Impact of Artificial Intelligence on the Learning Experience: A Systematic Literature Mapping

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Abstract. Context: the emergence of new tools such as AI-assisted search engines or chatbots is reshaping educational practices, fostering more personalized and dynamic learning environments. Objective: this study analyzes the incorporation of AI in traditional assessment methods and explores the challenges associated with implementing these new tools in student evaluation within the technological university context. Method: a systematic mapping of the literature was conducted to synthesize findings from existing research on the impact of AI on learning experiences and assessment practices. Results: the analysis reveals a paradigm shift in both teaching and assessment methodologies. AIs are progressively transforming traditional exams with more automated and, presumably, more efficient assessment systems. However, the integration of these tools requires teachers and students to acquire new skills to maximize their effectiveness. Additionally, ethical considerations regarding the use of AI, including privacy concerns and the potential displacement of human educators, highlight the importance of maintaining a humanistic approach in the digital age. The literature reviewed emphasizes the need for a balanced and thoughtful use of AI technologies in education, along with a critical understanding and clear frameworks to mitigate risks and optimize benefits.

Keywords: Artificial intelligence; education; assessment; competencies

1   Introduction

Artificial Intelligence (AI) is reshaping education, particularly in student assessment and learning experiences. AI-driven tools, such as intelligent tutoring systems and automated grading, offer opportunities to personalize learning and improve evaluation processes (Virvou & Tsihrintzis, 2023). However, integrating AI into education also raises challenges related to academic integrity, ethics, and the evolving role of teachers (Pereyra, 2023). Given the rapid development of AI, it is crucial to examine its impact on higher education and establish strategies for its responsible implementation.

The widely recognized benefits of AI in assessment include automated grading, which reduces instructor workload, enhances scalability, and improves institutional efficiency. Additionally, AI-powered assessments can offer personalized feedback and

real-time insights, allowing students to track their progress more effectively (Ayuso del Puerto & Gutiérrez Esteban, 2022). In competency-based learning environments, AI can help develop essential 21st-century skills, such as problem-solving, adaptability, and interdisciplinary collaboration (Cervantes de la Cruz et al., 2024).

However, these advantages come with significant concerns. The lack of transparency in AI decision-making raises doubts about fairness in automated evaluations (Kim & Wong, 2023). Additionally, the reliance on AI-generated assessments could impact students critical thinking and self-regulated learning, as they may passively accept machine-generated feedback rather than engaging in deeper reflection (Pereyra, 2023). Furthermore, privacy and ethical issues remain a major challenge, as AI-driven assessments involve collecting and processing large amounts of student data, increasing risks of bias and data misuse (Romo-Perez et al., 2023).

To ensure AI complements rather than replaces human-led assessment, it is essential to balance automation with pedagogical integrity. AI should enhance, rather than undermine, student engagement and fair evaluation. Addressing these issues requires interdisciplinary collaboration, ethical frameworks, and faculty training to maximize AI's benefits while minimizing risks (Kim & Wong, 2023; Kubullek et al., 2024).

This study employs Systematic Literature Mapping (SLM) to analyze research (2022–2024) on AI in student assessment within technological universities. It examines ethical and privacy concerns, exploring strategies for responsible implementation to help institutions adopt AI while preserving academic integrity and fairness.

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2 Method of review

The study utilized the Systematic Literature Mapping methodology (Kitchenham et al., 2009) to analyze AI in education from 2022 to 2024. The process involved selecting databases, developing a search string, and applying inclusion/exclusion criteria to ensure methodological quality. A detailed analysis of selected articles identified trends, patterns, and key contributions, providing a foundation for synthesizing findings. This approach enabled a comprehensive discussion of AI's advancements and challenges in education, ensuring a rigorous and representative examination of its impact.

2.1 Research questions

Four key research questions (Table 1) were formulated to guide the selection, evaluation, and synthesis of literature on AI's impact in education. Aligned with the Systematic Literature Mapping methodology, these questions ensured a structured analysis of emerging trends, challenges, and opportunities in teaching, assessment, and student learning.

Table 1. Presents the research questions along with their respective motivations.

Research questions	Motivation
P1. What is the impact of artificial intelligence on students' learning experience in the technological university context?	M1. Explore how artificial intelligence is transforming teaching, learning, and academic outcomes in the technological university context.
P2. How has AI been integrated into traditional assessment methods in terms of accuracy, objectivity, and scalability?	M2. Investigate the integration of artificial intelligence into conventional assessment methods and its impact on the accuracy, objectivity, and scalability of assessment.
P3. What are the ethical and privacy challenges associated with the implementation of generative models in student assessment in the technological university context?	M3. Analyze the ethical dilemmas and privacy concerns related to the use of generative models in assessing university students.
P4. What recommendations does the literature offer to optimize the implementation and effective use of generative models in assessing students in technological university programs?	M4. Review the recommendations and good practices provided in the literature to enhance the implementation and effective use of AI in assessing university students.

2.2 Search sources

The selection of databases aimed to ensure comprehensive coverage of relevant academic and scientific literature. While a broader set of databases was initially considered, a preliminary review confirmed that the three selected databases (Table 3) provided a substantial and representative sample for this study.

2.3 Search string definition

A systematic refinement process was applied to the search strings, adjusting terms and boolean operators for precision. Filters such as publication date, document type, and thematic area were explored to enhance relevance. This rigorous approach ensured the selection of representative academic articles on AI's impact on learning and student assessment in technological universities. Initially, a large volume of results required progressive refinement to improve accuracy. The following table presents the search strings applied in each database.

Table 3. Search strings

IEEE Xplore Digital Library	(impact AND (AI OR "artificial intelligence")) AND education AND (exams OR assessment) AND (competencies OR knowledge OR skills)

ACM Digital Library	impact AND (AI OR "artificial intelligence") AND education AND (exams OR assessment) AND (competencies OR knowledge OR skills) AND "educational strategies"
Science Direct	"educational strategies" AND education AND (exams OR assessment) AND (competencies OR knowledge OR skills) AND (AI OR "artificial intelligence")

2.4 Defining Inclusion and Exclusion Criteria

To ensure the relevance and focus of this systematic mapping, a filtering process was applied using defined inclusion and exclusion criteria (Table 4). These criteria were designed to select studies directly addressing the research questions while excluding irrelevant or non-scope publications.

Table 4. Inclusion and Exclusion Criteria

Inclusion Criteria
IC 1. Studies on competency evaluation or the impact of AI in education.
IC 2. Studies relevant to research questions and directly contributing to the study.
IC 3. Peer-reviewed sources, including journal articles, conference proceedings, and review papers.

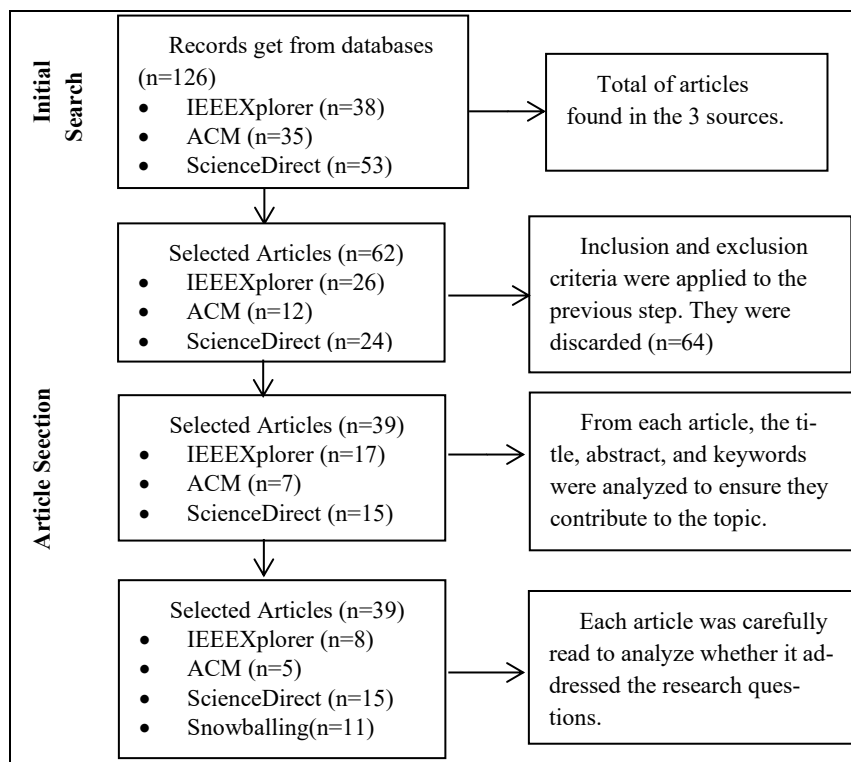| Exclusion Criteria |
|---|
| EC 1. Published before 2022 to ensure recent developments. |
| EC 2. Studies not written in Spanish or English. |
| EC 3. Non-peer-reviewed sources, such as book chapters, magazines, news, blogs, and posters. |
| EC 4. Unrelated to AI in education or competency assessment. |

In the first phase, retrieved publications were evaluated against the criteria, eliminating studies that did not align with the objectives. In the second phase, the remaining studies were reviewed in full to confirm their relevance. This process ensured that only high-quality and pertinent studies were included for analysis.

2.5 Study Selection

The search and selection process was meticulous, ensuring thoroughness and relevance. A review protocol guided the efficient execution of steps and tools. Initially, 126 articles were identified across the three databases. Applying detailed inclusion and exclusion criteria reduced this to 62 articles. A focused analysis of titles, abstracts, and keywords further refined the selection to 39 articles directly addressing the research questions. Since the selected articles were in English, they did not fully capture the specific realities and challenges of Spanish-speaking countries. To address this limitation, a

Snowballing approach was applied to incorporate articles written in Spanish. As a complementary search method, Snowballing helped identify additional relevant studies beyond keyword-based searches. Using forward snowballing (Jalali & Wohlin, 2012), a set of six highly cited articles was initially selected as seed papers. From these, citations were analyzed to expand the dataset, resulting in 11 final articles that provided broader coverage of relevant research. Finally, 39 articles were chosen based on their relevance and contribution, forming a solid foundation for the study's systematic mapping and synthesis of literature.

Table 2. Detail of the Article Search and Filtering Process.

Initial Search		
Records get from databases (n=126) • IEEEXplorer (n=38) • ACM (n=35) • ScienceDirect (n=53)		Total of articles found in the 3 sources.

Article Seection		
Selected Articles (n=62) • IEEEXplorer (n=26) • ACM (n=12) • ScienceDirect (n=24)		Inclusion and exclusion criteria were applied to the previous step. They were discarded (n=64)
Selected Articles (n=39) • IEEEXplorer (n=17) • ACM (n=7) • ScienceDirect (n=15)		From each article, the title, abstract, and keywords were analyzed to ensure they contribute to the topic.
Selected Articles (n=39) • IEEEXplorer (n=8) • ACM (n=5) • ScienceDirect (n=15) • Snowballing(n=11)		Each article was carefully read to analyze whether it addressed the research questions.

3   Extracted data synthesis

The study selection process provided a representative set of research reflecting trends and advancements in the field. It enabled the identification of relevant studies and the extraction of key information to answer the research questions. The methodology ensured diverse perspectives and outcomes, offering a comprehensive understanding of the state of the art.

P1. What is the impact of artificial intelligence on students' learning experience in the technological university context?

AI is transforming education by personalizing learning, enhancing teaching methodologies, and promoting more interactive student-teacher engagement (Kökuti et al., 2023; Virvou & Tsihrintzis, 2023). AI-driven tools adapt content to students' individual needs, improving learning efficiency and engagement (Posada Gonzalez, 2024). By analyzing large datasets, AI can generate adaptive study programs, helping educators identify areas where students need additional support (Cervantes de la Cruz et al., 2024). As a result, educational platforms dynamically adjust learning activities, aligning them with each student's cognitive abilities and progress (Ruiz et al., 2023). This adaptability not only enhances academic performance but also strengthens student-teacher interactions, making education more effective and student-centered (Ayuso del Puerto & Gutiérrez Esteban, 2022).

Beyond personalization, AI promotes self-directed learning, allowing students to explore subjects autonomously in a flexible way. AI-powered virtual tutors and chatbots provide real-time academic support, track progress, and offer immediate feedback on assignments (Esteves Fajardo et al., 2024; Kubullek et al., 2024). AI tools like ChatGPT have demonstrated positive effects on self-efficacy, particularly in fields such as language learning (Yuan & Lyu, 2024). However, AI's benefits come with challenges like transparency, inaccuracies, and difficulty interpreting qualitative learning aspects (Ordoñez García et al., 2024).

The integration of AI in education demands new pedagogical approaches to ensure its effective and ethical implementation. As AI becomes more prevalent, both teachers and students must develop digital skills to maximize its potential (Cervantes de la Cruz et al., 2024). Innovative assessment methods are essential to encourage critical thinking and independent problem-solving rather than passive reliance on AI (De Silva et al., 2023). In technical disciplines, AI-powered platforms like BIDTrainer provide real-time feedback, enhancing students' reasoning skills and improving their ability to tackle complex problems (Chen et al., 2024). Additionally, AI automates tasks, freeing up time for both students and teachers to focus on analytical and creative learning (Posada Gonzalez, 2024).

However, the growing reliance on AI in assessment raises concerns about academic integrity and evaluation validity (Wang et al., 2023). AI-generated content challenges traditional testing methods, necessitating revisions in examination strategies to prevent academic dishonesty (Kim & Wong, 2023). (Cánovas, 2023) warns against reverting to traditional closed-door paper exams, arguing that they increase teacher workload and hinder technological progress. Instead, institutions must adapt evaluation practices to balance AI integration with rigorous assessment standards, ensuring fair and meaningful student evaluations.

Moreover, AI is transforming knowledge production, as universities are no longer the sole providers of learning. Digital education and AI-driven platforms now make knowledge more accessible (Pereyra, 2023). This shift is particularly evident in technical fields, where AI plays a crucial role in professional training (Xu et al., 2024). Moreover, AI influences how knowledge is produced and distributed in professional environments, impacting workplace decision-making and industry applications (Romo-

Perez et al., 2023). The combination of these factors highlights the need to equip students with technical, critical thinking, and ethical reasoning skills to navigate AI-driven industries effectively (Lyu et al., 2024).

AI enhances cognitive and problem-solving skills by automating tasks, allowing students and educators to focus on higher-order thinking (Lyu et al., 2024; Romo-Perez et al., 2023). Beyond academia, it improves productivity and knowledge access, aligning education with industry needs (Pereyra, 2023; Romo-Perez et al., 2023). AI enhances training and decision-making in technical fields, requiring students to develop critical thinking and ethical reasoning. Thoughtfully implemented, it improves learning while preserving human-led education.

P2. How has AI been integrated into traditional assessment methods in terms of accuracy, objectivity, and scalability?

AI is redefining assessment methods, introducing both advancements and challenges. While AI enhances efficiency, scalability, and objectivity, it also complicates the evaluation of competencies and knowledge acquisition. (Romo-Perez et al., 2023) highlight that students can produce high-quality work in a short time, making it difficult to determine authentic learning outcomes. Similarly, (Artopoulos, 2023), cited in (Pereyra, 2023) , notes that AI's impact on reading and writing practices challenges both teaching and assessment methodologies, requiring a fundamental rethink of traditional education models. (Boude, 2023), cited in (Cervantes de la Cruz et al., 2024), questions whether current assessment tasks effectively measure students' competencies or simply assess AI-generated outputs. This concern underscores the need for educators to act as mentors, guiding AI interactions while ensuring meaningful learning (Dos Santos & Cury, 2023).

While industry rapidly adopts AI for productivity, academia often remains conservative in its integration (Wang et al., 2023). Addressing this dilemma, (Centurión, 2022), extracted from (Zazueta López et al., 2023), emphasizes the importance of fostering critical thinking, problem-solving, adaptability, negotiation, and technological literacy. These skills should be integrated into curricula, not only as learning tools but also as subjects of study. [29] advocates for greater transparency in AI applications, requiring full disclosure of models and algorithms to help students critically analyze AI-generated information. Additionally, [7] stress that assessment methods must evolve, as memorization-based exams lose relevance. [30] , cited in [7], argue that critical thinking, model design, and content validation must replace traditional rote learning.

One of AI's primary applications in assessment is plagiarism detection (Ayman et al., 2023). However, beyond detecting academic dishonesty, AI enhances self-assessment by enabling students to review and refine their work with chatbot-driven feedback (Ayman et al., 2023). AI also provides automated, scalable feedback without compromising quality (Yuan & Lyu, 2024). Additionally, [17] highlight AI's ability to personalize content by tailoring learning activities to individual student needs. AI-driven platforms can create virtual learning scenarios, adapting tasks to students' progress (Ordoñez García et al., 2024). Large Language Models (LLMs) further contribute by ensuring consistent and unbiased grading, particularly in programming assignments

(Lyu et al., 2024). According to [32], cited in [7], such tools benefit both students and educators by reducing grading bias and increasing assessment scalability.

AI-driven tools also support both formative and summative assessments, offering instant feedback and enriched learning experiences (González-Pérez & Ramírez-Montoya, 2022). Formative assessments powered by AI optimize feedback loops and real-time evaluation. Furthermore, AI-based platforms, such as ChatGPT, automate formative assessments, allowing educators to focus on more nuanced evaluation tasks (Kubullek et al., 2024). In addition, gamified environments dynamically adjust task difficulty and engagement levels based on user profiles, enhancing student motivation (Bucchiarone, 2022).

Beyond assessment, AI systems play a role in predictive analytics, using machine learning to analyze academic performance trends and guide targeted interventions (Miranda et al., 2024). This predictive capacity complements traditional assessments, helping educators address student challenges proactively. Additionally, AI-powered multimedia-based evaluations enhance data visualization and interactive learning, offering new ways to measure student comprehension (Zhao et al., 2024).

While AI improves efficiency and scalability, its integration into assessment requires caution. Transparency, contextual awareness, and critical engagement with AI-generated outputs remain ongoing challenges. AI should not replace human judgment but rather support educators in making informed decisions about student learning. To fully harness its potential, continued collaboration between educators and technology developers is essential. This will ensure that AI-driven assessment methods maintain academic integrity while fostering competency-based learning in an increasingly technological world.

P3. What are the ethical and privacy challenges associated with the implementation of generative models in student assessment in the technological university context?

The implementation of generative AI models in student assessment presents ethical and privacy challenges that require careful consideration. While AI enhances access to quality education (Wang et al., 2023), it also raises concerns about academic integrity, data privacy, and the evolving role of educators. Originally, tools like ChatGPT were not designed for education, yet their classroom value is increasingly evident (Virvou & Tsihrintzis, 2023).

AI integration in higher education requires curriculum adjustments and strategies to prevent faculty displacement (Posada Gonzalez, 2024). A lack of AI literacy among educators affects privacy, security, and ethical implementation (Posada Gonzalez, 2024). Additionally, AI adoption necessitates redefining the teacher's role, shifting from knowledge delivery to mentorship (Romo-Perez et al., 2023). The potential reduction in teacher-student interaction is concerning, as AI cannot interpret emotional cues or provide personalized feedback (Kökuti et al., 2023). The loss of human connection may negatively impact learning experiences (Rincón Macías, 2022).

Privacy remains a key ethical issue. AI tools rely on extensive datasets, increasing risks of data breaches and unauthorized access (Al-Zahrani, 2024; Kadaruddin, 2023; Wang et al., 2024). Storing student data in AI-driven systems raises concerns about

misuse and cybersecurity vulnerabilities (Yuan & Lyu, 2024). Additionally, biases in training datasets can reinforce stereotypes, affecting fairness in assessments (Kadaruddin, 2023; Wang et al., 2024). Over-reliance on AI-generated recommendations may also reduce student autonomy (Lyu et al., 2024). Moreover, students worry about how their personal data is collected and processed (Al-Zahrani, 2024). Institutions must establish clear data protection policies and security measures to ensure compliance with ethical frameworks (Posada Gonzalez, 2024).

AI also challenges academic integrity and fairness. AI tools can outperform students in specific tasks, raising concerns about authenticity in assessments (Abu-Salih & Alotaibi, 2024). ChatGPT facilitates plagiarism and automated content generation, necessitating strict oversight (Alfredo et al., 2024). AI-generated responses often appear convincing but contain inaccuracies, requiring human supervision (Kubullek et al., 2024). Since AI cannot always be treated as an absolute source of truth (Memarian & Doleck, 2024), balancing automation with human interpretation is essential for maintaining fairness (Chen et al., 2024).

Ensuring equitable access to AI tools is another challenge. Disparities in technological infrastructure and digital literacy create inequalities in AI adoption (Xu et al., 2024). AI models may favor certain academic disciplines, leading to biased assessment methods (Xu et al., 2024). Additionally, AI poses a threat to faculty expertise, as it competes with human educators' knowledge (Romo-Perez et al., 2023). [5] caution that AI could displace faculty unless institutions redefine educational roles.

To integrate AI responsibly, [27], extracted from [28], emphasizes that AI adoption must be accompanied by the development of critical thinking, problem-solving, negotiation, adaptability, entrepreneurship, and multidisciplinary collaboration. These competencies prepare students for an AI-enhanced educational and professional landscape. Incorporating AI as both a learning tool and an object of study is essential for developing these higher-order skills.

Addressing these concerns requires institutions to establish clear ethical guidelines, enhance cybersecurity measures, balance AI automation with human oversight (Chen et al., 2024), and promote critical engagement with AI-generated content (De Silva et al., 2023). Interdisciplinary collaboration is needed to develop AI tools that ensure fairness, equity, and accessibility (Xu et al., 2024).

Ultimately, AI integration must be transparent and critically assessed. Educators must refine AI-generated outputs to uphold academic integrity (Gao et al., 2024). By setting ethical guidelines, securing student data, and ensuring human oversight, institutions can maximize AI's benefits while safeguarding privacy and fairness.

P4. What recommendations does the literature offer to optimize the implementation and effective use of generative models in assessing students in technological university programs?

The literature underscores the importance of a critical approach to AI in student assessment, emphasizing ethical use, educator training, and maintaining AI as a complementary tool rather than a replacement for human instruction (Virvou & Tsihrintzis, 2023). AI should foster critical thinking, ethical reasoning, and effective communication, ensuring its responsible integration. [2] highlights the need for reflective AI use, while [3]

stress adapting AI to specific educational contexts. Additionally, [43] calls for guiding students in evaluating AI-generated content, fostering analytical thinking and bias awareness.

To ensure teaching and assessment remain central to education, (Rincón Macías, 2022) argues that AI must support pedagogical objectives rather than replace instruction. Ethical frameworks should be established to regulate AI's role in education (Kubullek et al., 2024). [7] argue that banning AI is impractical, as universities must adapt rather than resist its integration. Collaboration between technical and non-technical disciplines is essential for developing AI tools tailored to diverse educational needs (Xu et al., 2024). For instance, [33] proposes that technological infrastructure and interdisciplinary cooperation are key to effective AI adoption.

Successful AI integration depends on a well-trained academic community. Educators must recognize that students will use AI tools like ChatGPT, making training programs essential for evaluating and refining AI outputs (Kim & Wong, 2023; Yuan & Lyu, 2024). Institutions must also implement clear policies for responsible AI use (Yuan & Lyu, 2024).

A significant gap remains in assessing AI-driven learning outcomes. Traditional assessment methods may fail to capture AI-enhanced competencies, requiring new evaluation approaches. AI-driven gamification techniques can create more adaptive learning environments, improving assessment (Kadaruddin, 2023). AI should foster creative problem-solving rather than rote learning, necessitating assessment model transformations (Lyu et al., 2024). [4] propose AI assisting educators in assessment and feedback, but institutions must establish ethical boundaries to preserve academic integrity (Cánovas, 2023).

Despite its advantages, AI poses risks of dehumanization and over-reliance on technology. [17] warn that AI may reduce personal interactions, stressing the need to maintain human-centered learning and social skill development. AI should serve as a complementary tool, preserving a balanced approach. Institutions must also ensure academic integrity in AI-assisted assessments, as poor regulation could lead to ethical dilemmas and loss of trust (Cánovas, 2023). Failure to adapt to AI advancements may leave universities behind, as private technology firms and industry collaborations redefine education (Wang et al., 2023).

Concerns about AI's disruptive impact are valid, yet institutions should harness its potential to enhance education rather than resist its integration [46] cited in (Ayman et al., 2023). AI represents a paradigm shift, requiring a rethinking of teaching and assessment methodologies. Instead of replacing human creativity, AI should support brainstorming, content generation, and critical analysis (De Silva et al., 2023). [7] stress that universities must not only integrate AI into learning but also redefine assessment frameworks in response to technological change.

Ultimately, AI offers significant opportunities to optimize student assessment, but careful implementation is required. Institutions must preserve human-centered learning, ethical standards, and academic integrity. If properly integrated, AI can enhance student engagement, refine evaluation models, and contribute to the evolution of higher education in the digital age.

4   Discussion

AI is transforming education by enhancing teaching, content design, and assessment. Initially driven by computing and the internet, this shift has accelerated with AI, fostering greater personalization and interactivity. Automated evaluation systems are replacing traditional exams, improving efficiency while raising concerns about assessing qualitative aspects of learning. AI-generated content challenges existing assessment models, requiring new strategies that prioritize critical thinking and creativity over rote memorization. Beyond assessment, AI supports exam development and plagiarism detection, yet concerns about transparency, faculty displacement, and ethical use persist. Institutions must ensure responsible AI integration by establishing clear policies, training educators, and maintaining a balance between automation and human-led learning. While AI cannot replace essential social and emotional skills, it can enhance education when thoughtfully implemented. To maximize AI's benefits and mitigate risks, universities must adopt a human-centered approach, ensuring that technology complements rather than replaces traditional teaching. Proper oversight, curriculum adjustments, and faculty training are essential for effective AI adoption. If integrated responsibly, AI can support student learning, improve assessment methods, and enhance educational experiences while preserving the critical human elements of teaching.

5   Conclusions

AI has significantly transformed higher education by personalizing learning and adapting content to student needs. However, challenges such as over-reliance on AI, reduced teacher-student interaction, and ethical concerns must be addressed. Ensuring a balanced integration requires fostering critical thinking, ethical awareness, and proper educator training. While AI enhances quality and efficiency, clear boundaries and skill development are essential. A key gap in the literature remains the assessment of student competencies in AI-driven education, making the evaluation of learning outcomes a crucial area for future research.

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