

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 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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