



A Systematic Literature Review of the Adoption of Artificial Intelligence Tools in Higher Education

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Abstract: The use of Artificial Intelligence (AI) is quickly changing higher education. Although there is a growing body of literature on the subject, a clear understanding of adoption patterns, stakeholder experiences, and the resulting institutional responses is still lacking. This systematic literature review brings together practical and theoretical research from 2022 to 2026. It outlines the benefits, challenges, skill gaps, and integration strategies related to AI adoption in higher education institutions (HEIs). Following PRISMA guidelines, we conducted a systematic search on PubMed, IEEE Xplore, ScienceDirect, and Springer Nature Link. Out of 1,379 initial records, 51 studies met the inclusion criteria and were analyzed qualitatively. The review shows that ChatGPT is the most studied AI technology. Key benefits include better teaching and learning processes, increased efficiency and accessibility, and support for student well-being. However, significant challenges remain, including ethical and social risks, barriers to institutional adoption, and technological limitations. Notable skill gaps in AI understanding, critical evaluation, ethical awareness, and technical skills were identified among all stakeholder groups. The review developed a framework of six types of integration strategies: 1) policy-level approaches, 2) training and professional development, 3) redesign of teaching and assessment, 4) technical solutions, 5) psychological support, and 6) planning strategies. This review offers a clear framework that highlights the current state of AI integration in higher education. It clarifies the complex relationship between the benefits and challenges of AI adoption, identifies key skill deficits, and provides a structured list of strategies to support institutional practices and future research.

IndexTerms – Artificial Intelligence Tools, Higher Education, AI tools, Adoption

I. INTRODUCTION

Artificial intelligence (AI) is increasingly proliferating in many sectors, including education. AI encompasses a range of technologies, such as machine learning (ML), natural language processing, and robotics, enabling non-human systems to perform complex tasks in ways that resemble human intelligence (Alqahtani et al., 2023; Gil de Zuniga et al., 2023); (Tlili et al., 2023; Strzelecki, 2024). AI is therefore capable of revolutionizing teaching, learning, and research in higher education, and has captured significant attention in recent years (Aithal & Kumar Maiya, 2024; Dube, et al., 2026). It is with this mind that higher education institutions (HEIs) are increasingly exploring AI-enabled technologies to support both academic and operational functions (O'Dea & O'Dea, 2023; Al Zahrani & Alasmari, 2024). AI tools are personalizing learning, improving research through data analysis, as well as students' diverse learning needs (Bhat, 2023; Helmiatin, Hidayat & Kahar, 2024; Salas-Pilco, Xiao & Oshima, 2022).

Despite a plethora of research in this area, many existing studies are empirical in nature and there are very few literature reviews. In addition, the existing literature reviews are narrowly focused on isolated tools like ChatGPT, rather than a broader ecosystem of AI technologies (Dempere et al., 2023; Pradana, Elisa, & Syarifuddin, 2023). More so, the existing literature reviews fail to capture the complex requirements for selecting, combining, and using diverse AI tools in real-world educational settings (Hughes et al., 2025). Furthermore, other categories of literature reviews only identify applications and problems rather than synthesizing comprehensive, actionable frameworks for institutional adoption (Dai, Liu & Lim, 2023; Sandu, Gide & Elkhodr, 2024). Although some literature reviews have attempted to highlight important themes like faculty competencies and ethical governance, there still exists a gap of research that presents coherent strategies for implementing AI tools in higher education (Bearman, Ryan & Ajjawi, 2023; Chiu, 2024).

This systematic literature review addresses these gaps by offering three novel contributions. First, it provides a holistic examination of AI use in higher education, moving beyond a single-tool focus. Second, it synthesizes existing evidence on

benefits, challenges, and competency gaps to offer a multi-stakeholder perspective. Third, it consolidates disparate findings into a structured framework of integration strategies to guide both policy and practice. The review is guided by the following research questions (RQs):

RQ1: What are the benefits of using AI technologies in higher education institutions?

RQ2: How is the use of AI tools challenging in higher education institutions?

RQ3: What strategies could be implemented to support the successful integration of AI within higher education institutions?

II. METHODOLOGY

This systematic literature review adheres to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 guidelines (Page et al., 2021) to ensure transparency and rigor. A structured search was conducted in November 2026 across four academic databases chosen for their extensive coverage of education, technology, and computer science literature: PubMed, IEEE Xplore, ScienceDirect, and Springer Nature Link. The search strategy combined Boolean operators and keywords related to AI and higher education. An example search string for ScienceDirect was: `("AI" OR "Artificial Intelligence") AND ("Higher Education" OR "University" OR "Tertiary Education") AND ("Adoption" OR "Integration" OR "Implementation")`. The search was limited to studies published in English between 2022 and 2026 to capture the rapid developments in the field following the public release of advanced GenAI tools.

Research articles were included if they: (a) examined the adoption, benefits, challenges, or integration strategies of AI in higher education; (b) were peer-reviewed journal articles or full conference proceedings; (c) were published between 2022 and 2026; and (d) were written in English. Studies were excluded if they: (a) focused on non-educational applications of AI; (b) were grey literature (e.g., preprints, editorials, opinion pieces, reports); or (c) did not substantively address the intersection of AI and higher education. The initial database search yielded 1,379 records. After removing duplicates (n=20) and records outside the education sector or not in English (n=980), 379 records remained for title and abstract screening. Two reviewers (LM, TM) independently screened titles and abstracts against the inclusion criteria, excluding 307 records. The full texts of the remaining 72 articles were then assessed for eligibility. Of these, 21 were excluded for not adequately addressing the research questions. This process resulted in a final corpus of 51 studies for synthesis as depicted in Figure 1.

A standardized data extraction form was used to collect the following information from each included study: author(s), year, country, AI tool focus, stakeholder group, reported benefits, reported challenges, identified competency gaps, and proposed integration strategies. A narrative synthesis approach was employed to collate and summarise the findings thematically, corresponding to the research questions. Bibliometric data (e.g., publication year, country of origin) were also extracted to map the research landscape.

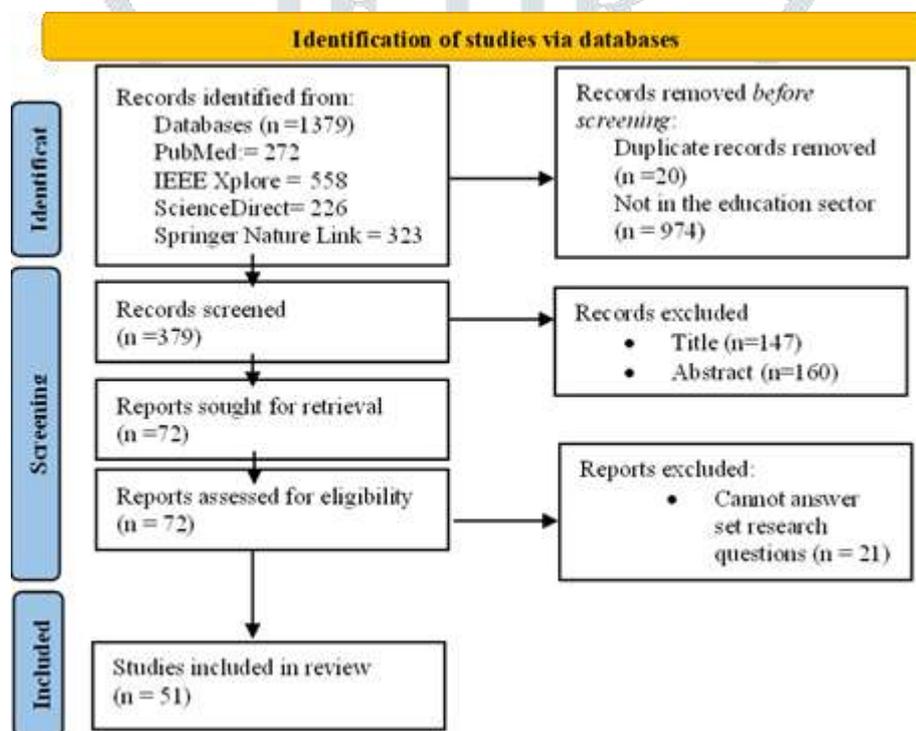


Figure 1. PRISMA flow diagram

III. RESULTS

The analysis of the 51 included studies revealed key patterns in the literature and generated thematic findings aligned with the research questions. A summary of the included studies is presented in Table 1 (available in the supplementary materials).

3.1 Descriptive Analysis of Included Literature

This section presents the descriptive analysis of the literature, which includes the publication trends, geographic distribution of empirical studies, and the AI tools that have been considered in the literature included in this study.

3.1.1 Publication Trends

A clear exponential increase in publications was observed, rising from a single study in 2022 to a peak in 2025, as indicated in Figure 2. This surge directly corresponds with the public release of ChatGPT in late 2022 and the subsequent wave of scholarly inquiry into its educational implications.

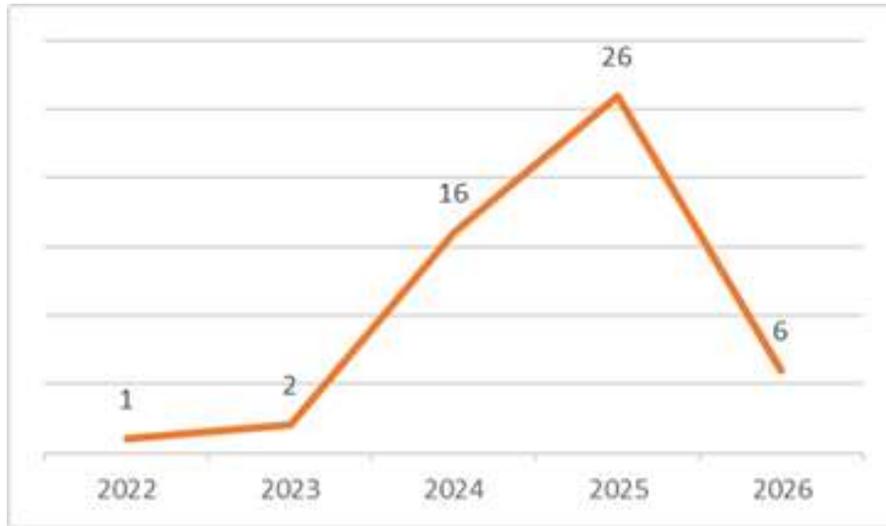


Figure 2. Article publication trend

3.1.2 Geographic Distribution

Figure 3 shows that the research activity is concentrated in Asia (n=20), followed by Europe (n=14). North America and Africa each contributed six studies, while South America was represented by only one, highlighting a significant geographic gap in the literature

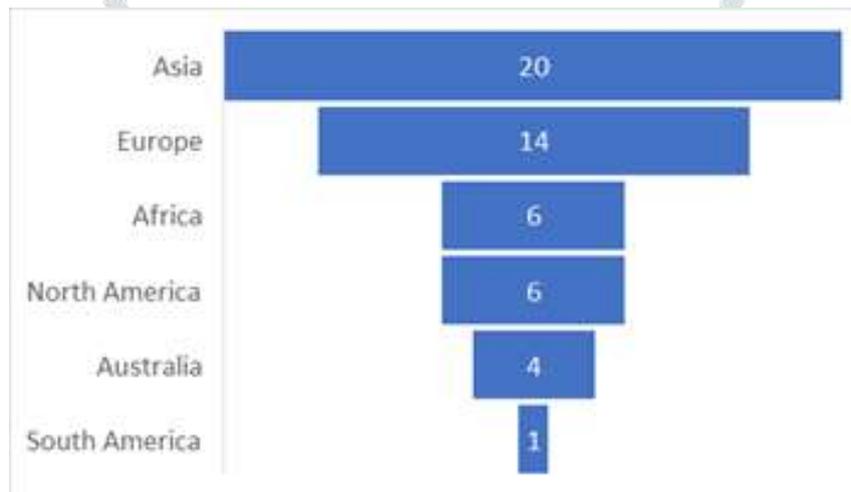


Figure 3. Geographic Distribution of included articles

3.1.3 AI Tool Focus Distribution

Figure 4 demonstrates that ChatGPT dominates the academic landscape, which is unsurprising given that it was the first widely available Generative AI tool and that its late 2022 release triggered international educational discourse. General AI has 14 papers, whereas GenAI has 19, suggesting that researchers are examining more closely the combined effects of multiple generative AI techniques beyond ChatGPT. With only two and one articles, respectively, AI Robots and Gemini are underrepresented in higher education research, indicating that physical AI applications remain understudied.

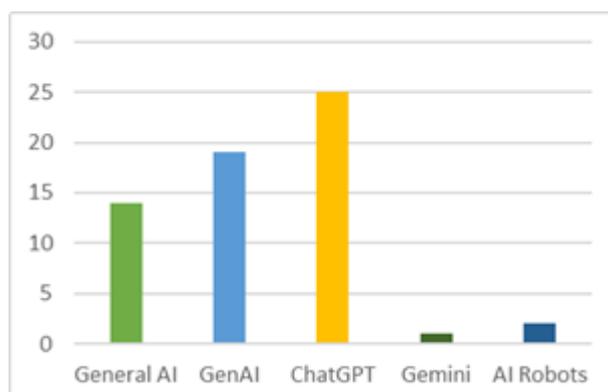


Figure 4. AI tools applied in education

3.2 Benefits of AI Adoption

The benefits of AI tools were found to be experienced differently across the three primary stakeholder groups: students, educators, and institutions. Students primarily use AI for enhanced learning, including understanding complex concepts, improving academic writing (grammar, idea generation), and managing time (Fan et al., 2025; Morell-Mengual et al., 2025; Anani et al., 2025). A critical benefit is well-being support, particularly for students with disabilities, who report increased autonomy, confidence, and reduced effort in academic tasks (Pierres et al., 2024; Johnston et al., 2024). AI promises to personalise learning, automate administrative processes like admissions and financial aid, enhance research capabilities through data analysis, and foster more inclusive learning environments for students with diverse needs (Bhat, 2023; Helmiatin, Hidayat & Kahar, 2024; Salas-Pilco, Xiao & Oshima, 2022). For educators, AI serves as a powerful efficiency tool and instructional aid. It streamlines the creation of instructional materials, case studies, and assessment items (Shata & Hartley, 2025; Mulaudzi & Hamilton, 2025). AI-assisted teaching systems also provide data-driven insights into student performance, enabling more informed pedagogical decisions (Zhang & Hou, 2024). Some studies even note psychological benefits, including reduced stress and increased job satisfaction (Cambra-Fierro et al., 2025).. At an institutional level, AI offers strategic and operational advantages. It enhances operational efficiency, fosters innovation, and enables data-driven decision-making for resource allocation and strategic planning (Fitriani et al., 2025). HEIs also see AI as a tool to promote educational equity and address disparities in access and outcomes (Jin et al., 2025).

3.3 Challenges of AI Adoption

Despite these opportunities, the integration of AI presents significant challenges. Ethical concerns, pedagogical implications, and questions surrounding academic integrity continue to shape critical discussions (Hutson et al., 2022). Clear evidence about the pedagogical effects of AI on student learning outcomes and engagement remains limited (Tang, 2024). Educators struggle to understand and effectively integrate AI tools while maintaining pedagogical integrity (Algerafi et al., 2023; Li et al., 2025). Students, meanwhile, grapple with the ethical dilemmas of AI use, appreciating its utility while acknowledging its potential threats to academic integrity and the development of critical thinking skills (Chan & Hu, 2023; Eleje et al., 2025). Student challenges centre on cognitive and developmental risks. Concerns about over-reliance, potential loss of critical thinking and writing skills, and the accuracy of AI-generated content are prevalent (Morell-Mengual et al., 2025; Fan et al., 2025). "Sociotechnical blindness," or ignoring the essential human role in AI systems, further hinders effective adoption (Uludağ et al., 2025). Educators face significant psychological and professional hurdles. "AI anxiety" manifests as fear for their professional future, concern about student learning, and worry about the misuse of AI (Verano-Tacoronte et al., 2025). A key challenge is resistance to integrating AI into identity-associated tasks like mentoring and providing personalised feedback, which are seen as fundamentally human endeavours (Chaieb et al., 2026). Institutions grapple with complex, systemic challenges. These include managing risks associated with LLMs (e.g., reliability, bias), navigating weak regulatory frameworks, and upholding academic standards amidst technological disruption (Hughes et al., 2025). Policy ambiguity and inconsistency across institutions create further confusion (Erhardt et al., 2025), while ethical concerns about data privacy and the significant environmental impact of LLMs remain unresolved (Wang et al., 2024; de Fine Licht, 2024).

3.4 Competency Gaps Among Stakeholders

The literature reveals pronounced competency gaps across all groups. The most critical gaps are in AI literacy and critical evaluation skills. Students consistently receive little to no formal training on how to use AI tools safely, effectively, and ethically (Baidoo-Anu et al., 2024; Stratton-Maher & Kelly, 2026). They often possess positive attitudes but lack the conceptual understanding needed to critically assess AI-generated content, leading to a "knowledge-practice dilemma" (Heil et al., 2025; Clement David-Olawade et al., 2025). A tech competency deficit also hinders their ability to leverage AI tools effectively (Rahman et al., 2025). Regarding educators, this literature review demonstrates a pedagogical integration deficiency, with the educators struggling to balance the benefits of AI with the complexity it introduces to their teaching (Zhang & Hou, 2024). They lack strategies for integrating AI into core, identity-driven tasks (Chaieb et al., 2026). Furthermore, they suffer from an anxiety management gap, as institutions seldom provide psychological support alongside technical training (Verano-Tacoronte et al., 2025). A lack of clear ethical guidelines and ongoing professional development further compounds the issue (Eleje et al., 2025; Schmidt et al., 2025). At the organizational level, gaps include a policy and guideline deficit, with many institutions lacking clear, consistent national or institutional directives (Erhardt et al., 2025; Shoukat, 2024). There is a strategic alignment gap, as many organizations lack a structured method for aligning AI adoption with core educational goals and integrating ethical governance (Fitriani et al., 2025). Finally, a decision-making framework deficiency leaves policymakers without robust tools to systematically evaluate and prioritize AI implementation strategies (Bukar et al., 2024).

3.5 Strategies for AI Integration

The synthesis of the literature resulted in a framework comprising six distinct categories of integration strategies. These categories include institution and policy, training and professional development, pedagogy and assessment, technical and design, as well as strategic planning frameworks.

3.5.1 Institutional and Policy-Level Strategies

These focus on creating the overarching conditions for adoption. They include developing national guidelines to ensure consistency and equitable access (Erhardt et al., 2025) and establishing comprehensive ethical frameworks based on principles like transparency, accountability, and fairness (Francis et al., 2024; Aler Tubella et al., 2024). Fostering stakeholder collaboration between students, faculty, administrators, and developers is also crucial (Jin et al., 2025).

3.5.2 Training and Professional Development Strategies

:These strategies aim to close the competency gaps. They call for implementing AI literacy programs for both students and faculty, moving beyond technical skills to include critical, ethical, and contextual understanding (Francis et al., 2024; Tzirides et al., 2024).

Programmes must be differentiated and targeted to address the specific needs and motivations of different user groups (Saihi & Ahmed, 2026).

3.5.3 Pedagogical and Assessment Strategies

These strategies address the core academic mission. They advocate for redesigning assessments to emphasize process, critical thinking, and metacognition over final products that AI can easily generate (Francis et al., 2024; Polyportis, 2026). This involves promoting a balanced integration of AI with conventional teaching methods and fostering task-sensitive adoption, where AI augments, rather than replaces, human effort in specific tasks (Chaieb et al., 2026; Fan et al., 2025).

3.5.4 Technical and Design Strategies

These focus on the tools themselves. Key recommendations include prioritizing user-centered and accessible design to build trust and ease of use (Roy et al., 2022; Pierres et al., 2024). Developing context-specific and discipline-specific AI tools that address the unique needs of different academic fields is also seen as vital (Baig & Yadegaridehkordi, 2025; Fan et al., 2025).

3.5.5 Psychological and Support Strategies

Recognizing the affective dimension of adoption, these strategies aim to address psychological barriers. They recommend providing anxiety management and emotional support alongside technical training (Verano-Tacoronte et al., 2025; Aldraiweesh & Alturki, 2025). The focus should be on addressing enactment barriers (practical hurdles) rather than just attitudes, by establishing clear norms and providing capability support (Polyportis, 2026).

3.5.6 Strategic Planning Frameworks

These provide holistic models for institutions to navigate integration. Hou's (2025) three-dimensional typology (AI as curriculum, infrastructure, and sociotechnical context) offers a tool for assessing coherence. Others advocate for holistic approaches that tackle the interconnected nature of adoption challenges, aligning AI with organizational goals, ethical governance, and stakeholder engagement from the outset (Hughes et al., 2025; Fitriani et al., 2025).

IV. DISCUSSION

The findings corroborate the transformative potential of AI while starkly illustrating the complex, multi-layered challenges that accompany its integration. The results extend prior work by moving beyond a singular focus on either benefits or risks to offer an integrated framework that connects stakeholder experiences, competency deficits, and a structured typology of solutions.

A central finding is the predominance of ChatGPT in the research discourse. While understandable given its disruptive arrival, this narrow focus risks creating an incomplete picture of the broader AI ecosystem, including other GenAI models and specialized educational tools. The significant geographic imbalance in the literature, with a notable absence of research from South America and large parts of Africa, is a critical gap that must be addressed to ensure AI integration is informed by diverse global perspectives and contexts.

The review's multi-stakeholder analysis reveals a fundamental tension: while AI offers powerful tools for efficiency, personalization, and support, it also threatens to erode the very human competencies and relationships that are central to higher education's mission. Students benefit from AI's cognitive and well-being support, but risk atrophying their own critical thinking and analytical skills. Educators gain efficiency but face profound anxiety and resistance to automating core aspects of their professional identity. Institutions see strategic opportunities but are hamstrung by a lack of coherent policy, ethical frameworks, and the sheer complexity of the challenge. This tension is at the heart of the "competency gaps" identified, which are not merely a lack of technical skill, but a deficiency in the wisdom to use AI judiciously.

The competency gaps themselves are telling. They are not simply about knowing how to use a tool, but knowing when and why to use it, and understanding its limitations and ethical implications. The widespread lack of formal training in AI literacy for both students and faculty are a systemic failure that HEIs must urgently address. The existence of an "anxiety management gap" for educators underscores the need for a human-centered approach to adoption that acknowledges and mitigates the psychological impact of technological disruption.

The six-part strategy framework synthesized from the literature provides a roadmap for institutions. Crucially, it demonstrates that no single type of intervention is sufficient. Technical and design solutions must be paired with pedagogical redesign; policy-level strategies must be supported by psychological support mechanisms. The framework highlights that effective AI integration is a sociotechnical challenge, requiring simultaneous intervention at the individual, pedagogical, and institutional levels. The most forward-looking strategies are those that move beyond a reactive, problem-focused stance (e.g., banning tools) towards a proactive, value-led approach that seeks to embed human flourishing and educational integrity at the center of AI adoption.

V. CONCLUSION

Artificial intelligence offers transformative benefits for higher education, including enhanced teaching and learning, improved efficiency, and vital student support. However, its successful and ethical integration depends on addressing significant, interconnected challenges and profound competency gaps across all stakeholder groups. Students need formal training in AI literacy and critical evaluation; educators require support to manage anxiety and develop new pedagogical approaches; and institutions must create coherent policies, ethical frameworks, and strategic alignment. Policymakers have a crucial role to play in establishing national frameworks that balance innovation with equity and ethical considerations. This review contributes a comprehensive, multi-stakeholder framework that maps the current landscape of AI integration. It clarifies the complex interplay between benefits and challenges, identifies critical competency deficits, and offers a structured typology of strategies to guide institutional practice. Future research should prioritize longitudinal studies to examine the long-term effects of AI on learning outcomes and skill development. It

must also expand its geographic scope to include underrepresented regions and explore a wider range of AI tools beyond ChatGPT. Finally, rigorous, empirical evaluations of the efficacy of the various integration strategies proposed in this review are urgently needed to move from recommendation to evidence-based practice. The ultimate goal is to move from fragmented, reactive approaches to comprehensive, context-sensitive strategies that harness the power of AI while steadfastly preserving the essential human elements of education. Despite these findings, the study had limitations regarding the number of databases and articles. Similar future studies could consider expanding the number of databases and articles to result in more informed opinions.

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