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Survey on Learning Models Using Artificial Intelligence and Its Impact and Implications

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Abstract

Artificial Intelligence (AI) has emerged as a transformative force in higher education, supporting personalized learning, adaptive instruction, automated assessment, and intelligent academic assistance. This survey paper presents a critical review of AI-based learning models and examines their impact and implications in higher education. Using a structured literature review approach, recent studies were analyzed to identify key applications, research trends, and major methodological limitations. The review reveals that while AI-based learning systems offer significant benefits in improving learning efficiency, student engagement, and educational accessibility, many existing studies remain limited by narrow sample sizes, lack of strong empirical evidence, limited practical implementation, and insufficient long-term outcome analysis. The study also highlights important concerns related to privacy, bias, academic integrity, and excessive reliance on AI-generated content. Based on these findings, the paper outlines practical recommendations for future research, including broader and more diverse sampling, longitudinal evaluation, multimodal AI integration, and ethically responsible educational adoption. Overall, this study provides a useful reference for researchers and educators by summarizing the current state, challenges, and future directions of AI-enabled learning models in higher education.

Keywords: Artificial Intelligence, AI-based Learning Models, Higher Education, Educational Technology, Generative AI in Education, Adaptive Learning Systems, AI in Teaching and Learning.

1. Introduction

Current trend in the world is not using Artificial Intelligence. So these is vacancy in vacuum in identifying good applications and good models. So this paper attempts works on this direction by studying popular learning models that are built on Artificial Intelligence by various scientists by end of these paper attempt present a summary of learning models applications to the methodologies, pros and cons so the paper will acts as a supporting material for research the field of Artificial Intelligence based skill.

The present study focuses on understanding how Artificial Intelligence is being introduced into learning systems and how different models are being used in educational environments. It also aims to identify the major methodologies followed by researchers while developing AI-based learning approaches and to examine their practical usefulness in higher education. The paper further highlights the strengths, limitations, and future possibilities of these learning models so that researchers can gain a clearer view of current developments. Thus, the study not only provides a general survey of AI learning models but also serves as a brief reference source for further academic work in Artificial Intelligence–based learning and skill development.

2. Literature Survey

2.1 Limited Generalization

Many studies on Artificial Intelligence in education are based on narrow samples, such as single universities or small participant groups, which limits the generalizability of their findings. Such studies do not fully represent diverse students, institutions, or disciplines in higher education. Therefore, broader research involving

multiple countries, institutions, and educational contexts is necessary to produce more reliable and widely applicable conclusions (Regala & Caballes, 2025; Son, Ružić, & Philpott, 2025). The constrained generalization ability of artificial intelligence arises from fundamental differences between computational models and human cognition. Humans can infer patterns and adapt even in situations with limited or ambiguous information, whereas AI systems typically depend on extensive labeled datasets for effective learning (Focused Learning: AI Training Using Small., 2025). Such dependence reduces their robustness in real-world environments where data is often scarce or noisy. In addition, most AI models are designed for narrowly defined tasks, which restricts their capacity to transfer knowledge across contexts (Gabriel et al., 2024). Addressing these limitations requires the development of learning frameworks that integrate more flexible, human-inspired cognitive mechanisms to enhance generalization.

2.2 Lack of Empirical Evidence

A major limitation in AI-based education research is the lack of strong empirical evidence. Many studies rely on small surveys, opinions, or exploratory observations rather than robust statistical analysis and measurable outcomes. As a result, the actual effectiveness of AI learning models remains uncertain, making large-scale and evidence-based studies essential for stronger validation (Ahn, Yoon, & Jung, 2023; Schön et al., 2023). The use of artificial intelligence (AI) in education remains controversial due to limited empirical evidence supporting its effectiveness. Although AI is increasingly adopted in educational settings, its expected benefits, including improved learning outcomes and personalized instruction, are not yet consistently supported by research. A systematic review found only 28 empirical studies on AI in K–12 education between 2019 and 2022, many of which lacked methodological rigor (Rizvi et al., 2023). Likewise, only three studies examined generative AI in computer science education, indicating that the field is still emerging and underexplored (Lin et al., 2025).

2.3 Outcome-Based and Long-Term Evidence

Although AI tools are often claimed to improve learning and engagement, there is limited evidence regarding their long-term educational impact. Most studies focus on short-term user experience rather than sustained academic performance, skill development, or knowledge retention. Therefore, outcome-based and longitudinal studies are needed to assess the true long-term effectiveness of AI in education (Stockwell, 2024; Lee et al., 2024; Tang, 2024). The integration of Artificial Intelligence (AI) in education is transforming learning outcomes and teaching practices, particularly within the framework of outcome-based education (OBE) (Krishna et al., 2025; Vijayakumar & Naveen, 2025). AI-based systems enable adaptive learning by tailoring content to individual learner needs, thereby enhancing conceptual understanding and retention levels (Krishna et al., 2025). In addition, these technologies automate assessment processes and provide timely, data-driven feedback to learners. Such advancements contribute to increased student engagement and improved academic performance over time. Moreover, personalized learning environments supported by AI foster sustained motivation and long-term educational success (Vijayakumar & Naveen, 2025).

2.4 Risks of Overgeneralization and Narrow Scope

Many studies on AI in education are conducted within narrow academic or institutional contexts, which creates a risk of overgeneralizing results. Findings from specific disciplines or small groups may not accurately reflect broader educational realities across regions, cultures, and subject areas. Hence, wider and more context-sensitive research is necessary for a more inclusive understanding of AI's role in higher education (Ghosh & Ghosh, 2023; Schofield & Zhou, 2025). The integration of artificial intelligence (AI) in education poses notable risks, particularly due to overgeneralization and limited research scope. Although AI has the potential to enhance learning, exaggerated claims in meta-analyses often misrepresent its effectiveness while the lack of standardized and real-world outcome measures further obscures its actual impact (Bardach et al., 2025). Such broad assumptions can also encourage overdependence on AI technologies, potentially diminishing critical thinking and human judgment in educational environments (Angwaomaodoko, 2023).

2.5 ***Limited Practical Application***

A significant limitation is that many studies discuss the theoretical benefits of AI but provide limited evidence from real classroom implementation. Few studies include actual experiments, pilot projects, or

institutional case studies that demonstrate practical educational use. Therefore, future research should focus more on real-world applications and multimodal AI systems that improve interaction and learning effectiveness (Coulson, 2024; Hrytsenko et al., 2024). Nai education, or nai taleem, faces challenges in practical implementation due to its philosophical basis and the dominance of traditional education systems. It promotes holistic development through skill-based learning, native languages, and community engagement (Chakraborty, 2025; Jain, 2023), but its adoption is often hindered by systems that prioritize rote learning over experiential methods, limiting its effectiveness (Chakraborty, 2025). Additionally, inadequate teacher training and lack of institutional support further restrict its integration into mainstream education. Limited policy-level emphasis also reduces its scalability and long-term impact.

2.6 Ethical, Technical, and Academic Integrity Concerns

Ethical and academic integrity issues remain major challenges in the adoption of AI in education. Concerns such as privacy risks, plagiarism, bias, misinformation, and overdependence on AI-generated content may negatively affect learning quality and fairness. To ensure responsible use, institutions must implement ethical guidelines, data protection measures, and assessment methods that support originality and critical thinking (Al Murshidi et al., 2024; Leal Filho et al., 2025). The integration of artificial intelligence (AI) in education presents significant ethical, technical, and academic integrity challenges that demand careful consideration. Although AI offers substantial benefits, issues such as algorithmic bias may reinforce existing inequalities, leading to unfair outcomes for students from diverse backgrounds (Abdurrahim et al., 2025), while extensive data collection raises concerns regarding privacy, surveillance, and informed consent ("Ethical Dilemma in Digital Education: Pr…", 2025). Additionally, AI tools may widen inequities for students with disabilities and those from underrepresented groups ("Ethical Dilemma in Digital Education: Pr…", 2025). From a technical standpoint, the emergence of AI-assisted content generation complicates plagiarism detection and challenges conventional definitions of academic misconduct (Khalida et al., 2025), and automated assessments may not fully capture authentic learning outcomes, raising questions about validity and fairness ("Ethical Dilemma in Digital Education: Pr…", 2025). Furthermore, increased reliance on AI can hinder originality, critical thinking, and creativity in academic work (Khatri & Karki, 2023), highlighting the urgent need for clear ethical guidelines and strong institutional oversight to ensure responsible use of AI in education (Güneş & Kaban, 2025).

2.7 Engagement and Pedagogical Challenges

Although AI-generated content is increasingly used in education, maintaining student engagement remains a key challenge. AI-based materials often lack emotional expression, authenticity, and human interaction, which can reduce learner motivation and connection. In addition, many educators face difficulties due to limited training and institutional support, making improved AI design and teacher preparation essential for effective classroom integration (Netland et al., 2025; Lee et al., 2024; Antony & Khalid, 2024). The integration of artificial intelligence (AI) in education offers substantial opportunities for enhancing student engagement while simultaneously introducing notable pedagogical challenges. AI-driven tools support personalized learning by enabling tailored learning pathways, which have been associated with increased student engagement and improved knowledge retention (Korolev, 2025). Similarly, adaptive learning systems, such as Intelligent Tutoring Systems, contribute to measurable gains in learning outcomes and higher levels of student interaction (Malik et al., 2025), while real-time feedback mechanisms further enrich the learning experience and promote deeper understanding (Nasser, 2024). However, the effective implementation of AI is constrained by several challenges, including insufficient teacher training, which limits the optimal use of these technologies in educational settings (Kumar, 2024). In addition, concerns related to data privacy and security remain significant (Korolev, 2025; Nasser, 2024), and unequal access to AI resources continues to widen the digital divide, potentially reinforcing existing educational disparities (Malik et al., 2025; Li et al., 2024).

3 Research Methodology

This study follows a systematic and thematic literature review methodology to examine AI based learning models and their impact in higher education. Since this is a survey paper, the study is based on the structured analysis of existing scholarly literature rather than primary data collection. Relevant and recent studies were selected from peer-reviewed journals, conference papers, and credible academic sources focusing on AI

applications such as adaptive learning, intelligent tutoring, automated assessment, personalized learning, and generative AI in education. The selected studies were comparatively reviewed to identify their research methods, educational applications, benefits, limitations, and ethical concerns**.** A thematic analysis was then applied to group the findings into key issues such as limited generalization, lack of empirical evidence, insufficient long-term outcome analysis, narrow sampling, limited classroom implementation, and privacy or academic integrity risks. Based on this analytical review, the study proposes that future research should adopt large-scale, multi-institutional, and cross-cultural investigations with broader and more representative samples. It also recommends the use of empirical, experimental, and longitudinal research designs to measure long-term effects on academic performance, engagement, and critical thinking. In addition, AI learning systems should move beyond text-only tools and develop into multimodal and interactive platforms that include adaptive feedback, audio, video, and intelligent tutoring support. Educational institutions should also establish ethical guidelines, privacy safeguards, teacher training, and AI literacy programs to ensure responsible adoption. Overall, the study concludes that AI should function as a supportive educational tool that complements human teaching rather than replacing it, thereby improving personalization, accessibility, and learning effectiveness while preserving academic integrity.

Table 1 Major Limitations in AI Learning Models and Corresponding Solutions

Sl. No.	Limitations	Solutions
1.	Lack of empirical data	Add surveys, Case studies, and statistical analysis
2.	Limited generalization	Use diverse, global samples and broader contexts
3.	No long-term impact evidence	Conduct longitudinal studies
4.	Limited practical application	Run real-world classroom experiments and pilot projects
5.	Underexplored risks (privacy, bias, ethics)	Include risk analysis and propose ethical guidelines
6.	Narrow sampling	Use stratified/ probability-based sampling
7.	No student experience data	Collect info on prior AI use and satisfaction
8.	Overfocus on chatgpt	Explore other AI tools (adaptive learning, AI tutors, etc)
9.	Limited dataset(few sources)	Include more articles, years and grey literature
10.	Teacher challenges(training, tools)	Provide training and create user-friendly AI platforms
11.	Ai lowers engagement/critical thinking	Use interactive, inquiry-based learning and gamification.
12.	Ignores non-verbal cues	Develop multimodal AI(Audio, video, gestures)
13.	AI videos less engaging	Add natural voice, emotion, and interactivity
14.	Risk of cheating and data misuse	Use AI-detection tools and redesign assesments

4. AI Learning Models – Limitations and Solutions

Table 1 provides a structured overview of the major limitations observed in Artificial Intelligence–based learning models and the corresponding solutions proposed in existing research. The table identifies key issues such as lack of empirical evidence, limited generalization due to narrow research samples, absence of long-term impact analysis, and limited practical classroom implementation. It also highlights important concerns including ethical risks such as privacy, bias, academic integrity, and challenges faced by teachers in adopting AI tools. Furthermore, the table points out issues like overreliance on specific AI platforms, limited datasets, reduced student engagement, and lack of multimodal interaction. To address these limitations, the table proposes solutions such as conducting large-scale surveys, using diverse and global samples, implementing longitudinal studies, performing real-world classroom experiments, improving datasets, providing teacher training, and developing interactive multimodal AI systems that integrate audio, video, and gesture-based learning.

5. Conclusions

This survey highlights the current landscape of Artificial Intelligence (AI) adoption in higher education learning models. While AI has demonstrated potential in enhancing personalization, engagement, and efficiency, several challenges remain unaddressed. Key limitations identified include lack of empirical evidence, narrow research samples, absence of long-term impact studies, and underexplored ethical concerns such as bias, privacy,

and academic integrity. Furthermore, AI-generated content often struggles to replicate the emotional and interactive qualities of human teaching, and many educators face barriers due to insufficient training and institutional support.

To overcome these challenges, future research must focus on broader, cross-institutional studies, multimodal AI integration, and outcome-based evaluations that measure long-term learning effectiveness. Ethical safeguards and teacher development programs are also crucial for sustainable implementation. Overall, the study emphasizes that AI should not replace human-centered learning but rather complement it through balanced, interactive, and ethically responsible practices.

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Ethical Considerations

Not applicable

Conflict of Interest

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