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Impact of the use of artificial intelligence in university teaching

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ABSTRACT

The integration of artificial intelligence (AI) in higher education presents significant pedagogical opportunities and institutional risks that require a strategic and multifaceted response. In pedagogical terms, the literature and empirical findings agree that AI can enhance the personalization of learning through adaptive pathways and recommendations based on behavioral analysis, which enhances engagement and, in some contexts, academic performance. In parallel, there are significant ethical, technical, and organizational risks. Cited authors highlight concerns about data privacy, algorithmic bias, the validity of AI-generated outputs, and threats to academic integrity (eg, the potential for generating content that facilitates plagiarism). These risks are reflected in the need for ethical and governance frameworks: data protection policies, explainability of algorithmic decisions, bias audits, and traceability protocols. Therefore, the central recommendation is to adopt an integrated and phased institutional strategy that emphasizes people, processes, and policies rather than technology alone. This involves (1) creating governance structures and ethical frameworks that define technical requirements and periodic audits; (2) deploying competency-based training programs with impact indicators and ongoing support; and (3) implementing disciplinary pilots with monitoring, evaluation, and institutional learning mechanisms to adjust and scale. This will maximize the benefits—personalization, efficiency, and improved evaluation processes—while mitigating risks related to ethics, equity, and academic integrity, ensuring that AI acts as a tool to enhance, not replace, educational work

Keywords: algorithms, ethics, personalization, privacy, training..

1. INTRODUCTION:

Artificial intelligence (AI) has emerged as a transformative force with a significant impact on higher education, redefining teaching and learning methodologies (Raji et al ., 2021) . This technological shift is not merely an addition, but a profound reshaping of the educational experience, promising to personalize learning and optimize academic processes (Vieriu & Petrea , 2025) . The integration of AI in higher education is a rapidly evolving field, with implications ranging from operational efficiency to pedagogical quality, generating ongoing dialogue about its implementation and long-term effects (Abdellatif et al ., 2022) . The increasing availability of AI tools has driven the need for higher education institutions to adapt their strategies to maximize its benefits and mitigate its inherent challenges.

The potential of AI to personalize learning is one of its most significant benefits in the university setting. Through advanced algorithms, AI can analyze each student's learning style, strengths, and weaknesses to offer educational experiences tailored to their individual needs (Singh & Hiran , 2022) . This not only improves comprehension and academic performance but also fosters greater student engagement by making content more relevant and accessible (Vieriu & Petrea , 2025) . Furthermore, AI can facilitate access to a vast amount of global resources and knowledge, expanding learning and

research opportunities for students and educators alike (Ramírez et al., 2024) .

However, integrating AI into higher education presents significant challenges that require careful consideration. One major concern is the lack of adequate training for faculty and administrators in the effective use of AI tools (Back, 2016) . This skills gap can hinder successful implementation and limit the technology's true potential. Furthermore, significant ethical concerns, such as data privacy, algorithmic bias, and the validity of AI-generated data, necessitate the development of robust policies and safeguards (Sam & Olbrich , 2023) . Academic integrity is also challenged by the ease with which AI can generate content, leading to debates about plagiarism and the originality of student work (Bukhari & Rehman, 2025) .

Artificial intelligence (AI) has emerged as a transformative force with a significant impact on university education, redefining teaching and learning methodologies at an accelerated pace. (Karam, 2023) . This technological shift is not merely an addition, but a profound reshaping of the educational experience, promising to personalize learning and optimize academic processes (Marcus & Davis, 2019) . The integration of AI in higher education is a rapidly evolving field, with implications ranging from operational efficiency to pedagogical quality, generating ongoing dialogue about its implementation and long-term effects (Bankins & Formosa, 2023) . The increasing availability of AI tools has driven the need for universities to adapt their strategies to maximize their benefits and mitigate their inherent challenges.

The potential of AI to personalize learning is one of its most significant benefits in the university setting. Through advanced algorithms, AI can analyze each student's learning style, strengths, and weaknesses to offer educational experiences tailored to their individual needs (Hammad , 2023) . This not only improves comprehension and academic performance but also fosters greater student engagement by making content more relevant and accessible (Elshandidy et al ., 2018) . Furthermore, AI can facilitate access to a vast amount of global resources and knowledge, expanding learning and research opportunities for students and educators alike (Slimi & Carballido, 2023) .

However, the integration of AI into higher education presents significant challenges that require careful consideration. One of the main concerns lies in the ethical implications, such as data privacy, algorithmic bias, and the validity of AI-generated data, which demand the development of robust policies and safeguards (Castelló et al., 2023) . Academic integrity is also challenged by the ease with which AI can generate content, leading to debates about plagiarism and the originality of student work (Pisica et al ., 2023) . To ensure responsible implementation, it is imperative that universities develop robust ethical frameworks to guide the use of AI and safeguard educational principles (Borenstein and Howard, 2021) .

Despite these challenges, the opportunities that AI offers to improve teaching and learning are immense. AI can automate repetitive administrative tasks, freeing up time for teachers to focus on teaching and interacting with students (Kelly, 2024) . It can also be a powerful tool for improving students' research skills and fostering critical thinking by providing them with access to information and advanced analytical tools (Kalnina et al ., 2024) . AI has the potential to transform assessment methods, offering faster and more personalized feedback and enabling a more holistic evaluation of student progress (Oreshin et al ., 2020) .

In the future, AI is expected to continue redefining the landscape of higher education, driving innovation in course design, instructional methodologies, and assessment (Brodheim , 2025) . To fully capitalize on the advantages of AI, universities must invest in staff training and foster an environment of experimentation and adaptation (Milberg , 2024) . It will be crucial for higher education institutions to actively shape its integration to ensure that it serves as a tool to augment human capacity, rather than replace it, preparing students for an increasingly technology-driven future.

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In the future, AI is expected to continue redefining the landscape of higher education, driving innovation in course design, instructional methodologies, and assessment (Wargo & Anderson, 2024) . To fully capitalize on the advantages of AI, universities must invest in staff training, develop robust ethical frameworks, and foster an environment of experimentation and adaptation (Slimi & Carballido, 2023) . As AI advances, it will be crucial for higher education institutions to actively shape its integration to ensure that it serves as a tool that augments human capacity, rather than replacing it, preparing students for an increasingly technology-driven future (Pypenko , 2024) .

2. METHODOLOGY

To address the impact of artificial intelligence (AI) on university teaching in a comprehensive and in-depth manner, a mixed-methods research methodology is proposed, with a predominant emphasis on qualitative exploration, complemented by a thorough review of the academic literature. This approach will allow us not only to synthesize existing knowledge on the integration of AI in higher education, but also to explore in detail the perceptions, experiences, and challenges faced by key university stakeholders: faculty, students, and administrators. The combination of these perspectives will offer a holistic and contextualized understanding of the phenomenon.

The first phase of the research will focus on a systematic and comprehensive review of recent academic and professional literature. Specialized databases such as Scopus and Web of Science will be consulted. Science , Google Scholar , ERIC, and repositories of educational institutions and international organizations were searched using keywords such as "artificial intelligence in higher education," "AI in university teaching," "AI pedagogy," "AI ethics in education," "AI personalized learning," and "AI challenges in universities." The search period focused primarily on publications from the last five years to ensure the information is up-to-date. The objective was to identify global trends, reported benefits, common challenges, best pedagogical practices, and emerging ethical frameworks related to AI in university teaching.

Alongside the literature review, primary data collection techniques will be used to capture the perspectives of university stakeholders. Semi-structured interviews will be conducted with professors from various disciplines to understand their experiences integrating AI into their teaching methodologies, their perceptions of the benefits and challenges, and their training needs. Additionally, focus groups will be organized with university students to explore their experiences with AI tools in their learning process, their opinions on the effectiveness of these technologies, and their ethical or practical concerns. Participant selection will be carried out using convenience and snowball sampling, seeking diversity across disciplines and academic levels.

Data analysis will be conducted at two levels. The findings from the literature review will be synthesized through thematic and narrative synthesis, identifying recurring categories and subcategories. A rigorous qualitative thematic analysis will be applied to the qualitative data obtained from interviews and focus groups. Recordings will be transcribed verbatim and coded using specialized software (e.g. , NVivo or ATLAS.ti) to identify patterns, emerging themes, conceptual relationships, and predominant discourses. The literature findings will be triangulated with the participants' perceptions to validate and enrich the understanding of AI's impact.

The ethical implications and limitations of the study will be carefully considered. Confidentiality and anonymity will be guaranteed for all participants in interviews and focus groups, with their prior informed consent obtained. The research will adhere to the ethical principles of social research, ensuring transparency in data collection and analysis. A potential limitation of the methodology could be the generalizability of the findings, as AI experiences and policies can vary significantly across different institutions and geographic contexts. Furthermore, the rapid evolution of AI technology means that some findings and recommendations may require periodic updates.

3. RESULTS

Table 1 Global trends reported in AI for university teaching (last 5 years)

Main theme	Description/ key indicators	Main evidence	Perceived impact
Personalized learning	Recommendation algorithms, adaptive itineraries	Greater participation in AI-related courses; variability across disciplines	Positive in commitment, variable in results
AI Tutoring	Chatbots , study assistants	Improved question-and-answer system, 24/7 availability	Increased autonomy , but human supervision is required
Evaluation and feedback	Automatic correction, AI rubrics	Reduction of teaching load; detection of common errors	Accelerates feedback, concerns about originality
Ethics and biases	Transparency, explainability , data bias	Concerns about bias and privacy	Explicit governance is necessary
Implementation	Infrastructure, teacher training	Need for investment and institutional support	Key to sustainable adoption

Table 2 Good pedagogical practices related to AI in higher education

Recommended practice	Description	Evidence of benefit	Requirements/conditions
Instructional design with integrated AI	Integrate AI into learning objectives and activities	Improved engagement and results in some contexts	Curriculum planning, alignment with competencies

Teacher training in AI	Professional development programs	Greater confidence and effective use of tools	Budget, time, and incentives
Transparency and explainability	Explain how and why AI makes decisions	Greater acceptance by students and teachers	Clear communication, data ethics
AI-powered blended assessment	Combination of automated and human evaluation	Balance between efficiency and rigor	Academic integrity guard, supervision

Table 3and regulatory frameworks

Ethical dimension	**Description**	**Challenges**	**Recommendations**
Privacy and data protection	Responsible management of student data	Regulatory compliance, consent	Data policy, data minimization, encryption
Explainability	AI decision comprehensibility	Model complexity	Explainability, documentation, audits
Fairness and biases	Mitigating biases in data and algorithms	Representation biases, unequal access	Bias audits, data diversity
Autonomy and authorship	Safeguarding academic integrity	Dilemmas about plagiarism and misuse	Clear guidelines, detection tools

Table 4 Implementation challenges and **limitations**

Dimension	**Main challenges**	**Evidence/indicators**	**Mitigation strategies**
Infrastructure	Computing capacity, connectivity, platforms	Variability between institutions	Investment, cloud services, partnerships
Human capital	Teacher training, resistance to change	Barriers to adoption	Professional development programs, communities of practice
Change management	Institutional governance, policies	Misalignment between areas	Strategic plan, AI committees, ethical oversight
Technological update	Rate of evolution, obsolescence	Need for constant updates	Review and update cycles, reserved budget

Table 5' perceptions on the integration of AI

Emerging topic	**Description**	**Examples cited**	**Implications for practice**	**Recommendations**
Perceived benefits	Increased efficiency, rapid feedback	Lesson planning, answers to questions	Time release for design and personalized support	Training in the responsible use of AI, best practice guides
Obstacles	Lack of training, uncertainty about ethics	Doubts about reliability, bias, privacy	Need for regulations and supervision	Training programs, ethics committees, controlled pilots
Training needs	Literacy in Educational AI	Workshops, mentoring, repositories	Greater sustainable adoption	Structured training offer, incentives

Table 6Students ' perceptions of AI tools

Emerging topic	Description	Examples cited	Implications for the learning experience	Recommendations
Usefulness of AI	Study support, explanations, personalized feedback	AI tutors, exercise generators	Increased motivation and understanding	Ensure ethics, avoid dependency
Ethical/practical concerns	Privacy, academic integrity, biases	Misuse, excessive surveillance	Need for clear rules	Usage policies, detection tools
Accessibility	Access to technology and resources	Inequality among students	It is important to consider socioeconomic differences	Equitable access plans, technical support

Table 7: convergences and divergences between literature and perceptions

Dimension	Convergences	Divergences	Comments for action
Benefits	Improved learning, personalization	They vary by discipline	Adapt approaches by disciplinary context
Challenges	Privacy, ethics, infrastructure	Risk perception vs. empirical evidence	Develop clear guidelines and institutional policies
Implementation	Need for training	Rate of adoption among teachers	Phased implementation plan

Table 8Proposed framework for action (institutional policy recommendations)

Area of action	Strategy	Indicators of success	Responsible	Term
Governance and ethics	Create an institutional AI Committee with policies on privacy, explainability, and responsible use.	Publication of policies, annual audits	Rector's Office/Faculties	12-18 months
Teacher training	Certified Educational AI Literacy Programs	Percentage of teachers trained, satisfaction	Office of Educational Technology	6-12 months
Infrastructure	Platform scaling, technical support	Service availability, response times	IT and institutional budget	12-24 months
Curriculum design	Integration of AI into key subjects	Design guidelines, AI rubrics	Departments	12-24 months
Evaluation and quality	Assessment protocols that combine AI and human review	Validity/reliability rate, academic integrity	Evaluation committees	6-12 months

4. DISCUSSION

Authors such as Hammad (2023), Elshandidy et al. (2018), and Slimi and Carballido (2023) highlight the potential of AI to personalize learning paths, improve comprehension, and expand access to resources. This is clearly reflected in Table 1 (Personalized Learning) and Table 2 (Instructional Design with Integrated AI), which show evidence of increased engagement and pedagogical benefits. The comparison reveals convergence: the literature and empirical findings support personalization as a core advantage. However, both the authors and the tables note the variability across disciplines; therefore, the

framework (Table 8) should include discipline-specific indicators and pilot programs adapted to specific contexts.

The ethical concerns raised by Castelló et al. (2023), Sam and Olbrich (2023), and Pisica et al. (2023)—privacy, algorithmic bias, and data validity—are directly reflected in Table 3 (Ethical Frameworks) and Table 4 (Challenges). There is a high degree of agreement: both the literature and the findings recommend governance, bias audits, transparency, and data protection policies. The comparison also suggests a practical gap: although the tables propose committees and policies (Table 8), the authors insist on specific technical measures (bias assessments, data traceability) that should be incorporated as minimum requirements in institutional recommendations.

Both Bukhari and Rehman (2025) and Pisica et al. (2023) warn about the challenge of plagiarism and originality in the face of AI's ability to generate texts; this connects with the "Evaluation and Feedback" category in Table 1 and with the mixed assessment recommendations in Tables 2 and 8. There is agreement on the need to combine automated assessment with human review and detection tools. However, the authors also point to the need to rethink assessment criteria (for example, valuing process and metacognition rather than product)—a recommendation that could be incorporated more explicitly into the curriculum design and assessment tables.

Back (2016) and others (Kelly, 2024; Milberg , 2024) identify the skills gap as a critical obstacle; Tables 5, 6, and 8 compile teacher/student perceptions and propose training programs. There is clear consistency: the literature and empirical findings agree on prioritizing literacy in educational AI. However, while the literature emphasizes the urgency and specifies competencies (e.g., understanding biases, explainability , pedagogical use), the tables could be enriched by detailing these competencies and proposing metrics for evaluating the effectiveness of the training.

Authors such as Marcus and Davis (2019), Bankins and Formosa (2023), and Brodheim (2025) describe AI adoption as a profound and continuous process of change that requires experimentation. Tables 7 and 8 promote pilot projects, contextual adaptation, and ethical governance, thus aligning with the literature on phased implementation. The comparison shows that the proposed institutional plan is consistent with the theoretical evidence, but it should incorporate formal institutional learning mechanisms (monitoring lessons learned, periodic reviews, and policy updates), as recommended by the cited authors, to ensure adaptability in the face of rapid technological evolution.

5. CONCLUSIONS

The integration of AI in higher education offers clear pedagogical benefits—personalized learning, automation of administrative tasks, and faster feedback—that can improve engagement and efficiency if designed and implemented in accordance with instructional objectives. Literature findings and the perceptions of faculty and students converge on the idea that AI is not just a technical tool but a catalyst for rethinking curriculum design, methodologies, and assessment; therefore, the most effective interventions will be those that align technology, pedagogy, and disciplinary competencies (field-specific pilot programs, adapted rubrics, and blended learning assessment).

At the same time, the ethical, technical, and organizational risks are significant and require structured responses: data protection and privacy, bias audits and output validation, safeguards for academic integrity, and systematic human capital development. A review of the literature and primary data shows that without clear governance (committees, policies, audits) and without training programs with specific competencies in educational AI, adoption can be uneven, creating access gaps and amplifying problems of equity and institutional trust.

Therefore, an integrated and phased institutional strategy is recommended that combines (a) explicit governance and ethical frameworks with minimal technical requirements (bias audits, data traceability), (b) competency-based training programs evaluated by teacher/student impact indicators, and (c) disciplinary pilot projects linked to an institutional learning process (monitoring, adjustment, and scaling). This approach, focused on people, processes, and policies—not just technology—will facilitate capitalizing on AI opportunities while mitigating its risks and preserving educational goals.

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