ChatGPT-Proofing: Redesigning Assessment Practices for E-Learning

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Abstract: The 21st century has ushered in a profound transformation in the realm of education, fueled by the widespread integration of e-learning, fueled by technological advancements and the pursuit of adaptable and accessible learning modalities. As the e-learning landscape continues to evolve, a pertinent question emerges: Do conventional assessment methods align effectively with the exigencies of the digital era and the competencies imperative for thriving in the knowledge economy? This systematic literature review undertakes a comprehensive exploration of this significant question. Through a meticulous synthesis and analysis of a diverse body of existing research, this review effectively brings to light compelling evidence that underscores the pressing need for the redesign of assessment practices within the context of e-learning. In probing this multifaceted subject, the review critically examines how traditional assessment approaches may fall short in capturing the intricacies of modern-day skillsets, critical thinking proficiencies, and adaptability demanded by the swiftly evolving digital landscape. In its conclusion, this study serves as a pivotal catalyst for change, illuminating the urgency and potential benefits of reimagining assessment practices for the dynamic realm of 21st-century e-learning. Based on the findings, it provides stakeholders with prudent and actionable recommendations, empowering them to embark on a purposeful journey of redesigning assessment strategies. By proactively embracing these recommendations, educators, policymakers, and institutions can engender a learner-centric ecosystem that optimally nurtures and empowers learners for a future defined by innovation and adaptability.

Keywords: ChatGPT, Generative AI, e-Learning, Assessment Methods, Higher Education

1. Introduction

The advent of the 21st century has brought about a remarkable transformation in the field of education, primarily driven by the rapid advancement of technology (Ebner et al., 2020). As digital technologies have revolutionized the way knowledge is acquired, disseminated, and accessed, e-learning has emerged as a prominent mode of education delivery, offering unprecedented flexibility and accessibility to learners worldwide (Ebner et al., 2020). However, despite the remarkable progress in e-learning methodologies, the assessment practices employed in this digital era often lag behind, relying on traditional methods that have roots dating back to ancient times. This paper delves into the critical issue of assessment practices in 21st-century e-learning environments and examines the extent to which these practices align with the dynamic and evolving educational landscape. Specifically, we explore the idea that contemporary e-learning, coupled with transformative language models like ChatGPT, has unveiled the shortcomings of traditional assessment methods, which are reminiscent of practices from as early as the 7th century.

In recent years, the integration of artificial intelligence (AI) and natural language processing (NLP) technologies into e-learning has provided new avenues for personalized and adaptive learning experiences (Baidoo-Anu & Owusu Ansah, 2023). Among these AI-powered innovations, ChatGPT, an advanced language model developed by OpenAI, has significantly reshaped the landscape of human-computer interaction and information processing. ChatGPT's ability to generate coherent, contextually relevant responses and its capacity to simulate human-like conversation have sparked a need for reevaluation of traditional educational practices, including assessments (Gundu, 2023).

The 7th-century assessment methods, characterized by written examinations, oral recitations, and tests which were all memorisation-based evaluations (Monroe, 1905), and have become questionable. These have served as the primary means of evaluating knowledge and understanding for centuries. While these methods may have been suitable for the educational needs of their time, they fail to accommodate the multifaceted demands of modern e-learning environments (Bryan & Clegg, 2019). The dynamic nature of digital education requires assessments that can assess critical thinking, problem-solving, creativity, collaboration, and adaptability skills that are pivotal in a rapidly changing world (Cahapay, 2020).

The transformative potential of ChatGPT and similar AI technologies in e-learning has highlighted the need for a paradigm shift in assessment practices as students can use these technologies to generate answers for assessments. This has shown a need to shift from static, standardised assessments to dynamic and adaptive evaluations for lecturers to have a deeper understanding of the students' progress (Cotton et al., 2023).

In this paper, we investigate the challenges in the current assessment methods and discuss opportunities in redesigning assessment practices for e-learning in the 21st century, with an emphasis on fostering a learner-

centric approach that nurtures creativity, critical thinking, and a growth mindset. Additionally, we explore how AI technologies can complement human expertise, enabling educators to focus on mentorship and personalized guidance.

Ultimately, this paper aims to shed light on the transformative potential of e-learning assessment practices, prompting educators, policymakers, and stakeholders to reconsider the traditional methods inherited from the past by exploring explore alternative assessment methods, such as project-based evaluations, portfolios, and performance assessments can better assess students' critical thinking, creativity, and problem-solving skills vs assessing knowledge retainment. These innovative assessment approaches seem to align better with the evolving needs of learners and the ever-changing knowledge economy.

The rest of the paper is structured as follows, next, the background of the study will be discussed followed by the purpose and objectives of the study. A literature review and methods applied will then be discussed, these would then be followed by findings and discussion of the findings. The paper will round up with a conclusion that will discuss the recommendations and possibilities for future studies.

1.1 Background

There has been a significant shift in the way teaching and learning occur, with advancements in technology playing a major role. Some popular learning methods of the 21st century include online learning, gamification, mobile learning, personalized learning, project based learning, social learning and artificial Intelligence assisted learning (Cahapay, 2020). The internet and advancements in online education technology have made it possible to access courses and educational content from anywhere in the world. The Use of game elements in non-game contexts, such as education, to motivate and engage students has also been noticed in the education environment of this day and age (Manzano-León et al., 2021). Most students have a mobile device of some sort, be it a smartphone or a tablet. The use of these devices for learning purposes, including educational apps, podcasts, and mobile-responsive e-learning platforms has also been greatly reported in literature. Social learning through interactions with others, including peers, instructors, and mentors has also been reported as a common form of teaching and learning. The surfacing of ChatGPT in November 2022 has led to a rise in the use of artificial intelligence to enhance the learning process (Baidoo-Anu & Owusu Ansah, 2023).

Some commonly used assessment methods in universities are tests, exams, essays, projects and group work. While the objective of tests and exams is to measure a student's knowledge and understanding of the course material, essays are written assignments that require students to critically analyze and present their arguments on a given topic (Bryan & Clegg, 2019). On the other hand, projects are meant to be hands-on assignments that challenge students to apply their learning to real-world scenarios. Presentations are oral assessments that allow students to demonstrate their knowledge and communication skills. And lastly, group work is collaborative assignments that assess students' teamwork, leadership, and problem-solving skills (Brown, 2019). Although this shows a broad array of assessment techniques, usually most weight is put on exams and tests which this paper regards as a weak assessment method mainly because ChatGPT can generate answers for such. But besides that, this method was not relevant anymore because of the following limitations and drawbacks.

Exams and tests:

- have a Narrow focus, they typically assess only a limited set of knowledge and skills, and may not provide a complete picture of a student's understanding of the material (Eltahir et al., 2022).
- Exams and tests can often place too much emphasis on memorisation, rather than critical thinking and problem-solving skills (Sato et al., 2015).
- can create stress and anxiety for students, especially if they are high-stakes or the sole basis for grading. This can lead to poor performance and can detract from the overall educational experience (Woldeab & Brothen, 2019).
- typically only assess what students have learnt, rather than their ability to apply that learning in new and creative ways (Awad Ahmed et al., 2021).
- often provide limited feedback to students, which can make it difficult for them to identify areas for improvement and to learn from their mistakes (Winstone & Boud, 2022).
- can sometimes be culturally biased, as the types of questions and methods of assessment may not be equally accessible to all students, particularly those from non-dominant cultural groups (Dahlgren & Hansen, 2015).

1.2 Purpose of the study

The purpose of this study is to investigate and expose the ineffectiveness of 7th-century assessment methods in 21st-century e-learning environments and to redesign assessment Practices with more learner-centric evaluation strategies.

1.3 Objectives of the study

The objectives of this study are as follows:

1. Exploration of the historical roots and origins of assessment methods and identifies traditional practices that date back to ancient civilizations. By understanding the historical context, the research establishes a foundation for evaluating the persistence of these methods in modern e-learning environments.
2. Investigating the effectiveness of traditional assessment methods and their relevance to 21st-century e-learning.
3. Propose reforms in assessment practices in e-learning environments based on the findings.
4. Provide recommendations for educators, policymakers, and stakeholders on how to redesign assessment practices in 21st-century e-learning.

2. Literature review

There has been a great shift in the way learners engage with information and interact with educators. With advancements in artificial intelligence and natural language processing, language models like ChatGPT have revolutionized human-computer interaction, sparking discussions about their impact on educational practices. This literature review critically examines the role of traditional methods of assessments in the era of ChatGPT and similar AI technologies.

2.1 Different subjects have different assessment requirements

Different subjects have different assessment requirements (Shraim, 2019), however, this study has a special emphasis on assessment requirements for practical subjects. Practical subjects refer to academic areas that focus on the application of hands-on and experiential learning, rather than theoretical or conceptual knowledge (Popkewitz, 2018). Practical subjects prepare students for specific careers in fields such as technology, arts and crafts, manufacturing and trades, agriculture and natural resources, etc. Practical subjects often require students to complete hands-on projects, internships, or apprenticeships to gain experience and develop skills in their chosen field (Popkewitz, 2018).

On the other hand, theoretical subjects are academic areas that focus on the study of concepts, ideas, and abstract reasoning, rather than hands-on or practical skills (Popkewitz, 2018). Theoretical subjects are focused on building a strong foundation of knowledge in areas such as mathematics, humanities, social sciences, etc. Theoretical subjects often require students to engage in critical thinking, problem solving, and independent research to gain a deeper understanding of their chosen subject area (Popkewitz, 2018). In addition, theoretical subjects may be offered in conjunction with practical subjects, such as laboratory or studio classes, to provide a well-rounded education and prepare students for further study or careers in their chosen field.

2.2 Purpose of assessments

The purpose of assessments in higher education, particularly in the context of e-learning, serves several essential functions that contribute to the overall educational experience and student development (Bryan & Clegg, 2019). These assessments are supposed to play a crucial role in evaluating student progress, promoting effective learning, and ensuring the attainment of 'educational objectives. The assessments aim to measure and evaluate the extent to which students have achieved the desired 'learning outcomes' (Gamage et al., 2020). Through various assessment methods, educators can gauge the level of knowledge, skills, and competencies acquired by students, providing valuable feedback to both learners and instructors. The question we can ask ourselves is, are the educational objectives and learning outcomes of today's e-learning environments still measurable by these assessments? Another purpose of assessment is for affording students' feedback for improvements and encouraging active learning (Winstone & Boud, 2022). Through various assessment formats, such as quizzes, projects, and discussions, e-learning encourages students to actively engage with the course content. Interactive assessments prompt critical thinking, problem-solving, and application of knowledge, fostering deeper understanding and higher-order cognitive skills.

Ultimately the goal of higher education is to build a competitive workforce/entrepreneurship-force to meet the job market/entrepreneural demand. Are the current assessments still able to measure if students have achieved relevant and industry-specific competencies, preparing them for successful entry into the economy? Is there a need for them to memorise information when they will have gadgets in, their pockets to give them that

information if required at the workplace? This study advocates for assessing the ability to apply knowledge and skills as opposed to the ability to retain knowledge. Therefore, there is a strong need to rethink assessments in order to optimize students educational experience, promote continuous improvement, and prepare them for the demands of a rapidly evolving global workforce.

2.3 The evolution of assessment methods

Historically, assessment practices in education have "evolved" from oral recitations and memorisation-based evaluations to the use of written examinations and standardized tests. These methods, while effective in their time, have been critiqued for emphasizing rote learning over critical thinking and problem-solving skills (Birenbaum, 2007; Bryan & Clegg, 2019). The contemporary e-learning environment demands assessments that align with the skills required for success in the 21st-century workforce, including creativity, collaboration, adaptability, and digital literacy (Herckis, 2018). The history of written exams and tests dates back to ancient civilizations, where assessments were conducted to evaluate individuals' knowledge and skills. Figure 1 is an overview of the evolution of written exams and tests throughout history.

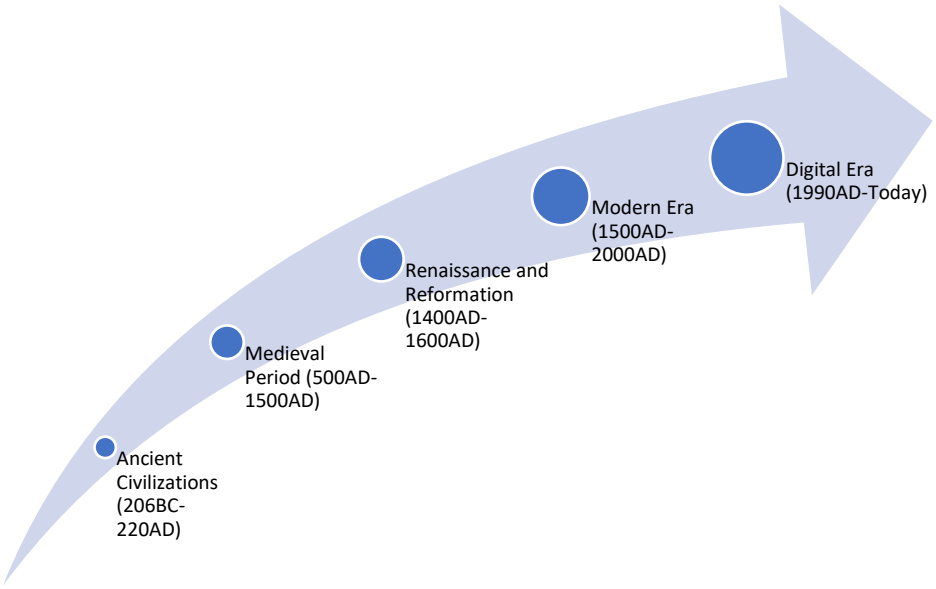

Figure 1: Overview of the evolution of written exams and tests

1. **Ancient Civilizations:** The concept of written exams can be traced back to ancient civilizations like China and Mesopotamia. In China, during the Han Dynasty, civil service exams were conducted to select government officials based on their knowledge of Confucian classics and administrative abilities (Li & Hayhoe, 2012). Similarly, in Mesopotamia, scribes were tested on their ability to write and interpret cuneiform script.
2. **Medieval Period:** In the Middle Ages, educational institutions like monasteries and cathedral schools in Europe used written exams as a way to assess students' understanding of religious texts and other subjects like arithmetic and grammar (Mounier-Kuhn, 2020).
3. **Renaissance and Reformation:** With the rise of humanism during the Renaissance, education shifted focus from religious subjects to broader knowledge in fields like literature, history, and philosophy (Eskelson, 2020). Written exams became more common in universities and schools to evaluate students' comprehension of these subjects.
4. **Modern Era:** The 19th century saw the establishment of standardized examination systems in various countries. Notable examples include the British "General Certificate of Education" (GCE) exams and the French "baccalauréat" exams (Brooks, 1993).
5. **Digital Era:** With the advent of digital technology, traditional paper-based exams have begun to transition to computer-based formats. Online examinations allow for more efficient grading and provide opportunities for remote testing (Herckis, 2018). As the history of written exams continues to evolve, alternative forms of assessment, such as project-based evaluations, are being explored to assess a broader range of skills beyond rote memorisation.

It is interesting to note that, throughout history, the purpose of written exams has remained consistent. The purpose being to evaluate individuals' knowledge, skills, and readiness for further education or professional

roles. However, the formats of these exams have continuously evolved to meet the changing demands of education and society.

2.4 Impact of ChatGPT on Assessments in e-learning assessment environments

ChatGPT's sophisticated language processing capabilities have prompted educators and researchers to reconsider traditional assessment methods. while Chat GPT has the potential to enhance learning experiences, its misuse by students can pose significant challenges to academic integrity and ethical conduct (Cotton et al., 2023). Students may exploit Chat GPT during online exams or quizzes to seek answers in real-time, bypassing the intended evaluation process. This form of cheating can compromise the fairness and accuracy of assessments Studies suggest that Generative AI is here to stay and that being so, there is a great need for an assessment mindset shift, from focusing on memorisation to application, encouraging critical thinking and problem-solving skills that AI algorithms cannot emulate (Baidoo-Anu & Owusu Ansah, 2023).

3. Method

A systematic literature review is a rigorous and comprehensive method of reviewing existing research to identify, assess, and synthesize relevant studies on a specific research topic or question. In this paper, a systematic literature review is employed to gather evidence to prove that the assessment methods that are being used might be outdated for 21st-century e-learning environments.

3.1 Search Strategy

A comprehensive search of peer-reviewed articles, conference papers, and relevant academic databases was conducted. Keywords such as "e-learning," "artificial intelligence," "ChatGPT," "assessment practices," and "redesign" were used in various combinations to ensure the inclusiveness of the search.

A ‘who’, ‘what’, ‘how’ and ‘where’ (WWHW) table was used to assist in the creation of the key search terms and ultimately the research string. The WWHW table, Table 1 is presented below.

Table 1: WWHW Table

	WHO	**WHAT**	**HOW**	**WHERE**	**OTHER ISSUES**
Are 7th-century engineered assessment methods still effective for 21st-century e-learning styles	Lecturers/ students	Assessment Methods	Assessment Plan	University/ College	E-Learning/ Remote Learning

The development of the search string was an iterative process. The resultant research string was:

("Assessment Method" OR "Assessment Plan") AND ("e-learning" OR "remote learning") AND ("higher education" OR "tertiary education" OR "university" OR "College")

For this study, the researcher utilized several bibliographic databases, including EBSCOhost Research database, Emerald Insight, Science Direct, and Google Scholar. The same search string was applied consistently across all the selected databases. The research process involved both initial and secondary screening of the search results. To manage the systematic reviews efficiently, the researchers employed Rayyan, a web-based application designed to assist researchers in creating and organizing their reviews.

3.2 Inclusion Criteria

For this study, the researcher utilized several bibliographic databases, including EBSCOhost Research database, Emerald Insight, Science Direct, and Google Scholar. The same search string was applied consistently across all the selected databases. The research process involved both initial and secondary screening of the search results. To manage the systematic reviews efficiently, the researchers employed Rayyan, a web-based application designed to assist researchers in creating and organizing their reviews. The inclusion and exclusion criteria are shown in Table 2.

Table 2: Inclusion and exclusion criteria

INCLUSION CRITERION	EXCLUSION CRITERION
• assessment methods • Higher education; university; college; tertiary education • Learning technologies; digital technologies; e-learning; remote learning	• Not applicable • Not relevant (outdated) • No abstract • Full-text unavailable • No translation for foreign language

3.3 Data Synthesis

The selected studies were subjected to data extraction, including information on research design, methodology, key findings, and implications. Thematic analysis was employed to identify common themes, patterns, and contradictions across the literature.

The aim of data synthesis is to combine multiple sources of information into a single, integrated, and comprehensive representation. This process involved collecting and integrating data from various sources discussed in section 3.1, and then using meta-analysis, and modelling techniques to create a synthesized dataset that provided a more complete and accurate picture of the subject matter. The goal of data synthesis is to improve understanding and decision-making by combining the strengths of individual sources and reducing the limitations and biases inherent in any one source.

4. Findings

A total of 342 articles were identified and retrieved for the research. The study focused on publications from 2013 up to the present, except for referenced articles specifically related to the learning style models mentioned in numerous citations. Refer to Table 3 for further details.

Table 3: Results of searches

Search String	("Assessment Method" OR "Assessment Plan") AND ("e-learning" OR "remote learning") AND ("higher education" OR "tertiary education" OR "university" OR "College")		
Database	**Number of Hits**	**Database**	**Number of Hits**
Google Scholar	125	Science Direct	107
EBSCOHost	34	Emarald Insight	76

After implementing the research string and obtaining the outcomes as described in Table 3, a PRISMA diagram was created. The PRISMA diagram serves as a visual representation of the information flow through the various phases of the systematic review, and it was utilised to report the findings from the conducted searches. Refer to Figure 2 for the diagram.

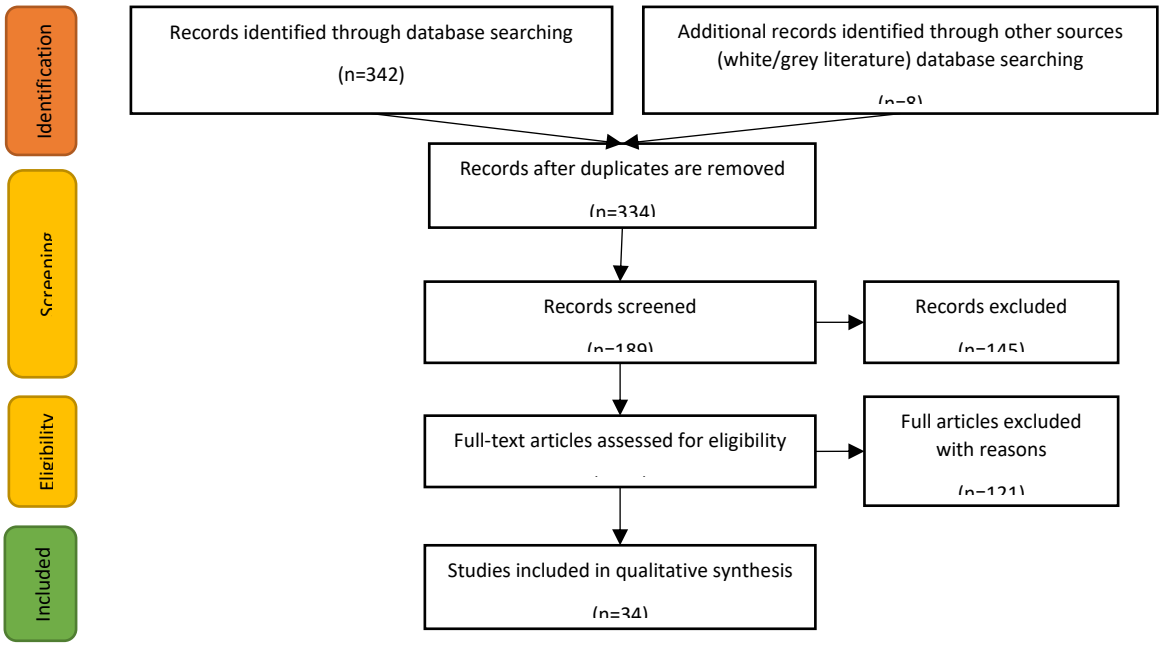

Figure 2: Systematic review flow

A total of thirty-four (34) articles that met the eligibility criteria underwent a quality assessment. Out of these, twenty-eight (28) papers were deemed suitable for inclusion in this systematic review.

To present the relevant and significant findings from these selected papers, data extraction tables were utilised. These tables contained valuable information and insights related to the research. Due to conciseness, the six (6) pages of data extraction tables have been summarized in Table 4.

Table 4: summary of data extraction table

	Major assessment methods			Learning Style			Subject Content	
Subcategories	Projects	Tests/Exams	Assignments	F2F	Online	Blended	Practical	Theoretical
Citing	6	20	2	0	26	2	25	3

As may be seen in Table 4, the majority of papers are based on e-learning (26) and are largely reliant on tests and exams (20) for practical e-learning modules (25). focused on blended learning components followed by 12 papers relating to blended learning styles.

5. Discussion

This section will critically discuss recommendations based on the findings for educational practices in the context of e-learning. It will highlight how to redesign assessment practices to meet the demands of the knowledge economy based on the outcome of the systematic literature review.

5.1 Recommendations for Redesigning Assessment Practices for 21st-Century E-Learning

Traditional assessment methods, such as written examinations and standardised tests, were designed for a different era and often fall short in assessing the diverse skills and competencies required in the modern workforce. This section discusses recommendations based on what was found in literature review. It was revealed that the 21st century education systems demand a more holistic approach to assessments that goes beyond testing memorisation and instead evaluates critical thinking, problem-solving, creativity, collaboration, and digital literacy (Bryan & Clegg, 2019). E-learning provides a unique opportunity to rethink assessment practices and align them with the needs of the skills and knowledge economy.

5.1.1 Recommended Assessment Practices

Adaptive Assessments: E-learning environments can be easily utilised for adaptive assessments, formative assessments, and authentic assessments. One of the key advantages of e-learning lies in its ability to harness technology for adaptive assessments (Brown, 2019). Adaptive assessments provide personalized feedback, allowing learners to focus on areas that require improvement and encouraging a growth mindset.

Formative assessments: these are ongoing and diagnostic in nature, play a crucial role in the learning process. In e-learning, formative assessments can be seamlessly integrated into courses, providing continuous feedback to learners and instructors (Sudakova et al., 2022). These assessments foster a deeper understanding of the course material, encourage active engagement, and support metacognitive skills as students monitor their own progress.

Authentic assessments: these mirror real-world challenges and tasks, allowing learners to demonstrate their knowledge and skills in practical contexts (McArthur, 2023). In e-learning, authentic assessments can be designed to simulate workplace scenarios or real-life problem-solving situations. Such assessments promote deeper learning, as students can apply their knowledge to meaningful and relevant situations (Woldeab & Brothen, 2019).

The dynamic nature of e-learning and the ever-changing demands of the 21st-century workforce call for these three discussed assessment strategies to prioritize the needs and individuality of learners. Learner-centric evaluation strategies place the focus squarely on the student, empowering them to take ownership of their learning journey and fostering a deeper understanding of course material.

5.1.2 Promoting Learner-Centric Evaluation Strategies

This section explores the importance of learner-centric evaluation strategies in e-learning and the various approaches that educators can adopt to create a more personalized and engaging assessment experience.

Empowering Learners through Self-Assessment

In learner-centric evaluation, self-assessment plays a vital role in helping students become active participants in their learning process (Luić, 2022; Riswanto et al., 2022). Encouraging learners to reflect on their progress, set learning goals, and assess their own performance fosters metacognitive skills and a sense of agency. E-learning platforms can facilitate self-assessment through quizzes, rubrics, and guided reflections, allowing learners to monitor their growth and make informed decisions about their learning path (Coutinho, Isabel, 2022).

Formative Assessments for Timely Feedback

Formative assessments are a cornerstone of learner-centric evaluation, providing ongoing feedback to support continuous improvement (Coutinho, Isabel, 2022; Sudakova et al., 2022). In e-learning, formative assessments can take various forms, such as quizzes, discussions, and interactive simulations. These assessments offer immediate feedback, enabling learners to identify areas of weakness and address misconceptions in real-time. The iterative nature of formative assessments promotes a growth mindset, where learners view mistakes as opportunities for learning and improvement.

Personalized Learning Pathways

Technology-driven adaptive assessments in e-learning platforms offer the potential for highly personalized learning pathways (Cevikbas & Kaiser, 2022). By analyzing individual learner data, such as learning preferences, strengths, and areas of improvement, educators can tailor assessments to match each student's unique needs. Personalized learning pathways ensure that learners receive content and challenges aligned with their current level of understanding, maximizing engagement and knowledge retention (Raj & Renumol, 2022; Zheng et al., 2022).

Authentic Assessments for Real-World Relevance

In e-learning, authentic assessments can simulate workplace scenarios, case studies, and project-based evaluations. These assessments encourage critical thinking, problem-solving, and creativity, preparing learners for the demands of their future careers. Authentic assessments also motivate learners by demonstrating the practical relevance of their learning outcomes (McArthur, 2023).

Engaging Learners through Gamified Assessments

Gamification elements can enhance learner engagement and motivation in assessments (Manzano-León et al., 2021). E-learning platforms can incorporate gamified assessments, such as badges, points, and leaderboards, to make the assessment experience more enjoyable and rewarding. Gamified assessments tap into learners' intrinsic motivation, promoting a sense of accomplishment and progress as they master course content (Zainuddin et al., 2021).

6. Conclusion

Exams are still a common and widely used method of assessing college students, however, rethinking assessment in e-learning is pivotal to unlocking the full potential of digital education. Embracing innovative assessment practices can lead to more meaningful learning experiences, better learner outcomes, and the development of agile, adaptable individuals equipped to thrive in the dynamic challenges of the 21st century. As we forge ahead into the future of education, a student-centered, technology-enhanced, and ethically sound approach to assessment is essential to empower learners and shape the future of e-learning.

Through this exploration, we have identified several key points that highlight the importance of rethinking assessment in the context of e-learning. E-learning platforms equipped with adaptive assessment tools can tailor learning experiences to individual student needs. By analyzing learners' performance data and providing timely feedback, personalized assessments foster a deeper understanding of strengths and areas for improvement, maximizing student engagement and motivation. This instant feedback loop empowers learners to take ownership of their learning journey and fosters a culture of continuous improvement. E-learning allows for the integration of authentic assessments that mirror real-world challenges and scenarios. By moving beyond traditional exams and incorporating real-life projects, case studies, and simulations, learners develop practical skills that are directly applicable to their future careers.

The significance of rethinking assessment in e-learning extends beyond formal education. E-learning enables lifelong learners to acquire new skills, update their knowledge, and stay relevant in rapidly evolving industries, fostering a culture of continuous learning. For future research, it is recommended to explore innovative assessment methods tailored to the digital era's demands, investigate adaptive and personalized assessment systems, conduct longitudinal studies on the impact of redesigned assessments, address equity issues, leverage assessment analytics, consider cross-cultural perspectives, assess teacher training programs, evaluate policy implications, incorporate student perspectives, encourage interdisciplinary approaches, explore emerging technologies, conduct qualitative studies, and perform comparative analyses to inform the ongoing transformation of assessment practices in e-learning for the 21st century.

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