaboration (20.5%).

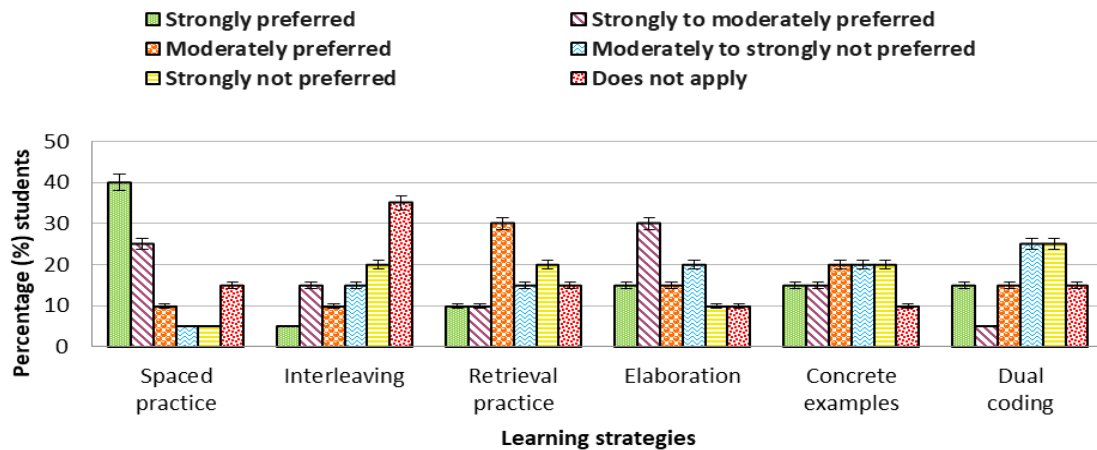


Figure 6: Students' perceived ratings of learning strategies

5. Conclusion

Overall, the study emphasises the complexity of anatomy education and the diverse needs of students when learning, particularly when considering different degrees. The preliminary findings indicated that face-to-face anatomy practicals are most preferred, effective and beneficial in teaching and learning, confirming its importance in anatomy education. The visual learning modality and spaced practice strategy were preferred, highlighting the significance of visual literacy and effective study schedules in anatomy education. Students were challenged with decreased cognition during online learning, lecture content overload, less student-lecturer interaction, and loadshedding. The results provide useful information for anatomy curricula development, enhancing the understanding of anatomy practices at UWC and potentially beyond. However, further research on anatomy learning in different degrees and the impact thereof on academic performance is needed. This study's main limitation was the COVID-19 related restrictions impacting the availability of certain face-to-face-teaching pedagogies, which hindered content delivery.

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Designing an Interactive Training Workshop for Teachers who are Teaching Learners with ASD

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Abstract: Teachers' experiences supporting learners with Autism Spectrum Disorder (ASD) in mainstream classrooms vary widely yet commonly teachers face various difficulties in teaching these learners. Following the inclusive education policy as envisioned in Education White Paper 6, independent primary schools are increasingly enrolling learners with ASD posing challenges for mainstream teachers. Having learners with special educational needs in mainstream classrooms, changes classroom dynamics with added responsibility towards learners with ASD. Teachers often lack knowledge of how to support learners with ASD and systemic factors influence the teaching atmosphere. To address these issues, an interactive workshop will be designed, framed around Albert Bandura's social cognitive theory, which focuses on self-efficacy. In this study, teacher self-efficacy in teaching learners with ASD will be explored. The paradigmatic perspective of the study will be pragmatism, using an action research design with a qualitative approach to collecting data to explore the research question, of what content and learning activities should be facilitated in a teacher workshop. The action research will follow six phases. In phase one, the planning of the workshop content will be done based on a thorough literature review. Phase two will be purposive sampling to select the teachers participating in the workshop which will be conducted in a mainstream primary school. Qualifying teachers will be asked to complete a pre-workshop survey detailing their biographical profiles and experience with ASD learners. Phase three is taking action, which refers to conducting the workshop. Phase four will be the collection of data from the workshop role-plays, observations, and post-workshop survey. Thematic content analysis will be used to analyse the raw data sets. The study will contribute towards teachers' professional development with practical, clear guidelines for mainstream teachers in supporting learners with ASD in mainstream primary classrooms.

Keywords: Autism spectrum disorder, Teacher training, Special needs, Inclusive education, ASD-specific training, ASD guidelines

1. Introduction

In mainstream primary schools, teachers' experiences in instructing learners with Neurodevelopmental Disorders such as Autism Spectrum Disorder (ASD) are challenging and require varied learning support strategies based on the characteristics of the learners (Yoro et al., 2020). Teachers employ a broader range of didactic, teacher-centred and pedagogical, learner-centred approaches to address the diverse needs of learners with ASD, thus enabling each learner to achieve their maximum potential. This study explores the preparation of an in-service teacher training intervention workshop to support learners with ASD in mainstream primary schools.

2. Problem Statement

Teachers encountering learners with ASD in mainstream primary schools often confront challenges related to complex behaviour and emotional dissociation, such as tantrum-throwing and head-banging (Vorster, 2019). As per the Education White Paper 6 policy (DoE, 2001), envisaging quality education for all learners, there are increasing numbers of learners with ASD integrated into the educational system. Teachers must thus adapt their pedagogical approaches to accommodate learners with ASD (Beghin, 2021). Such pedagogical accommodations underscore the necessity of designing appropriate in-service teacher training interventions to address the inadequate application of inclusive educational policies. The integration of learners with ASD into mainstream primary schools in South Africa presents challenges exacerbated by wide-spread poverty (Sumbane et al., 2023). The challenge also arises from the insufficient training of teachers in addressing the complexities presented by learners with ASD in primary schools (Jaffal, 2022). Not all teachers possess the requisite training or resources to effectively instruct and accommodate learners with ASD in mainstream primary schools (Sumbane et al., 2023). The central research problem may be compounded by teachers' inadequate pre- and in-service training for managing learners with ASD in schools.

3. Research Questions

What in-service teacher training intervention can be designed to support learners with ASD in mainstream primary schools?

Sub-questions

- What content can be used in an in-service teacher training intervention for teachers who are teaching learners with ASD in mainstream primary schools?
- In what way does an in-service teacher training intervention for teachers who are teaching learners with ASD in mainstream primary schools contribute to the didactics of teachers?
- What guidelines can be developed through the in-service teacher training intervention for teachers who are teaching learners with ASD in mainstream primary schools?

4. Conceptual Framework

The conceptual framework for this study includes ASD, inclusive education, and Albert Bandura's self-efficacy theory. The intersection of these concepts presents a comprehensive foundation for designing an interactive teacher workshop for assisting ASD learners in inclusive environments. This study explores key aspects of ASD, including challenges in social communication, emotional disturbances, repetitive behaviours, and sensory sensitivities (Maenner et al., 2021). The fundamental principles of inclusive education explored in this study were participation, equal opportunity, adaptability, and individualised support (Inclusive Education Canada, 2020). Self-efficacy refers to the belief in one's ability to accomplish a task (Bandura, 1994). According to Albert Bandura's self-efficacy theory, four sources influence self-efficacy: observation, past experience, verbal persuasion, and emotional state (Bandura, 1994). To successfully support learners with ASD, teachers should apply inclusive education pedagogies in the classroom and enhance their self-efficacy and beliefs that they can indeed support learners with ASD. It is crucial to introduce inclusive education strategies in a classroom which support all learners, including those with ASD. Hence, it is vital to provide in-service teacher training interventions that focus on teachers supporting students with ASD more effectively. In-service teacher training is essential for improving teachers' didactic skills thus helping boost teachers' self-confidence when working with learners with ASD.

5. Literature Review

South Africa's educational system has undergone a significant transformation, transitioning from focusing on mainstream and special education to integrating full-service mainstream schools following the enactment of Education White Paper 6 in 2001 (Mphanda, 2018). This shift has resulted in a notable increase in the enrolment of learners with ASD in mainstream schools, despite potential practical challenges. There is also a shortage of Special Educational Needs (SEN) schools equipped to accommodate learners with ASD.

The Diagnostic and Statistical Manual of Mental Disorders, 5th Edition Text Revision (DSM-5-TR) groups difficulties with social interaction and communication into one dimension known as ASD (American Psychiatric Association [APA], 2022). A health professional registered with the Health and Professional Counsel of South Africa (HPCSA), such as a licenced paediatrician, educational psychologist, clinical psychologist, or psychiatrist, diagnoses ASD in South Africa (Autism South Africa, 2015). Five factors, discussed in greater depth in Chapter Two, are part of the DSM-5-TR diagnostic criteria for ASD, which a person must meet in order to get a clinical diagnosis (Maenner et al., 2021). The DSM-5-TR identifies two primary characteristics of ASD: 1) deficiencies in social relations and communication; and 2) restricted repetitive behaviours, interests, and activities (APA, 2022). The updated language, as it appears in the DSM-5-TR, states that to be diagnosed with ASD, 'all' of the characteristics, rather than 'any' of them, must be present (APA, 2022).

Teachers should receive enhanced training and collaborative support from the education system to facilitate inclusive education in their classrooms effectively (Fourie, 2018). However, many teachers are inadequately equipped with the essential training to implement the inclusive education principles outlined in Education White Paper 6 (Majoko & Phasha, 2018). Not all teachers are adequately prepared during their pre-service training to implement inclusive education in a classroom setting (Adewumi & Mosito, 2019). The academic success of learners with ASD is closely linked to their performance in well-structured learning environments, where they feel more at ease due to clear routines and predictable structure (Nicklason, 2023).

Some guidelines to support learners with ASD include Picture Enhanced Communication Systems (PECS), classroom environment management, and support strategies. PECS employs visual aids, such as picture cards

and communication books, which are advantageous for learners with ASD who experience difficulties processing auditory information (Santos et al., 2020). Carefully designed to maximise sensory stimulation, the sensory garden engages the senses of hearing, sight, touch, smell, and taste via landscape, colour, and texture, among other components (Nikraves & Tabaeian, 2016). Multi-sensory environments (MSEs), also called sensory rooms, are specialised areas used extensively in special education facilities to regulate learners' emotional and sensory responses (Unwin et al., 2021).

In the study exploring the preparation of a training workshop for teachers who are teaching learners with ASD, the background, conceptual framework, and literature review were conducted. The methodology has been planned but is yet to be performed.

6. Methodology

6.1 Paradigmatic Perspective

This study will utilise a pragmatic paradigm to investigate the design an interactive in-service teacher training intervention focusing on support for learners with ASD in mainstream primary schools. Pragmatic research aims to identify inconsistencies in the inclusive education system and create solutions for them (Vasianovych et al., 2020).

6.2 Research Design

The study employs action research with a qualitative approach to investigate the research inquiries. The integrated method of participatory action research and learning (PALAR) amalgamates participatory action research with lifelong action learning, recognising PALAR as a theory of knowledge, a philosophy, and a strategy for facilitating community interaction (Zuber-Skerritte, 2015).

6.2.1 Phase one, planning action research

During the planning phase, it was imperative to review pertinent literature to gather information relevant to the design of the professional development in-service workshop. An action plan was developed, and the pre-workshop survey was designed to gather biographical information and participants' experiences with ASD learners.

6.2.2 Phase two, sample and sampling

Participants will be purposively sampled to. The criterion will be teachers instructing learners with ASD in mainstream primary schools.

6.2.3 Phase three, taking action

The workshop will be crafted after thoroughly reviewing the literature, and a participant manual will be developed. Designed to span a single day, the workshop will last 4-hours and be conducted by a skilled facilitator of adult professional training. Participants will engage in role-play activities to practice didactic skills and articulate their experiences teaching learners with ASD. The participants will participate in a role-play activity, expressing their experiences of teaching learners with ASD based on a scenario given to them. Following the role-play, the participants will be introduced to a discussion of support strategies for teaching learners with ASD. A follow-up role-play activity was after the discussion using the support strategies provided. An independent researcher will conduct ongoing observations according to a detailed schedule throughout the workshop.

6.2.4 Phase four, data collection

Data will be collected through a pre-workshop survey, role-play simulations, observations, and a post-workshop survey. The surveys will be distributed via Qualtrics and emailed to participants, containing open-ended questions. Role-play activities will be integrated into the workshop. Observation will continue throughout the workshop, with field notes as the primary observational data collection method. An online post-workshop survey, emailed to participants, will be conducted for participants to evaluate the workshop content and didactics.

6.2.5 Phase five, data analysis

Thematic content analysis will be used to code the raw data sets derived from the previous phase into meaningful themes using ATLAS-ti.

7. Contributions

The theoretical contribution is to the limited research that supports teachers who are teaching learners with ASD in South Africa. To support teachers who are teaching learners with ASD in mainstream schools and contribute to their understanding of literature applicable to the context, The practical contribution is to develop guidelines to support teachers when teaching learners with ASD. The workshop will enhance teachers' didactic skills in supporting the challenging behaviours and emotional dysregulation which ASD presents. The envisaged research output can be presented at conferences or schools in cooperation with the DBE to train teachers. The methodological contribution of the study is the use of Action research as research methodology. Action research in education has increased over the past few years, but it is still not commonly used methodology. Using role-play as a data collection method will provide a novel methodological contribution.

8. Discussion of the Progress

At this stage of the work-in-progress study, I provided an introduction and background, rationale, problem statement, research questions, objectives, and relevant concepts; the second chapter I completed aims to establish the conceptual framework, including my model based on personal experience and the theoretical orientation of others that shapes this study. In chapter two, I complete the study's conceptual framework, encompassing ASD, inclusive education, and Albert Bandura's self-efficacy theory, providing a comprehensive approach to supporting learners with ASD in inclusive environments. I have also concluded chapter three, which provides an overview of related and existing research on the diagnostic criteria of ASD, inclusive educational policies, the South African school system, teachers who are teaching learners with ASD, guidelines to support learners with ASD, and gaps in the literature. The guidelines retrieved from the literature were used to develop the workshop. I have developed and planned the workshop but must still apply it.

Furthermore, I have planned the fourth chapter of the study, which includes the methodology. The planned methodology for collecting the data includes a pragmatic paradigmatic perspective and an action research design. Furthermore, the planned methodology includes planning the action research, which includes various steps, taking action, which will include the workshop, purposive sampling to identify the teachers who will participate in the workshop, the data collection methods, including a pre-workshop survey, role-play, observation, and post-workshop survey, and thematic content analysis to analyse the data. The planned methodology also includes trustworthiness and ethical considerations that will be considered during the action research.

I await ethical clearance and acceptance of the study from the Faculty of Higher Degrees at the University of Johannesburg. Once the study has been accepted, I will contact relevant schools to request their consent to participate by the end of 2024. After receiving informed consent from the participating schools and participants, I will start collecting the data using a pre-workshop survey, role-play, observation, and post-workshop survey. At the end of 2024 or the beginning of 2025, I will apply thematic content analysis to analyse the data. Once that has been completed, I will write up the findings in the fifth chapter and discuss the findings in the sixth chapter of the study. The final chapter will provide a conclusion for the research report. The chapter will include the study's contributions, strengths, and limitations. Thereafter, recommendations for further studies will be made based on the results of this study.

9. Conclusion

There is a lack of guidelines for teachers teaching learners with ASD in the South African context. The envisaged research outputs are developing guidelines to support teachers when teaching learners with ASD in mainstream primary schools. These guidelines will contribute to the pedagogical and didactical approaches of the teacher. This will be specific to the South African context. The envisaged research output is to explore an in-service teacher training intervention that can be presented at conferences or schools in cooperation with the DBE to train teachers. The research results can contribute to developing teachers' skills in teaching learners with ASD in mainstream primary schools. This workshop, with guidelines to train in-service teachers when teaching learners with ASD in mainstream primary schools, can be presented nationwide. The study aims to equip teachers with sufficient skills to support learners with ASD in mainstream primary school classrooms. It will ensure they are trained and skilled to implement inclusive education in mainstream primary schools. The study will address the negative experiences of teachers when teaching learners with ASD with the necessary guidelines. The study will address the identified gap in supporting learners with ASD in mainstream primary schools.

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From Technophobia to Techno Confidence: Integration of iPad Software Applications in Teacher Training

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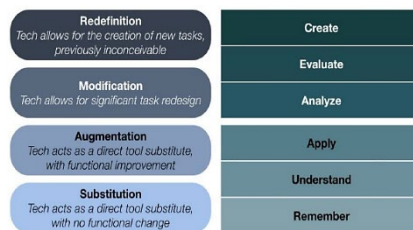
Abstract: The COVID-19 pandemic had a profound effect on higher education worldwide, underscoring the need for effective technology integration to enhance teaching and learning. This study aimed to address technophobia by introducing four iPad software applications to a group of 35 first-year Bachelor of Education preservice teachers specializing in the Intermediate phase at a private higher education institution in Westville, KwaZulu-Natal, South Africa. Conducted over six weeks in the second semester of 2024, the qualitative case study collected data through pre-intervention questionnaires, classroom use of Stop Motion, iMovie, Keynote and Plotagon in mathematics, natural science, and technology lessons, and a post-intervention focus group discussion. The findings demonstrated strong technological engagement under instructor guidance, with 91% of participants using at least one application during the intervention. The primary objective was to enhance preservice teachers' Technological Pedagogical Content Knowledge and reduce technophobia through hands-on experiences with iPad software applications. The findings revealed that preservice teachers envisioned using these four applications to create interactive, engaging, and student-centered classrooms, where learning is enriched through collaboration, creativity, and subject-specific tools for mathematics, natural science and technology. While many preservice teachers found the software applications easy to use, concerns about accessibility and teacher proficiency, especially due to socioeconomic disparities, highlighted the need for additional technology training. Stop-motion, Keynote and iMovie iPad software applications were believed to be crucial for developing technological pedagogical content knowledge, with Keynote particularly effective for blending abstract topics and concepts with innovative teaching strategies. It was recommended that Keynote be integrated into teacher training to create engaging worksheets and presentations. Stop Motion and iMovie could be used to create entertaining and interactive animations. Interestingly, the findings revealed that Plotagon was not used by the preservice teachers, possibly indicating technophobia or a lack of familiarity and confidence with the iPad software application. The study emphasized the importance of incorporating iPad software applications to assist primary school preservice teachers in overcoming technophobia and building confidence in technology integration. This integration of Stop Motion, Keynote, iMovie, and Plotagon could enhance teacher and learner experiences through creative and innovative instructional designs in mathematics, natural science, and technology.

Keywords: Technophobia, Techno confidence, iPad software applications, Technology integration, preservice teachers

The COVID-19 pandemic highlighted the issue of digitalization in higher education institutions and identified the potential of technology integration to shift traditional university teaching and learning pedagogies to digitalization as a “vital set of skills” (Akour and Alenezi 2022; Alenezi et al. 2023). The iPad is emerging as a progressive advanced handheld device for Science, Technology, Engineering and Mathematics (STEM) education and has shown improved academic achievement over traditional instruction according to a meta-analysis by Xiao et al. (2023). Pre-service teachers are not adequately prepared with technology classroom integration according to Pozas and Letzel (2023). In higher education, technophobia is hindering the integration of digital tools and impacting productivity in future organizations (Rehmat et al. 2014). Technology innovations have rapidly changed daily life and higher education (Dziuban et al. 2018). Anxiety towards technology integration in preservice teachers may arise from prior educational, socio-economic, and cultural factors, particularly in developing visualization skills in mathematics, science, and technology. Many preservice teachers often feel anxious and fearful about using technology due to a lack of training, exposure, and negative past experiences. Mpungose (2020) found that this fear can result in a reluctance to adopt new teaching methods, hindering the potential benefits of technology integration in education. Similarly, Ndebele and Mbodila (2022) discovered that preservice teachers struggle with feelings of inadequacy in their technological skills, leading to low confidence in using technology in the classroom. The constant evolution of technology adds to the pressure on educators to keep up with the latest trends, intensifying technophobia. It is essential to address these issues through effective teacher training that incorporates technology to enhance teaching effectiveness and empower future educators to embrace technology for student learning. Comprehensive training programs are needed to build techno confidence among preservice teachers, preparing them to navigate the challenges of a technology-driven educational environment. Technophobia, derived from the Greek words *technē* and *phobos*, refers to an irrational fear or anxiety related to the negative effects of advanced technologies (Osiceanu 2015:1139). This fear can lead individuals to avoid new technologies such as coding, robotics, and artificial intelligence, separate from computer anxiety (Xiao et al. 2023). Without proper training programs to address technophobia, preservice teachers may struggle to adapt to emerging technologies, widening the knowledge gap (Khasawneh 2018; Osiceanu 2015; Xiao et al. 2023). Overcoming technophobia through training can empower individuals to

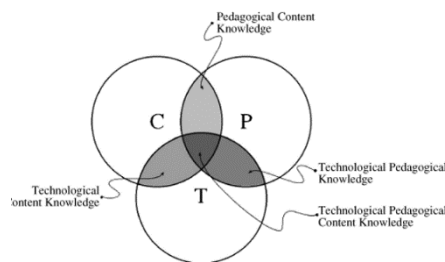
succeed confidently in today's digital landscape. Implementing interventions using iPad software applications like Stop Motion, iMovie, Keynote, and Plotogon can enhance visual-spatial skills and Technological Pedagogical Content Knowledge (TPACK) development in future preservice teachers. This approach should be integrated with pedagogical frameworks such as the TPACK and Substitution Augmentation Modification Redefinition (SAMR) models that highlight the synergistic relationship between technology and content integration in subjects like mathematics, natural science and technology (Li et al., 2024). Teachers play a crucial role in integrating iPad software applications and fostering technologically proficient learners in the classroom.

Future teachers must develop subject-specific technological knowledge and effective pedagogical strategies for teaching math, science, and technology in primary classrooms (Xiao et al., 2023; Pozas & Letzel, 2023). This study draws on two theoretical models: TPACK and SAMR. TPACK, as described by Hilton (2016) and Alivi (2019), helps teachers integrate technology in classrooms through seven components, including Technological, Pedagogical, and Content Knowledge. SAMR, explained by Hilton (2015), follows four stages—Substitution, Augmentation, Modification, and Redefinition. The latter stages have been adopted in the United Arab Emirates to improve teaching practices (Miles, 2019). Future research should examine how TPACK and SAMR models could guide iPad technology integration as these models could provide deeper insights into the effective use of technology in educational settings.



Mishra and Koehler (2006:1025)

Figure 1: TPACK Model



PuenteDura(2013)

Figure 2: SAMR Model

An initial meeting was held with the Bachelor of Education Intermediate phase first year preservice teachers to discuss the study's timeline and the use of iPad software applications for hands on activities in mathematics, natural science and technology. Ethical clearance was obtained from the Research Ethics Committee to conduct the research on site at the private higher education institution and participation in the study was voluntary. The Stop Motion and Keynote iPad software applications were used by the preservice teachers to explore two- and three-dimensional shapes in mathematics, perceptions of scientists and the water cycle in natural science and technology. In October, the preservice teachers used various iPad software applications such as Stop Motion, iMovie, and Plotogon to showcase their understanding of the water cycle in natural science and technology. Videos were uploaded on the Learning Management System and analysed thematically. A focus group discussion was held to gain deeper insights on the preservice teachers' technology integration experiences. The study was guided by two research questions: (1) "What are the most effective iPad apps for enhancing pre-service teachers' techno-pedagogical content knowledge?" and (2) "How does iPad integration impact pre-service teachers' technological pedagogical content knowledge (TPACK)?" Data collection included a pre-intervention questionnaire, a hands-on intervention with four iPad applications in math, science, and technology, and a focus group discussion with ten pre-service teachers. Three key themes emerged for the first research question: ease of use, enjoyment, and interactivity. Stop Motion, Keynote and iMovie were favoured due to their simple interfaces and engaging features, which helped reduce technophobia and improve the learning experience. The

participants' needs ranged from basic iPad skills to advanced application integration for complex topics. Further research is needed to explore the limited use of Plotagon. For the second research question, findings showed that iPads enhance subject-specific teaching in math, science, and technology through visual learning and interactive problem-solving. In technology, iPads were useful for teaching coding, robotics, and digital design, preparing students for future technology careers. The interactive nature of the applications promoted active learning, improved content retention and understanding.

According to Figure 3 below, out of thirty-five pre-service teachers, thirty-two used iPad software applications. Stop Motion and iMovie were the most popular, each used by 11 teachers (31%), while Keynote was used by 10 teachers (29%), likely for presentation-based lessons. Notably, no teachers used Plotagon, possibly due to technophobia, unfamiliarity, or lack of confidence in using the application.

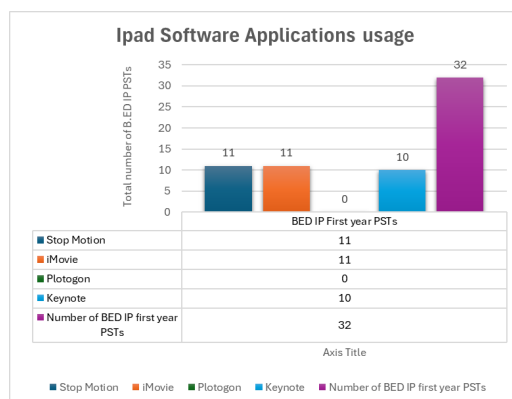


Figure 3: iPad Software Applications Usage

Several participants expressed the need to become familiar with the iPad's functionality and interface, particularly those more accustomed to Android devices. For individuals not comfortable with iPads or who do not own one, understanding basic device operation is viewed as an essential initial step. It was important that the selection of software applications is aligned with curriculum standards. Participants expressed a desire to explore Stop Motion, Keynote, iMovie and Plotagon applications for math visualization, science simulations, coding and robotics to make abstract concepts more engaging and interactive. While minor technical issues such as buffering and updates were noted, and a few participants faced difficulties finding resources, most reported no major challenges with using iPad applications. This study highlighted the importance of preservice teachers becoming proficient with new technologies, overcoming technophobia, and building confidence in their technological skills. Incorporating innovative technologies like iPad software applications in teacher education programs could empower preservice teachers to confidently use technology, preparing them for the demands of 21st-century teaching and a digitalized workforce. By developing technologically proficient primary school learners, South Africa could advance in economic growth, social development, digital innovation, and global competitiveness.

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Supervising Practice-Based Design Research: Business as (Un)usual?

Work-in-Progress Part 1

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Abstract: Practice-based design research encompasses scholarly inquiry wherein design activities and processes are integral to scholarly research and postgraduate studies. The Department of Higher Education and Training (DHET) also recognises such research activity as credit-bearing 'creative output', but report a lack of rigour, especially in the communication design field, where no such submissions in the previous review cycle could be awarded. This work-in-progress paper starts with a theoretical exploration of the nature, complexity and potential of practice-based design research, with a specific lens on communication design. Existing literature underscores a myriad of challenges inherent in this space, including the quest for a unified language and theoretical frameworks, the identification of suitable methodologies and research designs, and concerns regarding scholarly rigour, transferability, and trustworthiness of findings. Nonetheless, practice-based research in design provides researchers and postgraduate students the potential to be innovative and to abductively harness the possibilities of design and design thinking in the research space. Embracing and developing practice-based design research as an acceptable paradigm might also encourage more postgraduate enrolment and success since it builds on skill sets that are more familiar to designers, might better align with the knowledge needs of industry, and might, in the end, build capacity for this type of research output. This work-in-progress paper forms a theoretical background for a future study to shed light on South African supervisors and students' challenges in this space. By exploring these challenges, this research will contribute insights to the field, enriching our understanding of the dynamics within practice-based design research and providing guidance and support for those in supervisory roles within this domain.

Keywords: Supervision, Practice-based research, Postgraduate design studies, Communication Design

1. Introduction

Research and scholarship in the discipline of design in South Africa is a developing area with few postgraduate students and programs (van Zyl, 2024). Communication Design falls under the Design and Applied Arts (0302) CESM, which also includes Design and Visual Communications, General; Commercial and Advertising Arts: Industrial Design; Commercial Photography; Fashion/Apparel Design Interior Design; Graphic Design; Illustration Design and Applied Arts, Other. The naming convention in the Design and Applied Arts CESM does not do justice to the way Communication Design transformed to the design of interactions and experiences such as Interface (UI), User Experience (UX) and Learning Design (García Ferrari, 2017; van Zyl & Carstens, 2023). Therefore, although communication design is the focus of this study, the broader shift in disciplinary practice is implied.

The Design and Applied Arts CESM reported 320 master's degree graduates and 35 doctoral graduates in the 12 years from 2010 to 2021; this translates to an average of only 27 masters and three doctoral graduates per year across all the fields in the CESM in South Africa (van Zyl, 2024). These numbers exclude graduates who drifted into other disciplines or merged with Fine/Visual Arts; still, the numbers would not change significantly even if these were included.

International design institutions use both the traditional IMRAD-type (Introduction-Method-Results-Discussion) format as well as Practice-based Design Research (PBDR) at postgraduate level, where PBDR dissertations and theses are richly illustrated (De Lange & Ndlovu, 2019). The inclusion of design projects and the submission of project documentation and artefacts as research evidence has now, for many years, been accepted in countries such as UK, Australia, New Zealand and Scandinavia (Vaughan, 2017).

De Lange & Ndlovu (2019) point out that South African postgraduate design research that uses the traditional IMRAD approaches compares well with international output but that our practice-based and applied research in design disciplines can still be developed, and proceed to ask the critical question of whether we have supervisors and examiners with suitable academic and practical expertise? Challenges experienced by supervisors and students when conducting PBDR at a University in South Africa were the entangled relation between theory and practice, generalised and bureaucratic institutional structures and the presentation of such projects as a body of knowledge (Perold-Bull et al., 2023).

This paper is a work-in-progress, driven by the research question of whether supervising practice-based design research is 'business' as usual or unusual. I start by theoretically unpacking the complex and ambiguous nature of practice-based research. This is followed by a short review of the literature on using PBDR in postgraduate studies, specifically focusing on supervision, student challenges, and experiences. This research aims to provide

conceptual understanding to develop knowledge of this type of research and develop supervision capacity in the communication design space.

2. (Still) in Search of a Shared Understanding

Design is seen as directed to the future, shifting from the known to the unknown and uncertain, a world that does not exist, that values inspiration, use, purpose and demonstration (Jonas, 2014; Koskinen et al., 2011; Stappers, 2007). Designers use associative, generative, and inductive thinking and visual notations, such as sketching, making models or prototypes, and conjecturing the possible (Stappers, 2007). Research, on the other hand, seeks to understand and explain the present and past with rigorous analysis, value, validity and proof, logical reasoning, deduction, empirical measurement, verbal notation and the development of structured theories and ruling out the impossible (Stappers, 2007; Koskinen et al., 2011).

A rich discourse and debate explore the relationship between design and research; however, there is still no consensus (Stappers, 2007). Jonas (2014) turns to critical systems thinking and cybernetics as suitable paradigms of inquiry with the underlying logic of induction–abduction–deduction, with abduction as the designerly mode or activity when conducting what he calls Research Through Design (RTD). Jonas (2014) explains that *induction* is aligned to analysis (or inspiration, system knowledge, scenario field analysis); *abduction* to projection (or ideation, design exploration, transformation, scenario prognosis) and *deduction* to synthesis (or practice, the real, scenario building).

Stappers (2007), on the other hand, argues that the Stokes's four-quadrant research model (See Figure 02 in Stappers, 2007) could provide a suitable paradigm for PBDR. The Stokes model breaks the linear model that only differentiates between basic or applied research (Stappers, 2007) by providing the opportunity for both generalisable knowledge and application at different levels or scales (Stappers, 2007), thus allowing for both to be present, albeit with varying foci while doing PBDR.

Koskinen et al. (2011:5-6) call this type of research "constructive design research", where the constructed design leads to the construction of knowledge. The construction could be a scenario, a mock-up or a detailed concept (Koskinen et al., 2011). Examples of such design research would not be possible without a design background, for example, Dunne's work in the UK and Sade in Finland (Koskinen et al., 2011). Koskinen et al. (2011) differentiate between construction and constructivism in that some form of 'construction' guides the process, instead of the way social scientists use constructivism as the constructing of meaning. Constructive design research can take place in the lab, field or showroom (Koskinen et al., 2011) The lab is a more controlled environment, decontextualised with reduced variables, however, with the added challenge of the designer's skill and intuition during the design phase (Koskinen et al., 2011). Therefore, this design lab cannot be identical to a science lab.

Koskinen et al. (2011:70) point out that design researchers prefer to work in the 'field', rather than the 'laboratory', where first-hand experience of the context is valued. This 'working in the field' is extended to co-design and co-creation where the design process is opened to users, non-designers and stakeholders, with the designer becoming a facilitator. Frontrunners of this type of research can be found in Italy, Milan with the purpose of designing sustainable and social solutions (Manzini, 2015).

Koskinen's third site, the 'showroom', functions more like art research where the research is presented in a gallery, for viewers to experience. In the design space, a 'showroom' approach can be used for critical design to elicit comments, disrupt, or critique (Koskinen et al., 2011). Here, the exhibition takes on the role of a publication that could incorporate video, photography, and user responses.

These debates highlight an important question on how the type of design research will be evaluated – should the design activity be aesthetically, structurally or conceptually good (Koskinen et al., 2011)? Or should the outcome be assessed in the way the research questions were answered, as knowledge contribution... for example, negative cases such as design that fails as design, but contributes to knowledge? Debates about the epistemic framework still point out challenges around rigour and scientific validity, a "paradox" and "contradiction" (Jonas, 2014).

3. Similarities Between Design and Research

One way to move the debate forward is to focus on what design and research have in common (Stappers, 2007). Stappers (2007) identifies the most significant overlap between design and research as the cyclical nature of developing and reworking ideas and testing them in real-world scenarios. "Both design and research are

characterised by iterative cycles of generating ideas and confronting them with the world" (Stappers, 2007:82). Stappers (2007) points out that most university curricula include theoretical knowledge and research but that the inclusion and adoption of design skills and methods in research programmes is much slower. He attributes this to the prejudices that had to be overcome and the fact that appropriate types of research had to be developed to be used by a new generation of doctoral students (Stappers, 2007). The distinct design fields will also impact the way PBDR is done. Industrial design, for example, focus more on physical outcomes, sketches, prototypes, whereas Interaction design is time-related with personas, scenarios and interactions as part of the design process (Koskinen et al., 2011). Design as a discipline also evolves with new tools, contexts and challenges (Frascara, 2022; Meyer & Norman, 2020; Redström, 2020). This means that supervisors need to supervise design projects situated in unfamiliar design contexts and tools, using design and research approaches that they most likely have not experienced first-hand.

4. Postgraduate PBDR, Supervision and Student Support

Although PBDR could fit into what is described as a 'modern' doctorate (Lee, 2018), the nature of PBDR studies is diverse. The inclusion of some form of creative or applied output is locally recognised in both local Masters and Doctoral studies: "candidates may also present peer-reviewed academic articles and papers, and, in certain fields, creative work such as artefacts, compositions, public performances and public exhibitions in partial fulfilment of the research requirements" (CHE, 2013: 40). The Higher Education Qualifications Sub Frameworks allows for doctoral degrees that are pure discipline-based or that uses multidisciplinary or applied research (CHE, 2013). There is, therefore, no reason for more applied and practice-based design research not to be accepted in postgraduate studies. Furthermore, the Department of Higher Education (DHET) also recognises such research as formal research output (DHET, 2020). The National Research Foundation (NRF) manages these outputs according to a system of evaluation that determines whether such research is equivalent to research published in peer-reviewed articles or scholarly books and worthy of subsidy. In the latest Creative Outputs report (DHET 2023), no submissions in the 'Graphic Design' space were made. The previous Creative Outputs Report (DHET 2020) mentioned that no Graphic Design units were awarded. Both reports note a lack of scholarly rigour in the design space. Music achieved 58 units, Fine Art 48, Theatre Performance and Dance 12 units, with Design as a general category declining to 3 units (DHET, 2023). Therefore, one can only wonder why we have such low participation and success rates in the design space and if (or how) this could relate to using PBDR at postgraduate levels?

De Klerk (2019) identified two problem areas when looking at PBDR at postgraduate levels in South Africa – the first is the lack of consensus on the terminology and nature (such Practice-Based vs Practice-Led) and the articulation of the contribution. Perold-Bull et al. (2023) wrote an enlightening paper on the challenges her two students experienced when presenting at departmental progress seminars where the panel did not understand their research. Design research in their institution is integrated with Fine/Visual Arts. As a supervisor, she had to lead the students in re-grounding their research as it was situated in the design domain. She echoes students' questions regarding program structure and design alignment in the current shared Visual Arts MA programme at Stellenbosch University (SU) and points out that design students often feel lost (Perold-Bull et al., 2023). It could be that the department feels more at ease with Koskinen et al's. (2011) "showroom" approach without taking the nature of design research into account. Despite these challenges, researchers and supervisors from SU such as Haese and Costandius published several articles and case studies rooted in PBDR (van Zyl & Carstens, 2021; Haese et al., 2018).

Besides the contributions by the supervisors at SU, very few other critical studies have been published on the nature and supervision, as well as student experiences when using PBDR in Communication Design postgraduate studies. Also, only a few sources about PBDR in other design-related fields were located, such as Fashion (Harvey et al., 2019) and Photography (De Klerk, 2019).

Supervisory challenges are discussed in international literature, for example, in music, where the balance between the needs of students and institutional imperatives, finding suitable local examples, superior and student wellbeing and the supervision of colleagues were identified as problematic (Emmerson & Harrison, 2009). Hamilton and Carson (2015) also recognised the need to develop research education leadership and suitable supervision pedagogy in creative practice disciplines. De Lange and Ndlovu (2019) stated that South African design disciplines need to build capacity for supervising staff and examiners with suitable academic and practical expertise and experience, which may be difficult.

5. Future Research

If we in South Africa as a discipline want to argue for accepting PBDR as legitimate, then we need to develop a clear explanation and shared understanding of what we deem acceptable practice for Masters and Doctoral students. Stappers (2007) point out that abstract debates about the nature of PBDR often confuse rather than enlighten, especially when dealing with politics and funding. We do not yet see the type of funding and collaboration between industry, academy and support of communities of practice as Vaughan (2017) mentioned.

This work-in-progress paper contributes a snapshot of the challenges experienced when conducting PBDR in South Africa. It confirms the need for a more systematic analysis of current practice and supervisors and student experiences. The study focused on communication design; however, the preliminary literature review revealed a gap in all design fields and indicated the need for a broader study. The next step in my research journey is to expand the literature review, map the current PBDR-space at Masters and Doctoral levels in South Africa, select participants based on the map and develop a suitable research instrument.

I believe that PBDR could encourage more interest in postgraduate design research and could better align with industry knowledge needs. However, this would require developing a shared understanding and sufficient supervision and institutional capacity.

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Late Submissions

Developing Entrepreneurial Leadership in Students: An Immersive Experiential Learning Retreat

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Abstract: A challenge for traditional academic methods is found in adequately preparing students for the more practical aspects of the entrepreneur's journey. To develop these skills, experiential learning is essential. To assess its impact on the development of entrepreneurial leadership skills in students, this research developed an entrepreneurial leadership retreat. The entrepreneurial leadership retreat is an intensive, immersive learning experience specifically designed to develop essential entrepreneurial skills. Using a qualitative research approach, this research aims to select a diverse group of graduate students to participate. The research will begin with semi-structured interviews with participants before the retreat to establish baseline data on their leadership competencies and self-perceptions. Post-retreat interviews will then help assess any changes in their leadership abilities and mindset. Additionally, observational data is gathered throughout the retreat to better assess the impact of the program and students' reactions. The learning experience integrates outdoor challenges that test physical and mental resilience, strategic planning workshops that enhance cognitive and decision-making abilities, and business simulations for a more practical result. Thematic analysis of the data allows to identify key patterns and themes related to leadership development and the specific impacts of the retreat's activities. The experiential format aims to allow more engagements for students with the material and a more natural learning experience compared to traditional classroom-based methods. By creating an intense fun learning environment, students learn in an immersive way. By conducting this research, the objective is to contribute valuable insights to entrepreneurship education by demonstrating how experiential learning, and engaging learning are powerful tools for developing entrepreneurial leadership in students. The findings aim to encourage more experiential learning and programs that go beyond the classroom. It also seeks to inform the design of future educational programs and interventions that seek to better prepare students for leadership roles in entrepreneurial and innovation-driven settings.

Keywords: Experiential learning, Entrepreneurship retreats, Entrepreneurial leadership, New ways of learning

1. Introduction

There is a gap between traditional academic learning and the practical skills needed for entrepreneurial success (Fisher et al., 2016). Leadership development and resilience influence entrepreneur's success and there is a clear need for more practical, experiential learning (Fisher et al., 2016). Traditional classrooms can fall short in equipping students with the leadership and decision-making skills. Self-presentation (Goffman, 1959) can tie in how students project themselves in leadership roles and it is essential to give them the right environment to develop the right skills. It is essential to develop leadership skills and a growth mindset, which can be fostered through experiential learning (Cardon et al., 2009).

While there is significant literature on entrepreneurial education, there is still a need for more in-depth analysis on how experiential learning can contribute to leadership development in entrepreneurial contexts. Neck et al, (2021) recent work on entrepreneurship education provides support on the importance of innovative teaching methods including experiential learning. Our research suggests a new way of learning in the form of a leadership retreat that provides an innovative way of learning by creating an intense fun learning environment. Students learn in an engaging environment, outside the classroom and with a focus on creating an enriching experience.

This paper is structured into three key sections. The literature review examines existing studies on entrepreneurial education, focusing on the role of experiential learning in developing leadership skills. The methodology section then outlines the qualitative research design. It details the sampling process, data collection process through semi-structured interviews and observational analysis. This section presents the study objectives as well with a focus on evaluating leadership development and the specific changes in participant's leadership abilities. The finding part will provide an analysis of the results and the impact and learning outcomes of the retreat on students.

2. Literature Review

Entrepreneurial leadership combines traditional leadership skills, and the flexibility and innovative mindset required in entrepreneurship (Leith et al, 2013). Education provides a key support to develop these leadership skills. However, according to Neck (2021), there is a need for a shift toward more action-based entrepreneurial education and more practical learning. In fact, traditional classroom methods need to include more innovative methods to prepare for the complexities of real-world entrepreneurship. Experiential learning is referred to as

learning through direct experience, reflection and application (Motta and Galina, 2023). This approach provides a good opportunity to foster entrepreneurial skills like decision-making, creativity and problem solving. Experiential learning is a critical, interactive method to foster entrepreneurial development (Nabi et al, 2017). This new way of learning allows to develop leadership skills of students and their creativity by immersing them in real-world challenges (Deakins & Freel, 2018). As explained by Fayolle and Gailly (2015), lectures, and case studies in a typical classroom setting may limit the students in their thinking process, and there is a real need for more innovative and experiential approaches.

There are some clear limitations on entrepreneurship education methods and a need for an experiential approach that better equip students with the practical skills required for entrepreneurial leadership (Ratten & Jones, 2021). Experiential learning goes beyond just providing knowledge, it facilitates the application of skills in a practical context (Deakins & Feel, 2018). Engaging in experiential learning allows for more practices such as business simulation, in a controlled yet dynamic and creative environment. Hagg and Gabrielsson (2020), argue that immersion into real-life situations allow students to experience the complexities of leadership first-hand. Such immersive settings make them not only learn about the right skills but put them in a situation where they are forced to be good leaders in situations where they can see the impact of their decisions.

Experiential and immersive learning experiences have a lasting impact as they foster active learning (Hagg and Gabrielsson, 2020). Emotional and psychological benefits are essential for this active learning. Jones and Underwood (2017) emphasize that engaging in entrepreneurship education can evoke a range of emotional reactions, such as fear, excitement and uncertainty. These emotions, when they are managed in the right way, can develop self-efficacy and confidence while navigating complex entrepreneurship tasks (Jones and Underwood, 2017). In that sense, it is essential to practice a more experiential learning approach to foster emotional resilience particularly in a high-pressure environment like the one of entrepreneurship. As developed by Priest and Gass (2017), outdoor education can build resilience and ability to cope with uncertainty.

Entrepreneurial success depends on more than just business knowledge according to the literature. It consists of a set of personal competencies that allow leaders to navigate complex environments and uncertainty. Among these skills, confidence is a foundation for entrepreneurial resilience, and it equips individuals to face risks and make decisive moves. According to Motta and Galina (2023), experiential learning increases self-efficacy in entrepreneurship by providing the right environment to build confidence. Another interesting fuel for innovation according to the literature is creativity. It is crucial today as it helps approach problems from unique perspectives. Creativity is seen as a necessary skill and experiential learning nurtures it through a practice-based approach (Neck et al, 2021). Entrepreneurs must also often navigate complex emotional landscapes, emotional intelligence is made of empathy, resilience, and relationship management, a set of skills that are essential for sustainable leadership (Jones and Underwood, 2017). According to this study, handling emotional reactions is central to learning and developing emotional intelligence with experiential learning can help entrepreneurs regulate their emotions and remain motivated through their journey.

The existing literature highlights the significant impact of experiential learning for students in developing leadership traits and essential entrepreneurial skills like emotional intelligence and resilience. Despite the many studies, there is a need to further develop this, particularly in the context of experiential learning retreats. Continuing to explore research in this area is key to optimize educational interventions. To do so and according to the literature, in this study, we focus on confidence, creativity and emotional intelligence as primary competencies that experiential learning can enhance for students.

3. Methodology

The following study will use a qualitative research approach to explore the impact of the entrepreneurial leadership retreats on the leadership skills of graduate students. For this, semi-structured interviews will be used. Observational data during the retreat will also be key in exploring the impact of the experience. Qualitative analysis will be used for a rich exploration of participant's experiences and perceptions, it is interesting to use it to explore complex personal development processes (Creswell & Poth, 2016). The data set will be made of a selected set of 25 graduate students from different schools and majors to represent various range of industry focus and entrepreneurial experiences. The retreat experience will be 3 days long to allow for a multitude of learning experiences, both thanks to small focus groups and fun gathering between participants. The focus of this approach is to allow for a unique personalized experience and to create an enriching program. The aim of this learning experiment is for them to learn new skills, and to connect with each other, making them socialize and develop their emotional intelligence. For this reason, the entrepreneurship leadership retreat will consist of three main activities: outdoor challenges, strategic planning workshops and business simulations.

To collect data, there will be three different phases for this study. First, a pre-retreat interview, to gather baseline data on their leadership competencies and self-perceptions. This first step is essential as it aims to understand student's leadership styles, and their current view of entrepreneurship. The second phase is during the learning experience and consists of observing students, their interaction and how they react to the experience. It is also interesting in this phase to capture nonverbal cues, group dynamics and real-time problem solving. Interactions will be analyzed using thematic analysis to identify patterns and themes within the data. The third and last phase of the study consists of post-retreats interviews to assess the changes in leadership abilities, mindset and overall student's personal growth. All data collection processes and experiments will be validated by an academic institution to approve this approach and further detail it for more relevant results.

4. Research Objectives

The study aims to track improvements in the leadership ability following the experiment by measuring three important areas previously identified: Confidence, Creativity and Emotional Intelligence.

Table 1: Key research questions

Themes	Key questions
Confidence	How does leadership retreat impact participant's self-perception of their leadership abilities? In what ways does overcoming challenges during the retreat influence participants' self-assurance in taking leadership roles?
Creativity	In what ways does the immersive environment foster creative thinking in decision-making processes? How do participants apply creative problem-solving skills in team-based activities?
Emotional intelligence	In what ways do participants interact with other students? How does the leadership retreat enhance participant's emotional awareness?

5. Conclusions

This study will aim to explore how experiential learning, specifically through the entrepreneurship leadership retreats method, contributes to the development of leadership and entrepreneurial skills for participating students. The study will seek to complete the existing research knowledge on bridging the gap between traditional academic methods and more immersive, innovative methods. As entrepreneurship education is evolving, it is essential to provide a dynamic environment to develop not only soft skills but an essential growth mindset to face entrepreneurship challenges.

Experiential learning methods will enable participants to apply theoretical knowledge into real-world settings allowing them to develop their ability to develop their emotional skills and leadership ability (Kohn, 2024). The literature allowed to highlight the effectiveness of these innovative new ways of learning, but more research is required to determine the impact and importance of immersive experiences for student's mindset and development. The aim of this research is to provide an answer to that and to assess the impact of experiential learning through leadership retreats on the development of students' competencies and soft skills.

The next step of this study is to implement the entrepreneurial leadership retreat and collect relevant data to measure the impact of this experience on student's learning. This study aims to contribute to both entrepreneurship education and leadership development by providing empirical evidence on the value of experiential learning programs. This research also seeks to inform future research on the subject particularly on the design of new ways of learning and immersive experiences for students taking leadership and entrepreneurship classes.

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Assessment of Students' Attendance, Participation and Classroom Involvement in e-Classroom

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Abstract: Assessing students' involvement in e-classrooms enables instructors to identify students who may be struggling with the material or disengaged from the learning process. It allows instructors to provide timely feedback and support to help students overcome challenges and stay on track with their learning goals. Tracking attendance, participation, and classroom involvement helps instructors ensure the quality and effectiveness of e-classroom sessions. It allows instructors to assess whether instructional strategies are fully engaging students and promoting active learning in an online environment. A College of Primary Education was used for the study in Southwest, Nigeria. Access was gained into classes in the twenty-seven (27) departments in the six Schools in the College. The average attendance of students in the various departments were taken every week and reported on monthly basis for three months during the Covid-19 period. Findings revealed that students had a slightly high attendance rate, participated actively and were involved to some extent in the E-classroom. It is recommended that the government through institutions of learning should provide students with facilities that will ease the process of on-line classes, while students should always make themselves ready and available for on-line classes.

Keywords: Assessment, Attendance, Participation, Classroom involvement, e-Classroom

1. Introduction

The advent of technology has irrevocably transformed the landscape of education, leading to the rise of the virtual classroom. As educational institutions increasingly adopt e-learning platforms, assessing students' attendance, participation, and classroom involvement has become a focal point for educators. These parameters are essential indicators of student engagement, academic performance, and the overall effectiveness of digital learning environments (Kazeem, 2021).

Before addressing assessment strategies, it is imperative to define what is meant by attendance, participation, and involvement within an e-learning context. Attendance refers to the frequency with which students log into the e-learning platform and engage with course materials. However, in an e-classroom, mere attendance is insufficient; it must be accompanied by active participation, which encompasses a student's contributions to discussions, responsiveness to quizzes and polls, and interactions with peers and instructors. Classroom involvement, on the other hand, goes beyond just participation; it signifies a student's emotional and intellectual investment in the learning process.

When most classes were still taught face to face, participation was measured in terms of coming to class (attendance). Romer (1993) advocated mandatory attendance based on the strong relationship between attendance and performance. Other researchers examined the usefulness of different participatory metrics (hand raising, response cards, clickers). In the Internet environment, measures of attendance focused on time spent on the course site, clicks, and pages visited. Participation shifted to making meaningful contributions in email conversations and on discussion boards. In general, research shows that active class participation improves subjective and objective student performance. Students perceive that they do better in class, and objective criteria like Grade Point Average (Credé, Roch, & Kieszczynky, 2010) and scores on final exams confirm this (Duncan, Kenworthy, Mcnamara, & Kenworthy, 2012; Irwin, Burnett, & McCarron, 2018).

E-learning is a powerful engagement tool that students can use both inside and outside the classroom. Online media such as Internet portals and smartphones provide effective and simple information. Open communication and interaction options with many advantages. These media are public, accessible to anyone from anywhere, and all students can see what other students are doing and have done. They are open, without time restrictions, without face-to-face meetings or the need for parties to be present at the same time. This solves the problem of employees or students not being available during working hours, for example. Evaluating each student's participation is free and ongoing, so it is not a time-consuming process for faculty members. Evaluations may include number of participants, leadership, quality of questions asked, quality of answers given, speed of response, initiation, course-related activities, etc. As suggested by Wu & Chen (2005), some e-learning portals may provide automatic evaluation through the portal itself. Due to the importance of this area, it is advisable to introduce it in all courses to increase student participation and encourage

continuous learning. It is recommended to give more weight to this area. B. 30%; however, this percentage may be changed if deemed necessary by faculty members.

E-classroom is a form of online learning, offering various educational programs in an online form. This multimedia classroom technology provides a unique learning experience. It promotes quality learning. It makes learning very innovative, effective, and engaging. The e-classroom aims to go beyond the blackboard and textbook approach and improve the learning experience. It helps in connecting technology with education. So, e-classroom is all about bringing excellence in education. Also, it is environmentally friendly, as the students will not be using textbooks or copies. It will minimise the use of paper and save the environment too. Obviously, there will not be any need for infrastructure. So, it is very cost-effective too. This classroom is a fun activity and can help in minimizing stress. It even makes subjects like history, geography, and civics very interesting and engaging. The audio and video format makes it easier for students to understand and retain information. It provides students with the perfect learning environment where they can learn, grow and thrive.

Before COVID-19 pandemic traditional classroom teaching was the method of teaching which was changed to online teaching due to restrictions of the COVID-19 pandemic. However, due to COVID-19 pandemic restrictions, traditional classroom teaching was shifted to online teaching. Students have to go online to attend, participate and get involved in the classroom, which is not physically assessable to them. Assessing their attendance and participation helps gauge students' engagement with course material. It provides insights into whether they are actively involved in the learning process or if they might be disengaged. Monitoring attendance ensures that students are fulfilling their obligations and responsibilities as learners. It also encourages accountability and helps establish a sense of commitment to the course.

2. Literature Review

E-learning is also called Electronic Learning or online learning information and communication technology to enhance and facilitate teaching and learning is called e-learning according to Oye, et.al., (2012) in Ezeude et.al.

Lack of internet facilities, technology and e-learning facilities have been identified as major problems of adopting or fully utilizing online e-learning platforms by most Nigerian Universities. E-learning platform such as Zoom, Microsoft teams, Udemy, Coursera have been recognized to improve student's academic performance to a great extent. The result revealed that a good number of e-learning platforms have been utilized by undergraduates, there were recognized strategies of provision of more e-learning facilities and internet services that should be adopted to improve the continuous utilization of e-learning platforms among undergraduates. It was suggested that the government should assist in supporting tertiary institutions with financial services and management experts to promote and sustain the use of e-learning platforms in tertiary institutions.

Data collected by Holister, (2022) from course evaluative studies reported decreased in live lecture engagement and attendance with 72 percent reporting that low engagement during lectures with their online learning experience. A majority of students reported that they struggled with staying connected to their peers and instructors and managing the pace of course work. Students had positive impressions however, of their instructional staff. The majority of students felt more comfortable asking and answering questions in online classes, suggesting that there might be features of learning online to which students are receptive and which may also benefit in – person classes.

Several studies have explored the effectiveness of various attendance tracking systems in e-classrooms. These systems range from simple login/logout timestamps to sophisticated biometric authentication methods. Research suggests that automated systems are generally more reliable and efficient than manual methods in tracking attendance. Smart phones with downloaded software applications were used to check and show students attendances automatically, which can successfully reduce some time for tracking their attendance according to Chiang, et.al., (2022).

Researchers have proposed various metrics to measure students' engagement and participation in e-classrooms. These metrics often include frequency of interactions in discussion forums, submission of assignments, engagement with multimedia content, and participation in live sessions or virtual classrooms. Studies indicate that higher levels of engagement are associated with better learning outcomes.

The student participation scale developed by Anderson, et.al., (2019) revealed six types of elements of student's participation.

1. Students working together with peers and school staff
2. Students having a voice about schooling
3. Students having a say with influential people at school
4. Students having influence on decisions made at school
5. Student having a voice about school activities outside the classroom and
6. Students having choice

Going by Community of Practice theory which suggests that learning occurs within communities where members share common interests, goals and practices. In an e-classroom, assessing students' attendance and participation can gauge their integration into the virtual learning community, their contributions to shared knowledge and their active participation in group activities.

3. Attendance

Students' attendance is a controversial issue in higher education institutions; however, in my opinion, regular attendance of students in class is an important factor in the learning process, otherwise there would be no need for faculty and classes. Increasing student attendance in class depends on several factors, one of which is its assessment as a participation activity by the student, i.e. to motivate students who regularly attend and to encourage others not to miss classes without good reason. It is preferable to assess the attendance by the end of the term/ semester. Some higher education institutions leave the attendance policy within the hands of the faculty, while others set a general policy with a limit for the maximum percentage of absenteeism. In any case, and to reach a compromise for this debatable area, it is suggested to give it less weight, such as ten percent, with grading depending on the regulations followed by the faculty or the institution. For example, if the maximum allowed percentage of absence is 30%, as implemented in NCT (after which a student may be barred from taking the final exam), then students with more than 90% attendance may be considered to have full points, those with more than 80% attendance, 70% of the points, and those with more than the lowest acceptable percentage of attendance (70% attendance), half the points. Likewise the assessment for different limits of absenteeism may be adjusted accordingly.

4. Student Participation Assessment Process

Teaching staff should use their judgment to select a balance of participation areas that suit the learning outcomes, course nature, availability of time and resources, class atmosphere, and students' background and needs. Student participation assessment can be started from the first class; however, to raise awareness among students and to have an idea of their level, it is necessary first to introduce and discuss the issue with students, and to explain the importance of participation and its assessment. Following this, a formative assessment without grading (Angelo & Cross, 1993; Abuid, 2007) gives a measure of their level(s). The faculty can then decide on the proper area(s) of student involvement and when to start graded assessment.

The grading weight of participation should be considered as part of the total course grade. In NCT, this weight is considered as part of the 30% continuous assessment, while 20% and 50% are given for the mid-term and final exams respectively. The grading weight of the student-participation assessment depends on the assessment policy of the institution. However, if not specified, it may be suggested to carry five to 15% of the total course work grade; Brown University (Tyler, 2008) uses a rate of 15%.

When the areas of participation are decided, the grading weight for each area and the number of times to be assessed can be identified as per the decision of the faculty. To facilitate this, the following guidelines may help to answer several questions that may cross the mind of the assessor.

Issues with online learning include:

- Unreliable Wi-Fi often happens or always happen or sometimes happened
- Unreliable devices
- Lack of social interaction among students.
- Student's main issue was engagement.

5. Methodology

The instrument that was used to collect the data of attendance in the e – class comprised of the following: Date, Period, Time, Staff ID No, Name of Staff, Course Code, Course Title, Course Unit, Topic, Course Content.

Uploaded which showed highlight of content, being record No of students present in class (On-line) comments / Observant.

The instrument used for study was a Unit-developed instrument which was mainly based on the content reflection and attendance of students. Though in the E-classroom, there are many possible online activities in which students in which students can be engaged in and with, which they can be motivated to learn effectively. These include links, lecture notes, resources, questions and answers, discussion forums, quiz items, group works, Wikis and assignment submissions according to Park, Yu, and Jo, (2016). Access gained into classrooms under observation showed one level of participation and class involvement of student online. The time the student joined the classes was also noted. The verbal participation of students showed that college with high average attendance of students online was higher than those with low average attendances of students. Some students joined the classes later than the sterling time of the classes. Thus, they could not participate in the classroom activities as much as those that started earlier.

Research Questions

RQ1: What is the level of attendance of students in the E-classroom?

Research Hypothesis

There is no significant relationship between students' attendance, participation and classroom involvement in e-classroom.

There is no significant relationship between students' participation and classroom involvement in e-classroom.

6. Results

RQ₁:- What is the level of attendance of students in the E-classroom?

The table below shows the percentage of students' attendance on monthly basis during the COVID-19 period in the six (6) schools comprising 27 departments, in Michael Otedola College of Primary Education used for the study for three months and average attendance was recorded.

School of Arts & Social Sciences

S/N	Department	1 st reading	2 nd reading	3 rd reading	Average reading
1	Creative & Cultural Arts	75.00	66.67	33.33	58.33
2	Christian Religious Studies	53.30	40.00	20.00	37.76
3	Economics	85.71	37.50	76.92	66.71
4	Islamic Studies	37.50	57.14	40.00	44.88
5	Political Science	35.71	64.29	42.86	47.62
6	Social Studies	46.60	46.67	38.46	43.91
	Average	48.84	52.33	41.46	47.54

School of Early Childhood & Primary Education

S/N	Department	1 st reading	2 nd reading	3 rd reading	Average reading
1	Early Childhood Care Education	63.12	73.68	88.89	75.23
2	Primary Education	80.00	89.29	74.19	81.16
	Average	72.73	82.98	79.59	78.43

School of Education

S/N	Department	1 st reading	2 nd reading	3 rd reading	Average reading
1	Educational Foundation & Curriculum Studies	42.86	60.00	71.43	58.10
2	General Studies in Education	69.23	85.71	64.29	73.08
	Average	55.56	72.41	67.86	65.28

School of Languages

S/N	Department	1 st reading	2 nd reading	3 rd reading	Average reading
1	Arabic Language	50.00	25.00	42.86	39.29
2	English Language	13.33	33.33	58.33	34.10
3	French Language	25.00	41.67	70.00	45.56
4	Yoruba Language	18.18	63.64	81.82	54.55
	Average	24.00	40.00	61.70	41.90

School of Sciences

S/N	Department	1 st reading	2 nd reading	3 rd reading	Average reading
1	Computer Science	78.57	71.43	76.92	75.64
2	Integrated Science	83.33	83.33	76.92	81.19
3	Mathematics	46.67	53.33	66.67	55.56
4	Physical & Health Education	60.00	72.00	80.00	70.67
	Average	65.15	69.70	75.76	70.20

School of Vocational Education

S/N	Department	1 st reading	2 nd reading	3 rd reading	Average reading
1	Agricultural Science	57.90	57.90	72.22	62.67
2	Business Education (Accounting option)	50.00	62.50	25.00	45.83
3	Business Education (Secretariat option)	50.00	37.50	37.50	41.67
4	Business Education	84.62	30.77	20.00	45.13
5	Home Economics	76.92	53.85	61.54	64.10
	Average	63.49	53.85	50.00	55.78

Lectures were offered daily online (asynchronous). The information on the table was obtained by logging into each teaching-learning period and taking account of the number of students that were in the online classes. The result above shows the attendance of students in the School of Early Childhood and Primary Education with an average of 78.43 percent in the period under study. This was followed by the School of Sciences with an average of 70.20 percent. The School of Education had an average of 65.38 percent; School of Vocational Education had an average of 55.28 percent while the attendance was low in the School of Arts and Social Sciences and School of Languages with average of 47.54 percent and 41.90 percent respectively.

6.1 Hypothesis One

There is no significant relationship between students' attendance and classroom involvement in e-classroom.

Table 2: Relationship between students' attendance, participation and classroom involvement in e-classroom

		Students' attendance	Classroom involvement in e-classroom
Student attendance	Pearson Correlation	1	.307**
	Sig. (2-tailed)		.000
	N	100	100
Classroom involvement in e-classroom	Pearson Correlation	.307**	1
	Sig. (2-tailed)	.000	
	N	100	100

** . Correlation is significant at the 0.01 level (2-tailed).

From Table 2, the data analyzed shows a positive relationship exists student attendance and classroom involvement in e-classroom. Comparing 0.000 level of significance with 0.05 level of significance showed in the result, ($r = 0.307$; $N=100$; $p < 0.05$) indicates a significant low relationship between the two variables. Hence, the hypothesis states that there is no significant relationship between students' attendance and classroom involvement in e-classroom. is rejected.

6.2 Hypothesis Two

There is no significant relationship between students' participation and classroom involvement in e-classroom.

Table 3: Relationship between participation and classroom involvement in e-classroom

		Participation	Classroom involvement in e-classroom
Participation	Pearson Correlation	1	.586**
	Sig. (2-tailed)		.000
	N	100	100
Classroom involvement in e-classroom	Pearson Correlation	.586**	1
	Sig. (2-tailed)	.000	
	N	100	100

** . Correlation is significant at the 0.01 level (2-tailed).

From Table 3, the data analyzed shows a positive relationship existed between participation and teachers' productivity in public senior secondary schools. Comparing 0.000 level of significance with 0.05 level of significance showed in the result, ($r = 0.586$; $N=100$; $p < 0.05$) indicates a significant moderate relationship between the two variables. Hence, the hypothesis which states that there is no significant relationship between students' participation and classroom involvement in e-classroom is rejected.

7. Conclusion

The assessment of students' attendance, participation, and classroom involvement in e-classrooms is a multifaceted endeavor that demands innovative strategies and a keen understanding of the nuances of virtual learning environments. By leveraging advanced technology, fostering interactive learning experiences, and remaining adaptable to the diverse needs of learners, educators can ensure that engagement in digital classrooms is not only assessed but also enhanced. As education continues to evolve, ongoing reflection and adaptation will be essential in optimizing the e-learning experience and fostering student success in an increasingly digital world.

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Generative Artificial Intelligence and Formative Assessment: Perspectives from Higher Education in South Africa

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Abstract: Artificial Intelligence (AI) advancements have increased computer capacity to generate knowledge. Since 1960, computer algorithms and statistical models have enabled machines to learn from data, make decisions, and improve performance in specific tasks. Various industries have benefited from the growth of AI, and tertiary education has been included, with applications such as personalised learning, automated grading, predictive analysis, intelligent tutoring, and plagiarism detection. The advent of generative AI applications threatens to change the scope of formative assessment in higher education. Students no longer apply maximum effort to resolving assessment tasks with the temptation to seek solutions from generative AI applications such as ChatGPT. The accessibility of generative AI applications by tertiary students calls for new strategies in planning formative assessment tasks to achieve the intended objectives. This study explores the impact of generative AI on Formative Assessment for Higher Education. Underpinned by the Interpretivism paradigm, the study adopted a qualitative research approach. The study collected data from students, lecturers, and experts in Educational Technologies. Lecturers and students from various departments at the University of Venda were selected for interviews using probability purposive sampling. The interviews captured respondents' experiences and perceptions of the use of generative AI by students on Formative Assessment tasks. The study applied Thematic Analysis using Atlas.ti software to analyse qualitative data. The study identified the role of formative assessment in HE. The study also established the perceptions of generative AI applications for Formative Assessment in HE and associated challenges. The study contributes to teaching and learning in higher education by establishing strategies for the best practices for using generative AI for formative assessment.

Keywords: Generative Artificial intelligence; AI applications; Computer programming; Teaching and learning; Formative assessment (FA) Higher Education (HE)

1. Introduction

Technological advancement in recent years has seen the development of Artificial Intelligence (AI), making intelligent devices and brilliant computer programmes that make computers understand human intelligence. AI computer systems emulate human intelligence in performing any intellectual work humans may achieve (Okulicz-Kozaryn, Korneliuk, Kupczyk, Kalamán, Jasinowski, Artyukhov, Artyukhova, Malovychko, & Volk, (2023). According to Karan-Romero, Salazar-Gamarra, and Leon-Rios, (2023), AI imitates human intelligence, created by science and engineering in the form of behaviour capable of thinking, learning, and making decisions expressed through technological artefacts. Machine learning is a form of artificial intelligence application that enables the automation of systems (Mohammad, 2020). Machine learning facilitates computers to acquire knowledge and skills without human intervention (Acemoglu & Restrepo, 2018).

AI debuted in the 1950s, as identified by the Dartmouth Conference. The expansion of volumes of data processing, improvement of algorithms, and increase in computer power and memory resulted in the prevalence of AI (Okulicz-Kozaryn et al., 2023). According to Pannu (2015), this century has been marked by vast improvements and applications of artificial intelligence in various industries. Some areas in which AI has dominated include Language and Understanding, Learning and Adaptiveness, Problem Solving, Perception Visualisation, Modelling, Robotics, and Gaming (Acemoglu & Restrepo, 2018). The beginning of this decade has also seen the emergence of generative AI applications, with the popular ChatGPT being one of these. Higher Education teaching and learning has also joined other industries in evaluating ways to leverage AI.

The advent of Generative AI applications has brought about new perspectives in Higher Education teaching and learning. According to Zhaier (2021), Kale, Roy, and Yuan (2020), teaching and learning components in HE includes Instruction, Curriculum Design, Assessment, Feedback, Mentorship, Classroom Management, and Technology Integration. The growing application of AI in higher education teaching and learning comes with the challenge of re-strategizing approaches to these components. This study aims to analyse Formative Assessment perspectives in Higher Education in this era of generative AI. Advancements in big data technologies have led to the increased use of software, such as Turnitin since the late 1990s to limit academic dishonesty on Assessment tasks. The early 2020s marked the availability of generative AI applications such as ChatGPT. These technologies

are a class of machine learning technologies that may generate new content such as text, images, music, or video by analysing patterns in existing data (Brynjolfsson, Li, & Raymond, 2023). Few studies have been conducted on the impact of artificial intelligence and formative assessment in higher education. This study aims to bridge the gap by researching Generative Artificial Intelligence and Formative Assessment: Perspectives from Higher Education in South Africa.

This study is motivated by the need to re-strategies Formative Assessment in Higher Education in South Africa in this era of generative AI. The study established the following objectives:

- Identifying the objectives of Formative Assessment in Higher Education.
- Confirming the relevance of generative AI as a tool for formative assessment for HE.
- Establish perspectives on using generative AI for Formative Assessment in HE.

The study significantly contributes to the ongoing scholarly discussions on the use of generative artificial intelligence in teaching and learning in higher education, underscoring the importance of this research in shaping the future of education.

2. Review of theoretical literature and Conceptual Background

This section reviewed the application of AI in teaching and learning and identified the role of formative assessment in higher education. Understanding the objectives of Formative Assessment in higher education will assist in determining the applicability of generative AI in Formative Assessment.

2.1 Applications of AI in Higher Education

According to Zawacki-Richter, Marín, Bond, and Gouverneur, (2019), the incorporation of AI techniques in education dates to the early 1970s. Recent scholarly research has focused on leveraging AI technologies and techniques to support personalised learning (Wong & Liem, 2022). Personalised learning would allow customising learning depending on the needs and performance of individual learners. Intelligent Tutoring has also benefitted from the incorporation of AI techniques. Knowledge-based tutoring systems, also known as adaptive tutoring systems, use AI techniques to determine what to teach, who to teach, and how to teach it (Zawacki-Richter et al., 2019). Other AI application areas in Higher Education teaching and learning are automated grading and adaptive assessment that facilitates the reception of timely feedback on assessment tasks by learners (Erickson, Botelho, McAteer, Varatharaj, & Heffernan, 2020). Some AI applications in teaching and learning are Learning analytics, content recommendation, Game-based learning, Natural Language processing, virtual learning, and teacher Support (Zhai, Xuesong, Chu, Xiaoyan, Chai, Ching, Jong, Morris, Istenic, Starcic, Andreja, Spector, Jonathan, Liu, Jia-Bao, Yuan, Jing, Li, & Yan, 2021). Figure 1 illustrates how AI systems enhance teaching and learning.

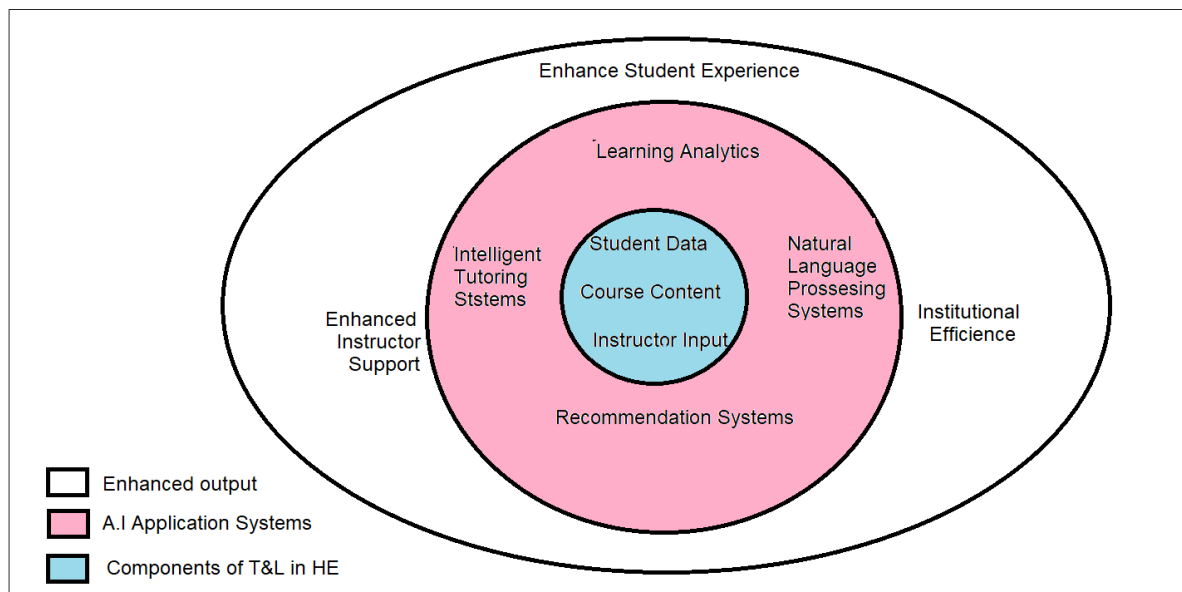


Figure 1: Application of AI in teaching and learning

Source: Fitria, (2021)

Considering the South African context, some institutions of Higher Learning still may not be able to afford some of the latest AI technologies to enhance teaching and learning (Opesemowo & Adekomaya, 2024). However, the recent availability of free generative AI applications has accelerated accessibility by most students, thereby potentially promoting student dishonesty during formative assessment.

2.2 Formative assessment in Higher education

Trumbull and Lash (2013) characterised formative assessment as an activity undertaken by teachers and students to provide feedback usable in modifying teaching and learning activities. Teachers use assessments as an integral part of the instructional process to identify individual learning difficulties and prescribe remediation procedures (Trumbull & Lash, 2013). Formative assessments may take various dimensions, determined by how the assessment activity is designed, executed, or scheduled.

2.3 The Role of Formative Assessment in Teaching and Learning and Prospects of AI

As a fundamental component of education, formative assessment represents an active and collaborative method of understanding and enhancing the learning process. These assessments give lecturers a valuable way to shape their teaching strategies through real-time feedback on student understanding.

2.3.1 Customized Learning

Customised learning, or personalised learning, is an educational approach that specifies the instruction to each student's needs, interests, and abilities. It departs from the traditional one-size-fits-all education model and aims to provide a more effective and engaging learning experience (Menéndez, Napa, Moreira, & Zambrano, 2019). AI captures the specific needs of students and gives feedback based on specific inputs. Engaging with AI also shapes the student's understanding of the task.

2.3.2 Enhancing Motivation and Confidence

Formative assessment serves not only as a powerful tool to assess students' understanding but also to boost students' motivation and confidence. Students receive recognition for their progress and achievements through formative assessment, which increases learning motivation and confidence (Leenknecht, Wijnia, Köhlen, Fryer, Rikers, & Loyens, 2021).

2.3.3 Enhancing Communication Skills

Participating in discussions and joint activities related to common learning goals improves students' communication and interpersonal skills. Students learn to articulate thoughts, listen actively, and express ideas effectively in preparation for academic and professional success (Koka, Brêmane, & Koş, 2023). Feedback from AI derives from the universal standards of the respective disciplines. Students' engagement with AI may enhance eloquence in engaging concepts within the discipline.

2.3.4 Student Engagement

Engagement is the quality of effort that students make cognitively in the educational activities that contribute directly to desired learning outcomes (Groen & Germain-Rutherford, 2021). Formative assessments assist students with student engagement, which leads to academic success (Wong & Liem, 2022). Enlightened students would not hesitate to share notes with fellow students regarding task findings from AI applications.

2.3.5 Sharing Learning Goals

A crucial role of formative assessment is to clarify and communicate to learners the learning intentions and success criteria that were initially the teacher's goals. When teachers share learning objectives transparently, students understand what is expected of them and why they engage in specific learning activities (Wong & Liem, 2022).

2.3.6 Enhancing Real-Time Feedback

Feedback is one of the strongest influences on learning and performance. AI technologies enable immediate and constructive feedback to students engaged in tasks. By using new automated assessment technologies such as natural language processing and machine learning, it is possible to provide automated feedback on students' short written answers (Wisniewski, Zierer, and Hattie, 2020). Advances in automated assessment technologies, facilitates timely feedback on students' work. Automated feedback based on multiple-choice answers is widely used in formative assessment because of its simplicity and convenience (Maier et al., 2016). Pedagogical research on the pedagogical implications of formative assessment using these new automated assessment technologies in real classrooms is just beginning.

2.4 Formative assessment tasks

Assessment tasks should be aligned with the teaching objectives to achieve the desired outcomes. Objectives are structured based on the level of the taught subject. Bloom's taxonomy of educational objectives is a framework for categorising teaching objectives and determining what students will have learned by the end of the teaching activities. Figure 2 illustrates Bloom's taxonomy and the possible general learning objectives.

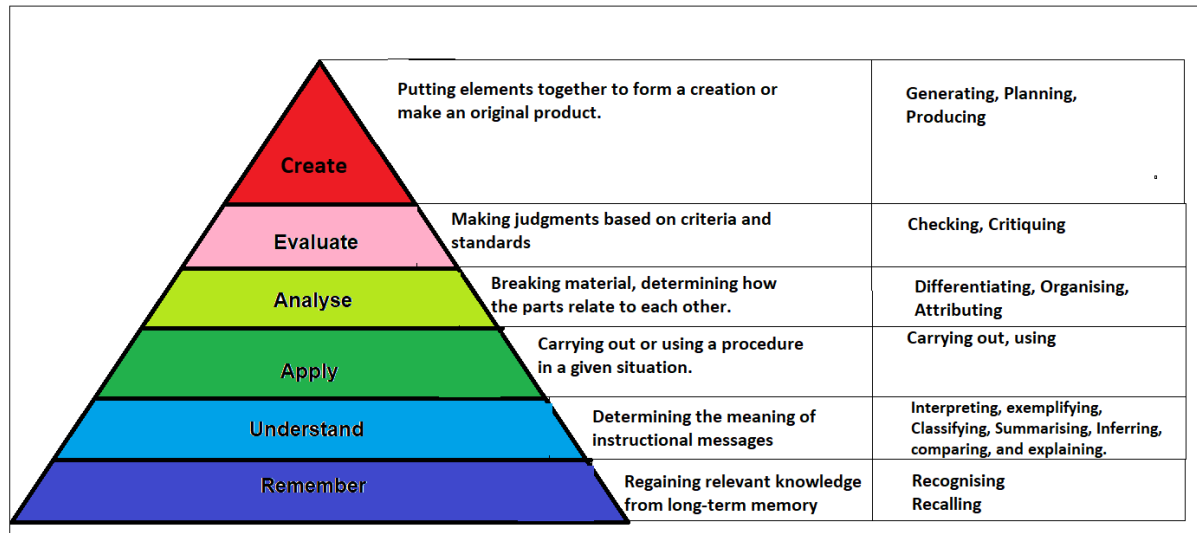


Figure 2: Bloom's taxonomy

Source: (Hwang, Challagundla, Alomair, Chen, and Choa, 2023).

2.5 Challenges of Generative AI in Formative Assessment in Higher Education

The following subsections discuss some of the identified challenges.

2.5.1 Overreliance on Technology

The sudden accessibility of generative AI tools to students in recent years came without warning to curriculum planners. Whilst AI applications are good tools for learners and teachers in their Formative Assessment tasks, lack of formal training on its use has resulted in overreliance. Some learners now turn to AI, even for basic assessment tasks that require individual input (Ivanov, 2022). Resorting to AI applications promotes laziness among students poorly prepared teachers may not identify student dishonesty.

2.5.2 Lack of understanding of AI

Many institutions have yet to establish meaningful support for using AI by students. Lack of proper training on using any technology might result in undesirable results. Proper training may equip learners and teachers with the relevant skills for engaging AI systems to guarantee better results (Velandar, Taiye, Otero, and Milrad, 2024)..

2.5.3 Output dependency on data quality

The output given by AI applications depends on the quality of data available for use by the system, which doesn't guarantee good quality at all times. Research has shown that AI systems' output is biased towards available data (Ntoutsis, Fafalios, Gadiraju, Iosifidis, Nejd, Vidal, Ruggieri, Turini, Papadopoulos, Krasanakis, and Kompatsiaris, 2020).

2.5.4 Ethical concerns

Plagiarism and academic dishonesty are some of the common issues encountered in Higher education. Akgun and Greenhow (2022) identified privacy, surveillance, autonomy, bias, and discrimination as ethical issues arising from using AI in education. Proper training of users is required to appraise the AI users in HE on the ethical implications involved with the use of AI.

2.6 Summary

With the established application of AI in teaching and learning in section 2.1 and the prospects of AI in Formative Assessment discussed in section 2.3, the availability of generative AI applications will reshape the approach to Formative Assessment in higher education. An analysis of the various dimensions of Formative Assessment

shows that some conventional dimensions will become ineffective in this era of generative AI. The methodology of the study is explained below.

3. Methodology

Underpinned by interpretivism, this study adopted a qualitative approach to interrogate the perspectives of Formative Assessment in the advent of generative AI within the Higher Education context in South Africa. Qualitative research tools such as interviews, document analysis and observation were employed. The study focused on understanding students' and lecturers' subjective experiences using generative AI applications for formative assessment in Higher Education. According to Alam (2021), qualitative researchers are inclined to illustrate and explore social issues rather than social structures, and qualitative research is more suitable for understanding the actual behaviour of human interactions, meanings, and procedures that establish actual organisational surroundings.

Based on the survey design, the study sampled students and lecturers from various departments at the University of Venda. Probability purposive sampling was applied to select students and lecturers from various departments for interviews. The purposive sampling method allows the researcher to select the most appropriate objects based on their knowledge and ability to reply to the study queries (Alam, 2021).

The study conducted semi-structured interviews to gain an in-depth understanding of generative AI perspectives from the interviewed sample of students and lecturers. The researchers prepared questions and themes based on the studied phenomena. The study also interviewed specialists in the field of educational technologies. Open-ended questions allowed the specialists to avoid the potential for biased responses (Velandar et al., 2024). The researchers transcribed the interview audio recordings and used the software ATLAS.ti to analyse the data.

4. Findings

The study identified three groups of participants in the survey. As shown in Table 1, twenty students and ten Lecturers from different university departments at the University of Venda were selected and interviewed. Students were tested on the awareness of generative AI applications to qualify for selection. Probing questions were used to identify lecturers who could share more information regarding the discussion topics. The last participants were the Experts in Technology in Education, and two experts participated.

Table 2: Participants

Participants	Number
Students	20
Lecturers	10
Experts in Technology in Education	2

Source: Author, (2024)

Data from the participants was analysed using the framework thematic analysis. Thematic analysis is a process of recognising, analysing, and reporting themes from data, and it is characterised by its flexibility (Alam, 2021). All the information extracted from the interviews was transcribed and imported to ATLAS.ti. Four themes were identified for discussion from the interview data. These include the objectives of Formative Assessment in Higher Education, the relevance of generative AI in formative Assessment in HE, the challenges of using generative AI applications by students for FA tasks, and possible strategies to facilitate the positive use of generative AI for Formative Assessment in HE. The themes were derived from the coding process using ATLAS.ti, and codes were analysed by relating to the findings from the literature review.

4.1 The Objectives of Formative Assessment in Higher Education

Section 2.3 discusses the role of formative assessment as revealed by the literature. Empirical evidence from the interviews confirmed the findings from the literature. Both students and lecturers attested to the relevance of Formative Assessment in teaching and learning in higher education.

4.1.1 Customised Learning

Formative Assessment allows the lecturer to give customised feedback to individual students, which helps address individual student challenges (Mahabeer and Akoo, 2021). The interviewed students expressed satisfaction with the personalised examples of improving their performance. The lecturers also confessed how

Formative Assessment allows them to address individual student challenges and appraise and encourage performing students individually. As part of the response to the interview question, "What is your opinion on

the role of Formative Assessment in your teaching and learning activities?" the following extracts were captured from students' and lecturers' responses.

"It gives me a chance to demonstrate my understanding of the content to the lecturer, which I can't do in a lecture, and the lecturer gives me personalised advice on improving". Student 3. Quote 2.

"Engaging students through their submissions for assessment tasks allows you to understand individual students and their strengths and weaknesses. This is difficult to achieve during lectures where some students never engage you as the lecturer". Lecturer 4. Quote 5.

4.1.2 Enhancing Motivation and Confidence

Leenknecht et al. (2021) alluded to the role of formative assessment in motivating students. Lecturers' feedback can change how students perceive their competence in a particular module and encourage them to improve. This view has also been captured from the interviews with students and lecturers, as quoted below:

"There are modules I only got encouraged after receiving feedback on an assessment task, and I realised I can do better". Student 11. Quote 3.

"You may notice some change in the attitude of some students to the module after giving them feedback on tasks. Some will only start taking the module more seriously than before." Lecturer 3. Quote 2.

4.1.3 Enhancing Communication Skills

Fundamentally, Formative Assessment enhances high-quality communication, relationships, and subject knowledge (Morris, Perry, and Wardle, 2021). In large classes, a few students can engage directly during lectures. Assessment tasks allow students to communicate themselves in the context of the subject matter, which, in turn, will enhance their communication skills. Students and lecturers confirmed that, as captured in some of the quotes.

"Assessment tasks have made me realise that, at times, I think I know, but I just fail to express what I know in the correct language. Feedback from lecturers has always helped me improve before sitting for my final exam," Student 13. Quote 4.

"Some students struggle to express themselves and only improve after a few assessment tasks." Lecturer 9. quote 3.

4.1.4 Enhancing Real-Time Feedback

Feedback is the most important aspect of formative assessment, which may be important in teaching and learning in real-time. Students then reflect and improve before forgetting the content (Wisniewski et al., 2020; Morris et al., 2021). Below are some of the quotes from student lecturer interviews that confirmed this.

"The formative assessment task allows me to reflect on the content taught soon after the lectures. The feedback also improves my understanding of recent lecture content." Student 17. Quote 4

"Formative assessment allows an immediate follow-up to evaluate class objectives and to give remedial action before students forget about the subject content of the class" Lecturer 8. Quote 3.

The students and lecturers interviewed confirmed the established role of Formative Assessment in higher education. Some students were unfamiliar with the term, but once the interviewer revealed what it constitutes, they could identify it and comment accordingly.

4.2 The relevance of generative AI in formative Assessment in Higher education

One of the objectives of this study was to establish the relevance of generative AI in formative assessment in higher Education. Section 2.1 discusses the application of AI in Education in general. An analysis of the role of Formative Assessment in Education also reveals how generative AI may contribute to Formative Assessment. The literature review revealed that generative AI enhances real-time feedback (Thomas, Gatz, Gupta, Lin, Tipper, and Koedinger, 2024), provides motivation and confidence to students (Cao & Dede, 2023), enhances communication skills (Yan, Nakajima, and Sawada, 2024), promotes customised learning (Guo, Yi, and Liu, 2024), and promote student engagement. The interviews with students and lecturers confirmed the above; the following quotes allude to that.

"When using Chat GPT, you can get immediate assistance on tasks anytime and with any queries. The submitted work is immediately graded, and feedback will be given soon after the submission." Student 10. Quote 4.

"In some cases, lecturers use AI to generate assessment tasks particularly targeting certain students based on their performance." Student 13. Quote 4.

"As lecturers, it's easier to use AI to generate and deploy many assessment tasks that will all be graded, and feedback given on time. The tasks might target different student competencies, and the different tasks will encourage students to engage each other without one student having to do the task and allow others to copy." Lecturer 5. Quote 3.

The empirical evidence of extracts from students' and lecturers' interviews confirms the relevance of generative AI in teaching and learning. Students and lecturers appreciate the use of generative AI in teaching and learning.

4.3 Challenges of using generative AI Applications by students for FA Tasks

These challenges are classified under the following: Over-reliance on technology, ethical concerns, poor quality of output, and lack of support. The following quotes from students and lecturers confirm the above:

"As students, we sometimes don't try to understand the tasks given. We rush to Google for answers from the internet. We also copy what comes up, paste it, and then submit it to the lecturer without engaging it. This means the search will be poorly done if one does not understand the task" Student 19. Quote 4.

"I have had problems with lecturers marking me wrong when I have used the internet (Chat GPT) to research answers to certain tasks. One lecturer confused me by saying that not everything online is correct." Student 13. Quote 5.

"Students no longer put effort into tasks. They forwarded the task to Chat GPT and copied what came from there. In most cases, we as lecturers fail to detect plagiarised work due to lack of expertise, and students get away with it." Lecturer 7. Quote 5.

"Institutions are not up to standard with acquiring tools to monitor abuse of generative AI by students who appear to be more resourceful than the lecturers. The lecturers also get lazy and resort to overuse AI to generate and grade assessment tasks." Lecturer 3. Quote3.

The above quotes reveal challenges such as ethical issues, academic dishonesty, overreliance on technology, plagiarism, inadequate data, and lack of support. This calls for an improved strategy to facilitate the effective use of generative AI for formative assessment tasks.

4.4 Strategies to facilitate the positive use of generative AI for FA in Higher education

The study contributed to the effective use of generative AI by considering possible solutions to the challenges proposed by lecturers and students. Interviews with experts in Educational Technologies gave hints on how best to strategise for the excellent use of generative AI for Formative Assessment in higher education (Dwivedi et al., 2023).

Table 3: Strategies to facilitate Generative AI in Higher Education

Challenge	Possible solutions
Overreliance on technology	Students should be advised only to use technology as scaffolding and not entirely depend on it for solutions.
	Use monitoring tools to check plagiarism on student solutions
Lack of understanding of AI	Train students and lecturers on the usage of Generative AI tools
	Lecturers should further engage students to test originality when they suspect fraud.
Output dependency on data quality	Lecturers should know the capacity of AI tools in every task they give.
	The lecturer should devise counter-engagements to improve solutions to tasks further.
Ethical concerns	Licensed tools should be used in the institution to counter academic dishonesty and plagiarism, and lecturers should always be knowledgeable about these tools.

Source: Author, (2024)

5. Discussions

The results suggested that the Objectives of Formative Assessment in Higher Education included customised learning, enhancing motivation and confidence, enhancing communication skills and enhancing real-time feedback. The findings agree with the studies of Mahabeer and Akoo (2021), whose findings indicated that students sometimes ignore feedback. Complimenting the above results is the work by Leenknecht et al. (2021), whose findings suggested that effective feedback positively influences students' actions, involves a dialogue between lecturer and student, and is cyclical, so it must be meaningful and correctly understood before students can correctly implement it.

The findings also demonstrated the significance of generative AI in formative assessment in higher education. This includes the use of Chat GPT, which provides prompt support for assignments and inquiries at any time. By utilising AI, educators may enhance the frequency of assigning work since the process of task creation and generation becomes automated. The findings of Thomas, Gatz, Gupta, Lin, Tipper, and Koedinger (2024) align with the outcomes obtained in this study. Their research indicated that in the Giving Effective Praise lesson, tutors practice reacting to students by offering praise and then getting prompt and standardised feedback provided by LLMs (Cao and Dede, 2023).

The outcomes demonstrated the difficulties encountered by students while utilising generative AI applications for FA tasks, which encompass ethical concerns, academic dishonesty, excessive dependence on technology, plagiarism, insufficient data, and absence of assistance. The investigations conducted by Guo et al. (2024) support the aforementioned conclusions. Their research highlighted the importance of Ethical Considerations and Bias in AI Algorithms, Addressing Privacy and Data Security Concerns, and Empowering Educators to utilise AI effectively. Research conducted by Yan et al. (2024) supports the previous conclusion since it revealed that there are challenges in collaborating with Gen AI in complex learning tasks and considering the differences among students.

Finally, the findings suggested utilising monitoring technologies to detect plagiarism in student responses and develop strategies to enhance task solutions in order to promote the responsible use of generative AI for formative assessment in higher education. The study conducted by Gupta et al. (2024) supports the aforementioned findings. It acknowledges the need to adapt to the fast-evolving educational practices and integrate these changes into our existing educational praxis. Supporting the aforementioned discovery, Dwivedi et al. (2023) conducted research that indicated incorporating generative AI tools into the classroom and instructing students on their constructive and secure usage might equip them with the skills needed to succeed in a work environment dominated by AI after completing their education.

6. Conclusion

The study concluded that the Objectives of Formative Assessment in Higher Education included customised learning, enhancing motivation and confidence, enhancing communication skills and enhancing real-time feedback.

With reference to the significance of generative AI in formative assessment in higher education. The study concluded that the use of Chat GPT provides prompt support for assignments and inquiries at any time. By utilising AI, educators may enhance the frequency of assigning work since the process of task creation and generation becomes automated.

The other conclusion was that both students and lecturers attested to the relevance of Formative Assessment in teaching and learning in higher education. Students and lecturers appreciate the use of generative AI in teaching and learning.

The study also concluded that the difficulties encountered by students while utilising generative AI applications for FA tasks encompass ethical concerns, academic dishonesty, excessive dependence on technology, plagiarism, insufficient data, and absence of assistance.

Lastly utilising monitoring technologies to detect plagiarism in student responses and develop strategies to enhance task solutions in order to promote the responsible use of generative AI for formative assessment in higher education.

7. Contribution and implications

The study contributes to policymakers and education practitioners' assessment policies in higher education institutions. The study also contributes to curriculum development by monitoring technology use in assessment.

In relation to practical implications, policy makers, researchers, educators, and technology experts should work together to start. Conversations on how these evolving generative AI tools could be used safely and constructively to improve education and support students' learning.

8. Research limitations and suggestions for further research

Future research will focus on evaluating the use of generative AI tools in formative assessment tasks to establish the accomplishment of teaching and learning outcomes. This would guide the design of Formative Assessment tasks that eradicate students' abusive tool usage. Assessment tasks should be well-planned to eradicate academic dishonesty. Tools to test plagiarism should be tested to isolate all weaknesses that might be taken advantage of by dishonest students.

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Postgraduate Supervision and Support in Private Universities in Gauteng, South Africa: Challenges and Innovations

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Abstract: In recent years, the landscape of higher education in South Africa has undergone significant transformation, with private universities playing an increasingly vital role. The purpose of this paper is to explore the postgraduate supervision, teaching, and support systems within these private institutions, addressing the unique challenges and innovative strategies in private institutions postgraduate supervision to enhance educational outcomes. This research is particularly relevant for academics, practitioners, and policymakers interested in the development of postgraduate education within private higher education institutions. It underscores the potential of private universities to innovate and adapt in response to the challenges of contemporary higher education, ultimately contributing to the advancement of knowledge and practice in the field. Despite their smaller scale and resource constraints compared to public universities, private universities in South Africa have developed distinct approaches to postgraduate education that prioritise individualised attention, flexible learning environments, and industry-aligned curricula. This study employs a comprehensive research methodology, including a review of institutional documents, such as policy manuals, curriculum guides, assessment rubrics, and support service records, from selected institutions within Gauteng. Additionally, semi-structured interviews were conducted with key stakeholders, including postgraduate students, supervisors, faculty members, and university administrators. The results of this research are expected to help private universities to benchmark their practices against identified best practices and standards. The research highlights the importance of inclusive teaching and learning practices, shedding light on effective methods to accommodate diverse student backgrounds and learning styles.

Keywords: Postgraduate supervision, Teaching practices, Student support systems, Private universities, Educational quality, Inclusive teaching

1. Introduction

Master's and doctorate degrees are fundamental to South Africa's National Plan for Higher Education (Department of Education, 2001). University instructors supervise postgraduate students, and student throughput is a productivity indicator. Private universities have become important actors in South African higher education in recent years. Despite their smaller size and fewer resources than public universities, private schools have grown in higher education, notably postgraduate studies. The supervisory process, however difficult to describe and multidimensional, is comparable to research. According to (Okeke-Uzodike, 2023), supervision is a formal process in which a supervisor helps a supervisee or candidate acquire competent and professional conduct. Few studies have been conducted on postgraduate supervision in private institutions. This study aims to bridge that gap by focusing on South African private institutions. The study is important because it addresses the challenges private universities in Gauteng, South Africa, confront in providing competitive postgraduate education. Private universities have successfully prioritised customised attention and aid for postgraduate students despite several challenges. The study examined Gauteng private colleges and universities' postgraduate supervision and assistance procedures. The study objectives were focused on the challenges and innovations in private university postgraduate supervision in Gauteng. The following sections cover the literature review and model underpinning this study; the research methodology is also given, and the findings are presented under clear themes and codes.

2. Background and literature Review

2.1 Introduction

Understanding the need for effective supervision is crucial for ensuring the success of postgraduate students. However, the current system sometimes does not have a clear professional structure for overseeing postgraduate students in university employment roles, which might hinder the quality of support provided (Costa, 2019; Costa, 2020). The challenges pertaining to postgraduate supervision in South Africa are not exclusive to any specific institution, but rather prevalent at institutions throughout the country (Namakula, 2024; Hansraj & Rampersad, 2022).

2.2 Kadusian Model of Postgraduate supervision

Developed by Dr Amina Kadusi, this model is a student-centric strategy that caters to the unique needs and challenges of postgraduate students.

2.2.1 Key Components of the Kadusian Model

Personalised Mentorship

Individualised Supervision Plans (ISPs) entail that each student is assigned a supervisor who collaborates with the student to create an ISP. It is tailored to the student's specific needs and research interests. Supervisors and students meet regularly (e.g., bi-weekly or monthly) to discuss progress, address challenges, and provide feedback. These meetings ensure continuous support and guidance.

Structured Progress Tracking

The model incorporates a system for tracking key milestones in the student's research journey, such as literature review completion, proposal submission, data collection, analysis, and thesis writing. Students are required to submit regular progress reports (e.g., quarterly) that outline their achievements, challenges, and plans for the next period. These reports help supervisors monitor progress and provide timely interventions.

Collaborative Learning Environment

Students are grouped into research clusters based on their research themes or disciplines. These clusters foster peer support, knowledge sharing, and collaborative problem-solving. Regular workshops and seminars are organised to enhance research skills, provide updates on the latest developments in the field, and offer opportunities for students to present their work and receive feedback.

Professional Development

The model includes training sessions on essential skills such as academic writing, presentation skills, research methodologies, data analysis, and project management. Supervisors provide guidance on career planning, including advice on publishing, networking, attending conferences, and applying for academic or industry positions.

2.2.2 Implication

Initial Assessment

At the start of the program, supervisors conduct a comprehensive assessment of each student's research proposal, skills, and career goals. This assessment informs the development of the ISP.

Development of Individualized Supervision Plans

Supervisors and students collaboratively develop ISPs that detail the research objectives, timelines, and milestones. The ISP is a living document that is updated regularly to reflect the student's progress and any changes in research direction.

Regular Monitoring and Feedback

Supervisors monitor student progress using milestone tracking and progress reports. Regular feedback is provided during one-on-one meetings and through written comments on progress reports.

Facilitation of Collaborative Learning

Research clusters and collaborative activities are established early in the program. Supervisors encourage active participation in these groups and organise workshops and seminars relevant to the students' research areas.

Continuous Professional Development

Professional development activities are integrated throughout the postgraduate program. Supervisors identify opportunities for skills training and career development and encourage students to participate in relevant activities.

2.2.3 Benefits of the Kadusian Model

The personalised and structured approach ensures that students receive continuous support tailored to their individual needs, leading to higher satisfaction and reduced attrition rates. Regular feedback and milestone tracking help maintain high standards of research quality and ensure the timely completion of research projects.

Implementing the Kadusian model requires significant resources, including time, trained supervisors, and administrative support. Institutions need to ensure they have the necessary infrastructure and personnel.

2.3 Availability of postgraduate assistance and facilities

The achievement of postgraduate research students, irrespective of the learning method, depends on the cooperation between students and supervisors, as well as the existence of strong support networks inside universities (Maphalala & Mpofu, 2018). According to Saidi (2024), there are several important variables that must be addressed to increase access to and success in postgraduate education. These factors include student funding, supervisory capability, and support services. In addition, initiatives by the Department of Higher Education and Training seek to enhance research productivity, specifically among disadvantaged postgraduates and distance learners (Matatiele, 2024). Postgraduate supervisors in South Africa frequently get research incentives as specified in the South African Research Funding Framework of 2003 (Ngulube, 2021). Many students lack the research methodologies and expertise necessary to succeed in postgraduate (Lee, 2010). Without considerable skill improvement and sufficient support, they might not be able to pull through.

2.4 Availability of expert postgraduate supervisors

According to Kiani and Jumani (2010), supervision entails not only helping students develop their research skills but also helping them build their self-esteem and providing guidance so they can become independent researchers with the capacity for conceptualisation and critical thought. However, there are obstacles that need to be addressed, such as supervisors lacking expertise and being overwhelmed with responsibilities, inadequate preparation for research, and insufficient financial assistance for postgraduate students (Cobbing et al., 2017). These obstacles can impede the academic advancement and achievement of graduate students, especially in universities with a history of disadvantage. The C.O.S.T.A. Postgraduate Research Coaching Model provides an alternative method to conventional supervision, emphasising rigour, psychology, and coaching to improve the postgraduate research process (Costa, 2019; Costa, 2020). Coaching models can offer further help and direction to students that go beyond conventional supervision approaches. The recruitment tactics for postgraduate students in South Africa, which involve forming foreign alliances to boost the enrolment of PhD students, have a substantial impact on the postgraduate education environment (Konyana, 2023).

2.5 Private institutions in Gauteng, South Africa

South Africa provides many private and independent higher education institutions for different needs and specialities. These institutions are categorised by ownership, funding, and programmes.

2.5.1 For-profit private universities

Private universities are owned by individuals or corporations and operate for profit. They provide many undergraduate, postgraduate, and professional programmes. Monash South Africa, currently part of IIE's Varsity College, and Pearson Institute of Higher Education are examples.

2.5.2 Non-Profit Private Universities and faith-based

Non-profit private universities aim to be non-profit. Any excess revenue goes to improving teaching, infrastructure, and student services at these colleges. They often get major charity support and have religious or non-profit associations. South African schools include St. Augustine College and Cornerstone Institute. Educational institutions affiliated with religious groups impart religious values and teachings. These colleges offer programmes in theology, religious studies, and the liberal arts, among other things. Seventh-day Adventist Helderberg College and Islamic Regent Business School are examples.

2.5.3 Specialised Institutions

These institutions specialise in business, technology, and the arts. They offer undergraduate and postgraduate degrees known for their expertise. AFDA focuses on film, TV, and performance, while the Da Vinci Institute develops management and leadership skills.

2.5.4 Distance-learning and TVETs

Distance education providers offer online and distance learning programmes. They provide flexible learning choices for people with employment, regional, or personal constraints. Examples include MANCOSA (Management College of Southern Africa) and UNISA (University of South Africa), which is publicly sponsored and offers many remote learning programmes. Private TVET colleges emphasise practical skills and job readiness. Students receive certifications to prepare for specific careers. They are crucial in addressing skills gaps in various economic areas. Such schools include Boston City Campus and Business College.

2.5.5 *International Branch Campuses and Professional Institutions*

International universities have branch campuses in South Africa that provide curricula identical to those abroad. Examples include Henley Business School South Africa, a subsidiary of Reading University in the UK, and Monash South Africa, originally affiliated with Monash University in Australia. Professional institutes prioritise education and training in certain professions, often with industry associations providing professional certification programmes. Accounting, finance, and legal use them frequently. SAICA and ICSA are notable instances.

2.6 **Accreditation, Autonomy, of private colleges and universities in South Africa**

The Higher Education Act of 1997 (Act 101 of 1997) regulates private colleges and universities in South Africa to guarantee high standards and student safety. DHET, CHE, and SAQA oversee higher education in South Africa. Creating a private company takes several crucial actions. Registering with the DHET is mandatory for private universities. Governance, financial stability, academic excellence, and infrastructure are required to register. Document academic curricula, governance structures, budget estimates, and quality assurance (Act 101 of 1997). The DHET inspects institutions rigorously for compliance. Private institutions can choose and hire staff according to their needs. This lets them invite industry leaders and experts with real experience and great ideas to offer in the classroom. They can set their own job terms, performance evaluation methods, and professional development programs, creating a dynamic and adaptive academic environment.

3. **Methodology**

The study adopted an interpretive qualitative approach utilising document analysis and semi-structured interviews underpinned by an exploratory research design in order to unpack unknown challenges and innovations of postgraduate supervision (Saunders et al., 2019; Sekerani & Bourgie, 2019). The study population included all postgraduate students, supervisors, faculty research committee members, and university administrators from the five selected institutions. The study also used policy manuals, postgraduate supervision and assessment manuals, and support service records. Purposive sampling was used to select the participants, with each institution contributing four study participants. Twenty representatives from the selected private institutions were interviewed semi-structured. Conducting semi-structured interviews with postgraduate students, supervisors, faculty research committee members and university administrators in five selected institutions helped provide qualitative information on the actual experiences and viewpoints of the individuals involved. Data analysis followed the major research issues indicated in the topic. It assumed a thematic approach based on the findings on challenges and innovations in private institutions' postgraduate supervision. The study also used content analysis to read and analyse institutional procedures by evaluating policy manuals, postgraduate supervision and assessment manuals, and support service records to provide a detailed analysis.

4. **Findings**

4.1 **Data presentation from document analysis on postgraduate programmes in private institutions**

Data presentation for this study assumes a thematic approach driven by the major findings that emerged from the study.

4.1.1 *Structure of postgraduate studies in private institutions in Gauteng, South Africa*

The postgraduate courses in private universities in Gauteng are structured to provide flexibility, personalised attention, and alignment with industry requirements. These establishments generally provide a variety of advanced academic programmes, such as Honours degrees, Master's degrees, and Doctoral degrees.

4.2 **Types of Postgraduate Programmes**

4.2.1 *Honours and Masters*

Postgraduate honours degrees are first-level. The curriculum takes one year for full-time students and two for part-time students. Honours courses typically entail coursework and research, depending on the university and topic. Research normally incorporates a thesis or research project, whereas education includes fields-specific modules. Short honours projects are typical. These programs strengthen students' field expertise and prepare them for master's or professional study. Students conduct real research in the master's program. Full-time study takes 1–2 years, part-time 2–3 years. Most master's degrees are research-based, although some are coursework-based or a blend. Curriculum-based degrees comprise modules and a mini-project or dissertation. An evidence-based master's emphasises a significant thesis or research project under supervision. Research and academic courses are expected in a combined master's. Students learn specific information and research abilities in such programs for professional or doctorate work.

4.2.2 PhDs and professional doctorates

Private universities' highest postgraduate research-based degree. It usually lasts 3–5 years. Doctoral degree programmes emphasise research and require students to conduct original research in their subject. Coursework may be required for some professional doctorates. Programmes like an MBA leading to a Doctor of Business Administration exist since most private schools focus on industry-related certifications, and most doctorate degrees are in administration or professional knowledge. These programmes develop advanced research, critical thinking, and field expertise. Graduates are prepared for academic, research, and high-level professional careers.

4.2.3 Postgraduate Components and Evaluation

This study found that most postgraduate courses need previous research modules for research postgraduate students. These courses deliver significant information on the student's subject and are often created with industry experts to ensure relevancy and usefulness. Recent research, methodologies, and practices are presented to postgraduates in seminars where industry leaders and academics make presentations. After research methodologies pre-research programs, postgraduate students must create a research proposal. Postgraduate students must propose their topic, method, and results. Postgraduate evaluations may involve tests, tasks, projects, and presentations, depending on the degree. The study concluded that internal and external examiners assess theses and dissertations for originality, rigour, and contribution. Most internal examiners evaluate honours and first-level postgraduate degrees. Approved examiners review masters and PhD theses. External examiners are private or part-time public academics. The student can defend their research in viva voce.

4.3 Data presentation from semi-structured interviews

Table 1 Semi-structured interview participants

Institution	Postgrad Students	Academic staff	Admin staff	Totals
A	2	1	1	4
B	2	1	1	4
C	2	1	1	4
D	2	1	1	4
E	2	1	1	4
Totals	10	5	5	20

Source: Authors, 2024.

The framework thematic analysis was used to analyse participant data. Thematic analysis is a versatile method that involves identifying, evaluating, and summarising themes from data (Saunders et al, 2019, Alam, 2021). After the interviews were conducted, all of the material was transcribed and added to ATLAS.ti. From the interview data, two main themes were established in line with the study objectives. Further, sub-themes emerged, which were discussed in line with these two main themes. Respondents' labels were created as follows: Supervisor (PS), Administrator (PA) and students (PGS).

4.3.1 Supervision and staffing in private colleges and universities

The interviews started by establishing the staffing situation within these private institutions. This inquiry was addressed to the staff of chosen institutions. Most private universities surveyed prioritise hiring highly educated academics with advanced degrees, research experience, and industry expertise. This ensures that students receive high-quality education and mentorship.

Participant PGS1: in this institution, we recruit industry professionals as adjunct faculty or guest lecturers to provide extra knowledge and real-world perspectives that complement academic learning. Together with our full-time staff, they play a central role in curriculum development, academic planning, and overall research. Adjunct staff, commonly referred to as part-time lecturers, bring specialised knowledge and expertise, enriching the academic offerings.

The inclusion of staff members from established public universities ensures that the gap is narrowed and that postgraduate students from private colleges end up at the same level as their counterparts in public institutions.

Participant PA2: Every student is allocated a supervisor or a supervisory committee to offer direction and assistance during the research process. Supervisors are usually seasoned academics who possess specialised knowledge in the student's study field. Postgraduate students are provided with a range of workshops and training programmes to enhance their research capabilities, academic writing abilities, and professional competencies.

The response above reveals that these institutions offer a variety of support services, such as academic guidance, access to library materials, writing assistance, and career guidance

4.3.2 Challenges in postgraduate supervision in private institutions in Gauteng

This survey sought to identify problems with postgraduate supervision in private institutions. Private institutions have autonomy and a legal framework for innovation and reaction, yet respondents believed they encounter issues.

Participant PGS3: In our discussions with other students from public institutions, we find we face a number of challenges as we prepare to embark on our studies, like the amount of time allocated to access supervisors.

On the other hand, administrators acknowledged that private universities encounter various obstacles that can hinder their capacity to provide high-quality postgraduate education, notwithstanding the benefits they offer.

Participant PA4: In private universities, unlike public ones, we do not receive direct financial support from the government. As a result, we must depend on tuition fees and private investments to sustain ourselves. This financial model restricts our ability to allocate funds towards research facilities, faculty development, and comprehensive student support programmes. Unfortunately, we are expected to still comply with specific criteria despite their limited resources, frequently requiring them to employ creative strategies to guarantee postgraduate students receive the necessary guidance and support.

4.4 Specific challenges in postgraduate studies supervision in private institutions

The study established a number of challenges, as pointed out by the interview respondents. However, the challenges can be summarised into three main challenges: the lack of unified form across all postgraduate programmes, understaffing in experience supervision, and the limited choice of postgraduate areas of study due to the influence of the two challenges above.

4.4.1 Lack of Supervisors

All the respondents acknowledged this challenge. Postgraduate respondents felt that because private institutions rely heavily on part-time staff from industry and public institutions, they often face a shortage of qualified supervisors, which can limit their capacity to support postgraduate students effectively.

Interviewee PGS3: It seems like the supervisors do not have the knowledge to guide us through it. it is difficult to follow instructions during supervision.

Participant PS2: There are very few of us who are dealing with postgraduate supervision; this will result in an increased workload for existing supervisors.

Participant PS4. Current full-time members are overwhelmed with high supervision loads, impacting the quality of mentorship and feedback.

Participant PS5: Since postgraduate studies rely on the generation of new knowledge, limited access to specialised expertise becomes real. Students may struggle to find supervisors with expertise in their specific research areas, potentially hindering the depth and scope of their research.

Participant PA1: The scarcity of supervisors leads to delays in assigning supervisors to students, which can slow down the research process and extend the time required to complete degrees.

4.4.2 Lack of unified formats

The study indicated earlier that private colleges and universities affiliate with international institutions and organisations outside of South Africa. In some cases, one private institution may subscribe to different international institutions for each specific faculty or department.

Participant PA2: We subscribe to different partners. For example, management studies may not be the same for ICT or other scientific-related college departments. That means one institution may end up accommodating a variety of postgraduate structures and formats to suit different offerings. This multiplicity of templates and formats for postgraduate programmes leads to inconsistencies in programme delivery, supervision, and assessment across different private institutions.

Participant PGS1: The implications of the absence of a unified format will result in a number of challenges. Without a unified format, the quality and rigour of postgraduate programs can vary significantly between institutions, affecting the credibility and recognition of degrees.

Participant PS3: Postgraduate students in the same institution may not be able to share and work together across faculties and departments. Students may face confusion due to differing programme structures, requirements, and assessment criteria, potentially impacting their academic experience and outcomes.

These responses ultimately indicate that benchmarking all postgraduate studies in an institution will be a challenge. The lack of standardisation makes it difficult to benchmark programmes against national and international standards, hindering continuous improvement efforts.

4.4.3 Limited choices of field of study

The final major challenge that the study revealed was the limited choice of areas to study within each institution. The study discovered that these private colleges offer a limited range of fields of study for postgraduate programmes, restricting students' options and potentially impacting their career aspirations and research interests.

Participant PA1: Due to their size and budget, private universities cannot offer everything in the academic arena at the postgraduate level.

This results in narrow academic and research opportunities for students enrolled in private institutions.

Participant PS2: Due to limited options, students may have to compromise on their preferred fields of study, which can affect their academic satisfaction and career prospects.

Participant PS5: One big challenge is the ability of private institutions to attract a wider range of prospective students.

Participant PGS1: they limit our range of postgraduate programmes, which makes private institutions less attractive to prospective students seeking specialised or niche areas of study.

The lack of diverse fields of study has been seen to stifle innovation and opportunities for interdisciplinary research, which are crucial for addressing complex societal challenges.

4.4.4 Recognition of qualification in the market

In a wide market where employees are recruited from both public and private institutions, employees tend to doubt the credibility of qualifications obtained from private institutions. This challenge was raised by both the students and postgraduate supervisors.

Participant PGS3: we are not sure if our qualification can be accepted if I want to progress at a public institution. I want to complete my masters and do doctorate.

Participant PGS4: I want a qualification that competes everywhere. I hear someone say this one is not good in some companies.

Participant PA5: Our programmes are competent because we affiliate with reputable international institutions. It is up to the companies to rate us.

Participant PA4: We have heard something like that, but we are registered with DHET, which means we are offering competitive programmes.

All administrative staff in postgraduate offices expressed trust in their products, although they acknowledged other organisations might doubt them.

Participant PS2: I don't think that will be a problem because, in most cases, the same supervisors in public institutions are also supervising here. The product is the same

4.5 Innovations for Quality Assurance in Postgraduate Supervision

Due to the foregoing challenges, private universities have developed various innovative postgraduate alternatives. These include personalised supervision methods that focus on students, technology to enable flexible learning, and business partnerships to make academic curricula more relevant and practical. These strategies help private universities overcome resource constraints and become flexible higher education institutions.

4.5.1 Professional Development for Postgraduate Supervisors

Professional development for postgraduate supervisors is crucial to ensuring high-quality supervision and the successful completion of postgraduate studies.

Participant PA1: Tailored professional development programs are essential in private universities, because resources and institutional support structures may differ significantly from public universities.

Participant PA2: development programmes help supervisors stay updated on best practices, enhance their skills, and address the unique challenges of supervising postgraduate students in private institutions.

Participant PS2: Effective supervision requires a range of skills, including mentoring, project management, conflict resolution, and academic advising. Professional development programs provide us with the tools and techniques necessary to guide our students successfully.

Participant PS4: Professional development helps maintain high standards of supervision across the institution, ensuring that all students receive consistent and high-quality guidance.

The academic landscape is constantly evolving, with new research methodologies, technologies, and educational paradigms emerging. Continuous professional development ensures that supervisors remain current and can adapt to these changes.

4.5.2 Student Support Services for Postgraduate

Effective student support services are essential for the success of postgraduate supervision. These services help students navigate academic research challenges, manage personal and professional responsibilities, and achieve their research goals. According to the interview responses, various tailor-made support services are crucial in private universities due to the unique environment and resources available.

Participant PGS: we propose the establishment of writing centres. Writing centres provide one-on-one consultations, workshops, and resources to help students develop their academic writing skills. This is a common phenomenon in public institutions in South Africa.

Participant PA4: Students have proposed regularly conducting research methodology workshops, which offer training in research design, data collection, and analysis techniques specific to various disciplines. We always do that regularly.

The rest of the postgraduate students and their supervisors also agreed that postgraduate students proposed the creation and belonging to *Thesis/Dissertation Support Groups*. These groups facilitate peer support groups where students can share feedback and advice on their research projects.

4.5.3 Introduction and exposure of postgraduate students to current software applications

The study established that private institutions have incorporated current software applications in the postgraduate studies which assist students with their research. Many software programmes are available to postgraduate students to help with many of their academic and research demands. These programmes cover project management, data analysis, writing and referencing, productivity, collaboration, and research management.

Participant PA1: as an institution, we have subscribed to a number of software applications to assist our postgraduate students in managing their studies

Participant PA2: We are currently checking and subscribing to all the latest softwares that are used for data presentation and analysis.

Participant PS1: I know that postgraduate students have access to software, but I am not good enough to teach them.

Participant PS3: our work is assisted by the software that is available to the students here. I am afraid they are now using too much AI applications, too

PGS2: Our studies work because we use applications here. I also use ChatGPT to help me

Participant PGS4: I need more training, but the softwares makes it easy to present findings and analyse.

The study revealed that storage, filing, data presentation and analysis, as well as referencing, are all supported by a variety of software applications.

4.5.4 International Affiliation

All the selected private institutions acknowledged affiliation to international reputable universities. International linkages boost South African private colleges and universities' intellectual and operational

capabilities. Alliances, joint enterprises, shared efforts, and satellite campuses are examples of these partnerships. These partnerships offer access to worldwide academic standards, cooperative research, and improved reputation and student attractiveness. Several private institutions in South Africa function as satellite campuses of international universities.

Participant PA1: our institute provide programmes that are comparable to those provided at the main university, giving students qualifications that are recognised worldwide.

An example is the Henley Business School South Africa, which functions as an affiliate of the University of Reading in the United Kingdom.

Participant PA2: As a private institution, we have formed collaborations with international universities to provide joint or dual degree programmes. These agreements enable students to divide their studies between South Africa and a foreign partner institution, resulting in the attainment of degrees from both schools.

An example of a partnership is the collaboration between Monash South Africa (now a member of IIE MSA) and Monash University in Australia.

Participant PS1: International research collaborations allow us to actively participate in global postgraduate research programmes, have access to state-of-the-art research facilities, and interact with a wider academic community.

Participant PGS1: I like the exchange programme because it allows me to learn international things in research. I benefited from attending international Webinars on research with overseas universities.

Participant PGS3: these international links make us international too

These programmes offer chances for cultural interchange, exposure to diverse academic settings, and enriched learning experiences. Several private universities seek accreditation from international accreditation groups to guarantee that their programmes adhere to global standards.

Participant PS4: Membership in international higher education organisations and networks improves the institution's reputation and offers opportunities for collaboration and benchmarking.

4.6 Discussion of findings on Challenges and Innovations

This study was carried out in order to establish the challenges and innovations that private institutions of higher learning are having to deal with in their postgraduate programmes.

4.6.1 Challenges

The major challenges that emerge from the study are the lack of sufficient qualified supervisors, different curriculum frameworks, and the failure to synchronise the postgraduate templates. The success of postgraduate research students, regardless of the instructional approach, relies on the collaboration between students and supervisors, as well as the presence of robust support systems inside institutions (Maphalala & Mpofu, 2018). Saidi (2024) identifies some crucial factors that need to be considered to enhance both the availability and achievement in higher education at the postgraduate level in South Africa. The study established that a shortage of supervisors or a delay in appointing supervisors to students might delay research and degree completion (Thompson et al., 2005). As such, private colleges' qualifications may not be competitive, as some organisations may not accept these graduates.

4.6.2 Innovations

The findings of the study established that private institutions hire industry professionals as guest-supervising lecturers to supplement academic learning. Their work influences curriculum, academic planning, and research. Part-time instructors, often comprising industry experts or public university academics, contribute valuable information and expertise. Supervisors often consist of highly knowledgeable academics with competence in the student's specific field of study. Many colleges provide mentoring schemes in which seasoned professors or industry experts provide guidance and assistance for career development. This confirms the earlier study by the C.O.S.T.A. Postgraduate Research Coaching Model, which provides an alternative method to conventional supervision, emphasising rigour, psychology, and coaching to improve the postgraduate research process (Costa, 2019; Costa, 2020). The study showed that institutions use joint research, publishing, and international conferences to improve postgraduate supervision programmes. They agreed that exchange programmes enable students and faculty travel between South African private universities and abroad.

5. Conclusion

The study concluded that private university postgraduate students, administrators, and supervisors face challenges, and they have devised innovative solutions to manage their programmes. The study provides advanced strategies and established norms for supervising and supporting postgraduate students. These institutions can serve as exemplars for other educational establishments, promoting the implementation of effective methods across private colleges in South Africa and potentially beyond.

6. Recommendations

It is recommended that experienced supervisors work together with less experienced faculty members in order to promote their own development as supervisors. There is a compelling argument in favour of having many supervisors. Students benefit from this in several ways, including the improvement of the supervisory process via the incorporation of other perspectives, the alignment of the approach to the issue, and the effective combination of methodological expertise.

7. Limitations of the study

Gauteng's private universities vary in focus, resources, and size. Due to this diversity, research findings from one institution may not apply to another. Further studies will expand to other provinces.

8. Contributions of the study

The investigation's findings should help private institutions evaluate and improve their operations in accordance with best practices and standards for postgraduate supervision. These can inspire efficient methods in South African private colleges and beyond.

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