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PEDAGOGICAL AND ETHICAL DIMENSIONS OF AI-DRIVEN LEARNING MANAGEMENT SYSTEMS IN THE GENERATIVE AI ERA: A CONCEPTUAL REVIEW

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ABSTRACT

Objective: This study examines the evolution of AI-driven Learning Management Systems (LMS), particularly in the era of Generative AI, by analyzing their pedagogical implications, academic integrity concerns, ethical challenges, and the tension between technological optimization and human-centered educational values.

Research Design & Methods: This paper employs a conceptual and theoretical literature review of reputable publications addressing AI integration in higher education platforms. The selected studies are analyzed thematically to identify recurring patterns, critical debates, and emerging pedagogical and ethical issues.

Findings: The review indicates that AI-enhanced learning platforms offer significant opportunities for personalization, adaptive feedback, and learning efficiency. However, they also introduce risks related to academic integrity, algorithmic bias, data privacy, and the erosion of cognitive autonomy. Trust and fairness depend on the alignment between system design, human-centered pedagogy, and institutional ethical governance.

Implications & Recommendations: Higher education institutions should adopt transparent and pedagogically grounded AI policies that prioritize human-in-the-loop approaches, data protection, and responsible AI literacy. Strategic governance is essential to ensure that technological advancement supports, rather than replaces, core educational values.

Contribution & Value Added: This conceptual review proposes an integrative framework linking pedagogy, ethics, and academic integrity, emphasizing that sustainable trust in AI-driven educational systems is shaped by value alignment rather than technological sophistication alone.

Keywords: LMS, Generative AI, Adaptive Learning, Academic Integrity, Ethical AI.

JEL codes: I21, I23, O33

Article type: research paper

INTRODUCTION

Learning Management Systems (LMS) have evolved from simple digital storage to sophisticated educational platforms. The application of Generative Artificial Intelligence (AI) in education shows great progress, improving the system's ability to personalize, adapt, and automate the learning process (Ikhsan et al., 2025). The widespread adoption of online learning, especially

after global disruptions such as the COVID-19 pandemic, has accelerated the integration of Artificial Intelligence (AI) into LMS functions, shifting the focus from simple content delivery to dynamic and interactive ecosystems (Johar et al., 2025). Technology is constantly changing various aspects of society, and education, which stands at the forefront of innovation, is ready to utilize AI to enrich the teaching and learning experience (AlAli and Wardat, 2024). AI technology now facilitates personalized learning paths, automated feedback mechanisms, and intelligent assessment systems that adapt to the needs of individuals from diverse learner populations (Gkintoni et al., 2025).

Recent advances in generative AI, including large language models (LLMs), have further reshaped the use of LMS by enabling automated content creation and conversational learning support, acting as a More Knowledgeable Other in the digital classroom (Ra et al., 2025). Various universities are beginning to explore the integration of GenAI to improve learning effectiveness and institutional efficiency, while facing serious challenges related to academic integrity, algorithmic bias, system transparency, and data protection (Hussain et al., 2020, 2021).

The adoption of AI in higher education itself has accelerated significantly in recent years, with a variety of applications beginning to reshape the educational landscape (Chakraborty et al., 2021; Chua et al., 2019). Previous studies have shown that AI has the potential to improve learning personalization and instruction quality, but it also raises ethical issues such as plagiarism and academic authenticity (Qazi et al., 2024). In this context, attention to academic integrity has become increasingly crucial. Several studies emphasize the need for clear and transparent policies regarding the use of GenAI in academic writing and learning practices, emphasizing the importance of human supervision and critical evaluation of AI-generated content (Hussain et al., 2021; Qazi et al., 2024). This challenge requires a structured governance strategy that balances the pedagogical benefits of AI with the ethical and social consequences of its use in higher education settings.

One of the main arenas for AI integration in higher education is the Learning Management System (LMS). LMS has evolved from a simple digital repository into an intelligent education platform that supports complex, data-driven learning interactions. The expansion of online learning, especially in the wake of the COVID-19 pandemic, has accelerated the integration of AI into LMS, shifting its function towards a dynamic, adaptive, and interactive learning ecosystem (Hussain et al., 2020; Jain, 2022). AI technology in LMS now enables personalized learning paths, automated feedback, learning analytics, and intelligent assessment systems tailored to the individual needs of learners.

Advances in Generative AI are further expanding the role of LMS through automated content creation and conversation-based learning support, which serve as learning support agents in the digital classroom (Ra et al., 2025). However, the use of this technology also raises concerns regarding pedagogical appropriateness, ethical governance, and the potential degradation of students' cognitive autonomy (Bittle and El-Gayar, 2025). Existing literature still tends to focus on technical aspects such as system architecture and AI algorithms, leaving a conceptual gap in understanding how AI-based LMS can be designed in line with pedagogical principles and academic values.

The current educational landscape is marked by the "AI Paradox," in which the benefits of simplifying academic work are often offset by concerns about declining skills, loss of cognitive autonomy, and erosion of pedagogical identity (Alhur et al., 2025). Despite extensive research undertaken on AI technologies in LMS, a lack of integrative conceptual models exists that consider pedagogy, academic integrity, ethics, and user trust within the era of Generative AI. This study addresses this conceptual gap by conducting a comprehensive literature-based analysis of AI-driven LMS research, focusing on the tension between technological optimization and human-centered educational values. The purpose of this study is to develop an integrated conceptual framework that combines pedagogical, ethical, academic integrity, and trust dimensions in an Artificial Intelligence (AI)-driven Learning Management System in the era of Generative Artificial Intelligence. It is hoped that this study will contribute conceptually to the development of LMS that is not only technologically advanced but also academically responsible and sustainable.

LITERATURE REVIEW

The Transformation of E-Learning and the Role of LMS

The COVID-19 pandemic has accelerated the shift from face-to-face learning to online learning. This has increased the use of Learning Management Systems (LMS) at all levels of education. This transition requires technical and pedagogical changes, lecturer readiness, and adaptive institutional policies (Qazi et al., 2024). Studies in Indonesia show that the readiness of teachers and lecturers in managing online learning has a significant impact on the successful use of LMS (Murad et al., 2020). The importance of contextual and pedagogy-oriented online teaching strategies, not merely transferring content to digital platforms (Mondego and Gide, 2021). The need for ongoing teacher training and monitoring of student satisfaction and learning progress was also emphasized as prerequisites for quality online learning (Supriyatno and Kurniawan, 2020). However, various studies reveal that regulatory constraints, institutional communication, and learning design remain major obstacles in ensuring the sustainable quality of online education.

The limitations of conventional LMS in vocational and STEM education are evident due to the need for hands-on practice and physical interaction. The use of video conferencing platforms such as Zoom and WebEx cannot replace practical learning experiences, leading to a decline in learning outcomes (Edy et al., 2020; Salas-Pilco, 2022). A SWOT analysis of online learning in higher education shows that despite its flexibility and accessibility, challenges in quality, assessment, and student engagement remain significant (Wang et al., 2022). Previous studies have focused more on technical aspects and user readiness, but have not comprehensively integrated pedagogical, ethical, and governance dimensions, especially in the context of AI and Generative AI development.

Artificial Intelligence in Education and the Evolution of AI-Based LMS

As online learning becomes increasingly complex, Artificial Intelligence (AI) is being integrated into LMS to overcome the limitations of conventional systems. AI is understood as a system that is trained using large-scale data to mimic human thought processes and automate various cognitive tasks (Hassani et al., 2020; Sze et al., 2017; Tjoa and Guan, 2021; Zhou et al., 2019). In education, AI has been applied to support adaptive learning, content personalization, learning analytics, and automation of interactions between students and systems (Qazi et al., 2022; Shafique et al., 2020).

A number of preliminary studies have shown the effectiveness of AI in improving learning experiences through adaptive learning. For example, the use of decision tree algorithms in e-learning systems has been proven to be able to tailor material to the individual needs of students (AL-Chalabi et al., 2021). The development of AI-based personalized learning systems that utilize chatbots as interactive agents also shows great potential in automating student-lecturer communication in Moodle-based LMS (Nenkov et al., 2016; Skrebeca et al., 2021). Cross-sector studies confirm that AI chatbots have the ability to improve service efficiency, including in education, although challenges related to interaction design and context understanding remain (Albayrak et al., 2018).

Generative AI and Pedagogical Disruption in LMS

The latest developments in educational AI are marked by the emergence of Generative AI, particularly ChatGPT, which was developed based on the Generative Pre-trained Transformer (GPT) model by OpenAI (Zhang et al., 2023). By utilizing deep learning and natural language processing, ChatGPT is capable of generating human-like linguistic responses and has demonstrated performance equivalent to passing grades on advanced professional exams (Bengio et al., 2021). The arrival of ChatGPT marks a fundamental shift in learner interaction with LMS, from content-based systems to dialogic and generative systems. However, this capability has also sparked academic controversy, including debates about scientific authorship, as seen in the case of ChatGPT being used as a co-author in scientific publications (King, 2023). Generative AI integration also extends to virtual reality-based learning, student performance prediction, and learning analytics. Deep learning models that utilize LMS log data have been proven to accurately predict student academic

performance, even when considering social and demographic factors using machine learning algorithms such as Random Forest (Akmeşe et al., 2021; Aljaloud et al., 2022; Chiang et al., 2022).

AI, Assessment, and Academic Integrity Challenges

In addition to adaptive learning, AI is also widely used in the domain of academic assessment and evaluation. Various AI-based online proctoring systems have been developed to prevent cheating in online exams, including PearsonVUE, ProctorU, Respondus, and Talview (Slusky, 2020). Critical analysis of these systems shows that while they are effective in surveillance, there are serious concerns regarding privacy, algorithmic bias, and fairness of evaluation (Nigam et al., 2021). The application of AI in education across four main domains: learning, teaching, assessment, and administration, each of which has different ethical and pedagogical implications (Chiu et al., 2023). In the context of academic integrity, Generative AI complicates the line between legitimate learning assistance and academic misconduct, challenging traditional assessment paradigms that focus on the final product (Salas-Pilco, 2020).

Ethical Dimensions, Inclusivity, and Governance of AI Technology in LMS

The role of AI in supporting inclusive education, especially for students with special needs. The development of AI-based smart glasses for autistic students, AI tutors for Braille learning, and adaptive systems for students with learning disabilities demonstrate the enormous potential of AI in expanding access to education (McCarthy et al., 2016; Standen et al., 2020; Vahabzadeh et al., 2018). However, using AI in this context requires strict ethical governance to protect sensitive data and ensure user dignity. Supporting technologies such as blockchain are also proposed to address data security issues, certification credibility, and privacy protection in AI-based LMS ecosystems (Chen et al., 2018; Sun et al., 2018). The integration of AI with big data and machine learning in LMS enables highly personalized learning predictions and recommendations, but at the same time increases the risk of excessive surveillance and algorithmic dependence (Sharma et al., 2019; Villegas-Ch. et al., 2021).

METHODS

This research uses a conceptual synthesis approach based on a structured literature review to analyze the developments, challenges, and pedagogical and ethical strengthening of the implementation of Artificial Intelligence (AI)-based Learning Management Systems (LMS) in higher education. This approach was chosen because the research objective was not to test empirical hypotheses, but rather to integrate and reinterpret scientific findings to build a comprehensive conceptual framework.

The literature search was conducted systematically through several major databases, namely Scopus, Web of Science, IEEE Xplore, and ERIC. The literature was limited to the period 2019–2025 to represent the crucial transition phase of AI adoption—particularly generative AI—from the experimental stage to widespread implementation in LMSs. Inclusion criteria included peer-reviewed articles that explicitly discussed AI in LMSs, adaptive learning, generative AI, academic integrity, or the ethical governance of AI in higher education. Non-academic publications, articles without a peer-review process, and studies outside the context of higher education were excluded. The search strategy used a combination of keywords such as “AI-driven LMS,” “Generative AI,” “adaptive learning” OR “personalized learning,” “academic integrity,” and “Academic integrity” OR “ethical AI” OR “human-centered AI.” The analysis was conducted through a thematic coding approach to identify patterns, cluster issues, and contextual relationships between studies. This approach allows researchers to capture the current dynamics related to learning personalization, academic integrity, and AI ethical governance in the AI-based LMS ecosystem.

LMS depends on a balance between technological innovation, learning design, and ethical governance.

Based on the mapping of trends and conceptual evolution described above, Table 1 systematically summarizes the main studies by showing the relationship between research focus, theme groups, research focus and key findings, as well as their pedagogical and institutional implications in the context of LMS and AI-based learning. The integration of AI into Learning Management Systems (LMS) has triggered a structural transformation that positions technology not merely as a tool for automation, but as an augmentation partner in the Self-Regulated Learning (SRL) network that strengthens students' metacognition and agency. These findings confirm that personalized learning paths and intelligent tutors significantly increase emotional engagement and administrative efficiency. However, this innovation must be balanced with a strict ethical framework such as the SAIE and ETHICAL principles to ensure data privacy and human accountability in the system. Furthermore, the data reveals that the threat to academic integrity posed by the use of Large Language Models (LLMs) calls for assessment reform to become more AI-resistant through higher-order thinking skills (HOTS) evaluation and adaptive e-assessment strategies. The success of adopting this technology ultimately depends on the emotional intelligence of the AI system and the digital literacy of teachers, requiring institutions to shift from punitive policies to transparent and inclusive governance in the digital age.

Table 1. Thematic Synthesis of AI-Driven LMS Literature

No	Theme	Research Focus & Key Findings	Pedagogical & Institutional	References
1	Safety & Ethics	Development of ethical standards (SAIE & ETHICAL) covering transparency, accountability, data privacy, and human-in-the-loop principles.	Institutions must develop comprehensive governance policies, integrate ethics into LMS infrastructure, and ensure full control over data for sustainable education.	(Peñalvo et al., 2024; Sozon et al., 2025; Van Wyk, 2025)
2	Learning Regulation & Metacognition (Self-Regulated Learning)	AI as a dialogue partner in a co-regulation network that influences students' self-regulation and metacognitive processes.	Focus on developing epistemic competencies and evaluative judgment; AI should function as pedagogical scaffolding, not merely as a content production tool.	(Khlaif et al., 2025; Lodge et al., 2024)
3	Academic Integrity & Assessment Reform	Investigating the challenges of LLM as an "essay factory" and developing adaptive/AI-resistant e-assessment strategies.	The shift from rote memorization testing to critical thinking evaluation (HOTS) and the need for legal/technical regulations (such as watermarking) to mitigate cheating.	(Gaumann and Veale, 2024; Gundu, 2025)
4	Personalization & Learning Paths (Smart LMS)	AI integration for administrative automation, provision of intelligent tutors, and creation of immersive personalized learning paths.	Improving system efficiency through interoperability standards and leveraging predictive analytics to proactively monitor student retention and progress.	(Alshahrani and Qureshi, 2024; Sozon et al., 2025; Wu et al., 2025)
5	Literacy, Adoption & User Interaction	Analysis of student adoption factors (utility/emotional) and the role of AI as an interactive conversation partner (L2) or creative narrator.	The need for professional development for teachers (AI literacy) and content design that increases emotional engagement without ignoring the risk of AI hallucinations.	(Daniels et al., 2025; Minnillo et al., 2024; Świerczyńska-Kaczor, 2024)

Pedagogical Dimensions of AI-Based LMS

The results show that Learning Management Systems (LMS) powered by artificial intelligence (AI) fundamentally shift the pedagogical approach from uniform learning to adaptive, learner-centered learning. AI enables adaptive learning pathways by utilizing data on student

interactions, academic performance, and engagement patterns to dynamically adjust content, activities, and the sequence of learning (Franzoni et al., 2020; Ginting et al., 2024; Villegas-Ch et al., 2020). This approach not only increases the relevance of learning materials, but also supports instructional differentiation that was previously difficult to achieve in static conventional LMS (Almufarreh et al., 2021; Lintao et al., 2025). The literature confirms that AI-based personalization directly contributes to increased learning effectiveness by aligning individual student needs with established learning objectives (Autsadee et al., 2023; Luo and Wang, 2024).

In addition to personalization, the role of AI in providing real-time feedback and pedagogical scaffolding is an important finding that is consistent across various educational contexts. AI systems in LMS are capable of continuously analyzing learning activities and generating instant formative feedback, whether in the form of content recommendations, early warnings, or conceptual support (Franzoni et al., 2020; Ginting et al., 2024; Rakhmetov et al., 2025). Unlike traditional feedback, which is delayed and results-oriented, AI-based feedback tends to focus on the learning process, thereby helping students manage their learning strategies, correct mistakes immediately, and develop metacognitive skills (Moghadam et al., 2023; Rakhmetov et al., 2025). Several studies also show that AI acts as a pedagogical scaffold by improving the accessibility and usability of learning materials, primarily through content format adaptation and semantic analysis, which ultimately expands the inclusivity of digital learning (Almufarreh et al., 2021; Villegas-Ch et al., 2025).

The application of AI in LMS contributes significantly to increased engagement and self-regulated learning (SRL). An adaptive learning environment, supported by personalized recommendations and instant feedback, encourages active student engagement cognitively, affectively, and behaviorally (Bian and Zaid, 2025; Pliushch and Sorokun, 2024; Zdravkova and Ilijoski, 2025). Empirical studies show that students who interact with AI-based LMS systems demonstrate improvements in learning planning, progress monitoring, and self-reflection, which are core components of SRL (Lintao et al., 2025; Rakhmetov et al., 2025). In addition, the use of AI to tailor learning based on contextual factors, including emotions and engagement levels, further strengthens the role of LMS as a responsive learning environment that supports learner autonomy (Moghadam et al., 2023).

In terms of adaptation approaches, the literature clearly distinguishes between technology-driven adaptation and pedagogy-driven adaptation. Technology-based approaches generally focus on algorithm optimization, decision automation, and system efficiency by relying on user preferences and data analytics, but often fail to consider broader pedagogical goals (Bertolini et al., 2023; Pliushch and Sorokun, 2024; Yefremenko et al., 2025). Conversely, the pedagogy-based approach positions AI as a tool that supports reflective instructional design, taking into account cognitive, emotional, and social aspects in the learning process (Bian and Zaid, 2025; Moghadam et al., 2023; Villegas-Ch et al., 2025). Several studies explicitly show that adaptations driven solely by technology risk neglecting the learning context, while adaptations aligned with pedagogical principles can produce more meaningful and sustainable learning experiences (Villegas-Ch et al., 2025; Zdravkova and Ilijoski, 2025).

Overall, the main findings of the literature confirm that the effectiveness of AI in LMSs is highly dependent on its integration with reflective, human-centered instructional design. AI has been shown to be most effective when it functions as an augmentative technology that supports educators' pedagogical decision-making, strengthens learning interactions, and facilitates independent learning, rather than as a system that completely replaces the role of the instructor. This synthesis highlights that the success of AI-based LMS is not determined solely by technological sophistication, but rather by the extent to which the technology is consciously integrated into a pedagogical framework that emphasizes engagement, reflection, and the long-term competency development of learners.

AI-Driven Assessment dan Academic Integrity

a. The Use of AI in Academic Assessment

The use of AI in academic assessment is growing rapidly and includes evaluative, formative, and reflective functions. AI is used to support adaptive and process-based assessments, such as preliminary assessments of programming tasks using structured rubrics that quickly and consistently evaluate functionality, code structure, documentation, and efficiency (Bernik et al., 2025). This approach allows lecturers to shift their focus from mechanical assessment to conceptual feedback and advanced guidance. In addition, the integration of AI in LMS through Smart Learning Applications (SLApps) strengthens course-based assessment, personalized feedback, and the use of learning analytics to continuously monitor student learning progress (Peñalvo et al., 2024).

AI is used to support open-book exams, project-based assessment, question randomization, and adaptive e-assessment, which aim to reduce reliance on memorization and assess analytical thinking and problem-solving skills (Gundu, 2025). In this context, GenAI is positioned not only as a technical tool, but also as a collaborative partner in ideation, source summarization, and initial exploration of ideas, as long as its use is explicitly and transparently regulated within an assessment framework (Estaphan et al., 2025; Wu et al., 2025). Innovative approaches such as the tapas model even propose an assessment spectrum that distinguishes between purely human work, limited AI use, and full human-AI collaboration as adaptive strategies to the learning reality in the GenAI era (Hau, 2025).

Furthermore, AI also plays a role in improving the quality of learning experiences through personalized feedback, scenario-based simulations, and experiential learning, which strengthens the link between assessment and meaningful learning (Daniels et al., 2025; Kumar et al., 2024). In this perspective, AI is viewed as an assessment enabler that supports self-reflection, self-regulated learning, and strengthened student-faculty interactions, rather than merely a tool for automating assessment (Alshahrani and Qureshi, 2024; Lodge et al., 2024). These findings confirm that AI-driven assessment has the potential to improve the validity of formative assessment when aligned with didactic objectives and process-oriented learning design.

b. Risks to Academic Integrity in AI-Based Assessment

The application of AI, particularly Generative AI (GenAI), in the context of academic assessment poses serious challenges to multidimensional academic integrity. The most dominant risk identified is the increase in AI-based academic cheating, including generative plagiarism, automatic paraphrasing, and the use of AI as an assessment shortcut to produce academic assignments without sufficient cognitive involvement from students (Khlaif et al., 2025; Martha et al., 2025; Peñalvo et al., 2024). GenAI's ability to generate text that is original on the surface but difficult to trace back to its source has blurred the line between legitimate learning aids and academic integrity violations, especially in essay-based assessments and take-home assignments.

The literature also consistently highlights the ambiguity of authorship and authenticity of student work as a crucial conceptual risk. The use of GenAI as a writing and ideation tool makes it increasingly difficult for lecturers to distinguish between human intellectual contributions and AI output in the final assessment product (Espartinez, 2025; Wu et al., 2025). Several studies confirm that AI-based detection approaches are no longer adequate to guarantee the authenticity of work, due to the low accuracy of detection tools and the potential for misclassification, which can harm students academically and ethically (Hau, 2025). This situation challenges traditional assumptions about individual authorship, which have long been the foundation of academic evaluation.

Additionally, the risk of over-reliance on AI emerges as a latent threat to the integrity of the learning process. Students tend to use GenAI to avoid demanding cognitive processes, such as in-depth analysis, critical reflection, and idea synthesis, thereby distorting the integrity of assessments as representations of learning outcomes (Estaphan et al., 2025; Peñalvo et al., 2024). In long-term, this dependence has the potential to weaken the development of critical thinking and metacognitive skills, because assessment success is determined more by the ability to utilize AI than by the students' own conceptual understanding (Lodge et al., 2024).

Another significant risk relates to the validity and fairness of assessments. Hallucinations, algorithmic bias, and inaccuracies in AI output can affect the quality of students' answers, especially when AI is used without critical verification (Van Wyk, 2025). On the other hand, differences in access to and competence in using AI create academic inequality, where students with higher digital literacy and resources have a disproportionate advantage in completing AI-based assessments (Khlaif et al., 2025). This raises issues of evaluative justice that conflict with the principles of academic integrity and equal learning opportunities. The phenomenon of AI-based essay mills shows how GenAI can be institutionalized as a means of contract cheating that is difficult to clearly criminalize, as determining the intent, knowledge, and level of involvement of students becomes increasingly complex (Gaumann and Veale, 2024). This situation weakens the mechanism for enforcing academic integrity, which has so far relied on easily identifiable violations.

Conceptually, several studies criticize institutional responses that place too much emphasis on control, prohibition, and technical detection, as such approaches tend to reduce academic integrity to a mere issue of compliance rather than a pedagogical value built through student agency and responsibility for learning (Hau, 2025; Lodge et al., 2024). An excessive focus on preventing cheating risks neglecting the need to redesign assessments to align with the reality of human-AI collaboration. Thus, the literature concludes that the main threat to academic integrity stems not only from the existence of AI, but also from the unpreparedness of assessment paradigms, policies, and pedagogical designs to accommodate the ethical and meaningful role of AI in higher education (Gundu, 2025; Wu et al., 2025).

Ethical Issues, Bias, and Privacy in AI-Based LMS

a. Literature Findings Related to Issues of Ethics, Bias, and Privacy

The integration of AI into LMS raises complex ethical dilemmas, including data privacy, algorithmic bias, and potential surveillance (García-López and Trujillo-Liñán, 2025). AI is ideally positioned as a pedagogical facilitator supporting experience-based learning, reflection, and authentic assessment, rather than as an automatic evaluation mechanism that replaces the role of humans (Bernik et al., 2025; Daniels et al., 2025). However, weak institutional policies and unclear guidelines on AI use have led to risky practices, particularly in relation to transparency, fairness, and data protection (Martha et al., 2025).

The issue of bias arises at various levels, ranging from algorithmic bias due to non-transparent training data to structural bias reinforced by differences in digital literacy and access to technology among students (Espartinez, 2025; Peñalvo et al., 2024). In addition, over-reliance on AI detection tools leads to low reliability and validity, as well as potential discrimination and evaluation errors against students (Bordalejo et al., 2025; Gundu, 2025). Overall, literature emphasizes the need for transparent, ethics-based institutional policies that prioritize human oversight to ensure that AI in LMS operates in alignment with educational values and user rights (Alshahrani and Qureshi, 2024; Wu et al., 2025).

Recent literature consistently places user trust as a key element in the successful implementation of AI-based LMS. Conceptual models that link ethics, responsibility, and accountability in AI governance emphasize that trust does not arise solely from the technical performance of the system, but rather from users' perceptions of fairness, transparency, and ethical intent behind AI design (Rousi, 2022). The gap between the discourse on AI ethics and users' perceptions of trust remains a major issue, especially when AI systems are widely used without adequate understanding of how they work and their limitations.

The issue of transparency is a central concern in the literature, particularly regarding the use of black-box models that limit users' understanding of AI decision-making processes. This opacity has the potential to erode trust, especially when AI is used in sensitive contexts such as academic assessment and learning analysis (Zubiaga, 2024). In addition, the ability of AI, particularly language models, to generate offensive or biased content also raises serious ethical implications that directly impact perceptions of the legitimacy and security of AI-based LMS systems (Zubiaga, 2024).

b. Impact on Fairness of Academic Evaluation and Student Trust

The lack of transparency in algorithms, bias in AI output, and inequality in access to and competence in using AI create unequal evaluation conditions among students (Estaphan et al., 2025; Khlaif et al., 2025). When AI is used in assessment or grading without clear rubrics and human-in-the-loop mechanisms, the risk of unfairness increases, especially for students who lack AI literacy or adequate access to technology (Bernik et al., 2025; Espartinez, 2025). In addition, the use of learning analytics that is overly intrusive can blur the line between learning support and institutional control, potentially violating the principles of fairness and academic autonomy for students (Peñalvo et al., 2024; Wu et al., 2025).

The continued impact of this situation is a decline in student trust in AI-based LMS systems. The literature shows that user trust is greatly influenced by perceptions of transparency, accountability, and privacy protection (Hau, 2025). The ambiguity of AI's role in assessment and data processing has sparked resistance and reduced student trust in LMS, especially when institutional policies are punitive and focused on detecting violations rather than educating students on the responsible use of AI (Gaumann and Veale, 2024; Kumar et al., 2024). Therefore, the literature emphasizes that fairness and trust are interrelated dimensions and are highly determined by the quality of ethical AI governance in LMS (Lodge et al., 2024; Minnillo et al., 2024).

The application of AI in education poses difficult ethical challenges. These relate to data consent, transparency, and the use of secondary data. These issues are often not considered early in the design process, which can affect user trust (Sperling et al., 2024). The increased use of AI in writing raises questions about norms, particularly regarding the integrity and originality of work. This uncertainty is related to the limitations of using AI in assessment, which can affect institutional trust (Conklin et al., 2024). The literature shows that trust is built on a commitment to privacy, user control, and data transparency. Human oversight is essential to control the risk of over-reliance and align AI with educational values and goals (Peñalvo et al., 2024; Zhao et al., 2024). Algorithmic bias arising from historical data can reinforce existing inequalities and affect fair academic evaluation. This makes data protection not only a legal obligation, but also an ethical basis for legitimizing the use of AI in education (Pliushch and Sorokun, 2024). The effectiveness of AI is also influenced by students' self-efficacy and institutional readiness, as trust in AI correlates with perceptions of self-competence and confidence in the relevance and integrity of the data used by the system (Rakhmetov et al., 2025; Singh et al., 2025). However, continuous data collection through learning analytics risks turning into excessive surveillance that blurs the line between pedagogical support and privacy violations if it is not balanced with transparent policies and the ethical competence of educators (Sahayu et al., 2025).

c. Conceptual Model of the Relationship between AI Ethics and User Trust

Based on a synthesis of the literature, the relationship between AI, ethics, and user trust in LMS can be understood through a layered conceptual model. At the first layer, AI design and governance, including algorithmic transparency, institutional control, data protection, and human oversight, form the ethical foundation of LMS systems (Peñalvo et al., 2024). This layer shows how well AI follows existing educational values and rules. In the second layer, AI is used in a clear manner and integrated into task design. The use of AI is limited to supporting learning, not replacing human assessment (Estaphan et al., 2025; Hau, 2025). This practice serves as a mediator between technology and student learning experiences, and influences perceptions of fairness and legitimacy in academic evaluation (Gundu, 2025).

The third layer is user perception and response, particularly among students, which includes a sense of fairness, privacy assurance, and transparency regarding the role of AI in the learning process (Wu et al., 2025). When these three layers are aligned, trust in AI-based LMS can be established and maintained. Conversely, failure in one of the layers, such as unclear policies or algorithmic bias, can undermine trust and weaken the legitimacy of AI systems in education (Espartinez, 2025; Gaumann and Veale, 2024). Conceptually, the literature concludes that student trust is not a direct result of AI sophistication, but rather a product of consistent ethical, pedagogical,

and institutional integration within AI-based LMS ecosystems (Alshahrani and Qureshi, 2024; Minnillo et al., 2024).

DISCUSSION

Reinterpretation of Findings from a Human-Centered Pedagogy Perspective

This study shows that AI-based LMS has great potential in education, such as personalized learning, immediate feedback, and support for independent learning. However, from a human-centered pedagogical perspective, this potential is not only about efficiency or advanced technology, but also as a way to deepen the meaning of learning, self-reflection, and the development of learning identity. This perspective is in line with Self-Regulated Learning Theory, which emphasizes learning autonomy, metacognitive reflection, and active control over the learning process, as well as a constructivist view that positions learners as active meaning makers in authentic learning contexts. The literature indicates that AI-based adaptive learning is most effective when positioned as an augmentative technology that strengthens the role of educators and student agency, rather than as an automated mechanism that replaces human pedagogical judgment.

The tension between optimizing adaptivity and technological engagement with the values of reflection, autonomy, and meaningful learning highlights the risk of dehumanization if LMS design focuses too much on algorithmic logic. These findings reinforce criticism of technology-driven adaptation approaches, which tend to prioritize system efficiency and learning behavior predictions without considering the cognitive, emotional, and social contexts of students. From a sociological perspective of education, such over-reliance on algorithmic systems may also reproduce institutional power asymmetries and reduce participatory learning dynamics. In contrast, pedagogy-driven adaptation approaches show that AI can function as a pedagogical scaffold that supports reflective, metacognitive, and sustainable learning when consciously integrated into instructional design. Thus, reinterpretation of the findings shows that the success of AI-based LMS does not lie solely in the level of automation or personalization, but rather in the alignment between technological functions and human-centered pedagogical values that place humans as the main subjects of learning.

Tension between Technology Optimization and Human-Centered Values

The use of AI in education creates tension between efficiency, adaptability, and learning engagement with human-oriented values that are important for reflection, identity, and meaning in learning. Although AI can improve personalization and scalability, too much focus on optimization can shift education toward shallow performativity and reduce the ethical, leadership, and moral awareness aspects of students (Daniels et al., 2025). Tensions between algorithmic efficiency in AI-based academic integrity assessment and monitoring and the principles of fairness, pedagogical accountability, and trust are increasing. There is also a risk of discriminating against students with diverse languages and academic styles (Bernik et al., 2025; Bordalejo et al., 2025).

Reliance on algorithmic evaluation in learning can diminish the role of lecturers, confuse academic responsibility, and cause students to become overly dependent, which can weaken critical thinking and academic integrity (Martha et al., 2025; Peñalvo et al., 2024). AI should be used ethically as a support system that reinforces, rather than replaces, human decisions in the design, implementation, and evaluation of learning (Van Wyk, 2025). Without a clear pedagogical framework, GenAI personalization and automation risk obscuring the authenticity of the learning process, reducing the quality of meaningful learning, and weakening the development of high-level cognitive skills and soft skills that are AI-proof (Espartinez, 2025; Estaphan et al., 2025; Khlaif et al., 2025).

Conceptually and policy-wise, the literature views this tension as a fundamental dilemma, not a transitional phenomenon. The optimization of technology that is not balanced with human oversight, ethical literacy, and proportional policies has the potential to erode learning autonomy, academic freedom, and educational justice. Therefore, the relationship between humans and AI in

education must be augmentative and human-centered, with pedagogical control and human ethical responsibility as the main prerequisites for the legitimacy and sustainability of AI-based LMS.

Academic Integrity in Generative AI Era

In the context of assessment, AI, particularly Generative AI, simultaneously acts as an assessment enabler and a source of disruption to academic integrity. On the one hand, AI enables adaptive, authentic, and process-based assessments that have the potential to improve formative validity and the quality of feedback. On the other hand, GenAI's ability to generate academic content quickly and convincingly poses risks of generative plagiarism, authorship ambiguity, and cognitive dependence among students. These findings reinforce the argument that the crisis of academic integrity in the AI era is not solely due to the existence of technology, but rather due to the unpreparedness of assessment paradigms that are still oriented towards final products and traditional assumptions of individual authorship. This condition reflects a misalignment between traditional product-based evaluation models and constructivist and process-oriented assessment approaches. An institutional approach that focuses on technical detection and control has proven inadequate and even has the potential to undermine the fairness of evaluations and student trust due to the low reliability of AI detection tools.

This research shows a shift from a punitive approach to a more open and reflective assessment design, with an emphasis on the clear, pedagogically limited use of AI focused on supporting the learning process. Thus, academic integrity needs to be reconceptualized as an ethical and pedagogical competency that is built through learning design, not merely as compliance with rules.

Policy Implications and Institutional Governance

The findings of this study have strong implications for policy and institutional governance in the implementation of AI-based LMS. The literature shows that weak policies, unclear guidelines, and dependence on third-party AI platforms increase the risk of bias, privacy violations, and unfair evaluation. Therefore, higher education institutions need to develop AI policies that are not only reactive or symbolic, but operational, transparent, and aligned with pedagogical goals. An effective governance approach should include the principles of human-in-the-loop, algorithmic transparency, institutional control over student data, and the integration of AI literacy for faculty and students. In addition, policies need to shift the focus from AI policing to responsible AI use education, emphasizing AI use declarations, transparent assessment rubrics, and process-based task design. To operationalize these principles, policy recommendations may include:

- Establishing clear institutional guidelines on permissible and limited AI use in learning and assessment.
- Embedding AI literacy training for lecturers and students within curriculum development programs.
- Ensuring transparency mechanisms that explain how AI systems process data and support decision-making.
- Limiting excessive surveillance through learning analytics to protect autonomy and privacy.

The implications of this policy also include the need to avoid excessive monitoring through learning analytics, which has the potential to blur the line between pedagogical support and institutional control, as well as undermine student trust in AI-based LMS. Thus, AI governance must be understood as a pedagogical and ethical practice, not merely regulatory compliance.

Theoretical and Conceptual Contributions of the Research

This study adds to the understanding of AI-based LMS as a socio-technical ecosystem that has value, not just as a learning technology. The synthesis conducted shows that the relationship between AI, pedagogy, ethics, and user trust is layered and interdependent, as formulated in the conceptual model of AI, Ethics, User Trust. This study integrates three domains, namely the

pedagogical dimension of AI, academic integrity, and ethical governance, into a coherent conceptual framework.

By explicitly linking Self-Regulated Learning Theory, Constructivist Learning Theory, and sociological perspectives on institutional trust and power, this framework provides a more solid theoretical foundation for understanding how AI-based LMS shapes learning experiences and trust formation. This model emphasizes that student trust is not a direct result of AI's technical performance, but rather a product of the alignment between technological design, pedagogical practices, and institutional policies. Furthermore, this study expands the discourse on human-centered AI in education by showing that the tension between technological optimization and human-centered values is structural and cannot be resolved through technical solutions alone, but rather through pedagogical design and reflective policies.

Limitations and Future Research Directions

Although this study provides a comprehensive literature synthesis, several limitations should be noted. First, this study is conceptual and literature-based, so it does not include direct empirical data from the implementation of AI-based LMS in specific institutional contexts. Second, most of the literature analyzed comes from the context of higher education in developed countries, so generalizations to the Global South context or institutions with infrastructure limitations need to be made with caution. Further research is recommended to empirically test the conceptual model of AI, Ethics, and Trust through quantitative (e.g., SEM-PLS) and qualitative (institutional case studies) approaches. In addition, cross-disciplinary and cross-cultural exploration is needed to understand how human-centered values are interpreted and operationalized in different contexts of AI use. Longitudinal studies are also important to assess the long-term impact of AI-based LMS on academic integrity, cognitive development, and learner identity in the era of Generative AI.

CONCLUSION

This study conceptualizes AI-based Learning Management Systems (LMS) as layered socio-technical ecosystems in which ethical governance, pedagogical integration, and user perception interact to shape sustainable trust. Unlike prior studies that focus primarily on technical efficiency or adoption factors, this research offers a structured conceptual synthesis that positions trust not as a by-product of technological sophistication, but as an outcome of alignment between algorithmic design, institutional governance, and human-centered pedagogy.

The findings indicate a clear paradigm shift in the literature—from automation-driven efficiency toward reflective, ethical, and pedagogically grounded AI integration. Generative AI, in particular, introduces a dual dynamic: it enhances personalization, feedback, and self-regulated learning, while simultaneously challenging academic integrity and assessment validity. This study advances the field by proposing that AI should function as augmentative intelligence that strengthens educator judgment and student agency, rather than replacing them. The proposed layered framework clarifies how transparency, data protection, human oversight, and declarative assessment design collectively sustain user trust.

Conceptually, this framework matters urgently in the era of Generative AI, where rapid deployment often outpaces governance and pedagogical adaptation. By integrating ethical, pedagogical, and institutional dimensions into a single model, this study provides a coherent foundation for policy design and responsible AI implementation in higher education. Nevertheless, this research is limited by its conceptual and literature-based nature and the predominance of studies from developed higher education contexts. Future empirical research is needed to validate the proposed framework and examine its applicability across diverse institutional and socio-cultural settings.

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