Towards Smart and Socially Integrated Learning: A Systematic Review of LMS, Social Media and Artificial Intelligence Synergies

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Abstract: This systematic literature review investigates the synergistic role of Learning Management Systems (LMS), social media (SM) and artificial intelligence (AI) in enhancing student engagement, satisfaction, and academic success within smart online and blended learning environments. LMS platforms are highlighted as the backbone of digital pedagogy, offering increasingly personalized, interactive, and adaptive experiences. The paper examines 34 peer-reviewed articles sourced from Scopus and Web of Science that address the connection between LMS and SM in higher education. In addition, a separate search query was conducted for research question 3, resulting in 11 studies that focus specifically on the intersection of AI, LMS, and SM. Findings indicate that LMS tools such as discussion forums, automated assessment, learning analytics, and interactive content modules consistently support motivation, timely feedback, and improved academic outcomes. The integration of SM enhances these outcomes by introducing familiar, interactive and collaborative dynamics that foster peer engagement and community - building. Case studies- including platforms like Moodle-VKontakte, KnowMore, and my.eskwela - show how features like newsfeeds, chatbots, and analytics can transform static learning portals into autonomous learning ecosystems. Looking ahead, the review also identifies significant potential for emerging technologies - particularly AI - to elevate the effectiveness of LMS and SM integrations. Future learning environments may incorporate AI-driven personalization, predictive analytics for early intervention, and chatbot assistants that provide academic guidance or direct students to well-being resources in an empathetic, non-diagnostic manner, influencing their engagement and overall satisfaction with learning. Immersive virtual spaces such as metaverse-based classrooms also offer new avenues for simulation-based learning and collaborative engagement. Together, these developments signal a shift toward digital ecosystems that are adaptive, community-oriented, emotionally supportive, and grounded in evidence-based design principles. Overall, this review contributes a consolidated understanding of how LMS and SM can jointly advance the quality of digital education, supported by emerging technologies such as AI. By outlining both current practices and future opportunities, it offers a clear foundation for the development of next-generation learning systems that are more engaging, equitable, and responsive to the diverse needs of today's learners.

Keywords: Learning management systems, Social media, Artificial intelligence, e-Learning, Student satisfaction, Student engagement, Academic success

1. Introduction

One area of interest in higher education is the development of social tools integrated inside of Learning Management Systems (LMS), as these tools have the potential to increase student satisfaction, engagement, and even success. Social media (SM) is becoming a part of educational tools taking one step further by enabling more interactive and collaborative experiences between students and faculty.

Despite the adoption of LMS and SM individually in e-learning, there is limited research on their structured integration, particularly regarding their combined impact on student satisfaction and engagement. Moreover, the role of artificial intelligence (AI) in enhancing these integrated digital learning environments, especially in higher education, remains largely unexplored. These gaps highlight the need for a contemporary systematic review to provide an updated overview of the evidence as of 2025 and to examine how LMS, SM, and AI collectively influence student experience.

This systematic literature review (SLR) examines the multifaceted effects of integrating SM into LMS on student outcomes. SM can enhance education by fostering collaborative learning and social interaction, which are key to improving student engagement and performance. Research shows that SM promotes purposeful collaborative learning through active interaction, while ease of use and perceived usefulness have minimal impact. The Technology Acceptance Model and constructivist learning theories support the positive role of SM in education. By encouraging active, collaborative learning, SM improves both student satisfaction and academic performance. Likewise, specific SM platforms have been shown to enhance learning satisfaction and perceived academic achievement.

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The use of SM in asynchronous learning frameworks has been shown to enhance student participation and academic success. Students who engage in both face-to-face and online learning via SM demonstrate higher levels of engagement, motivation, and academic performance. Integrating SM into educational environments also supports goal orientation and persistence, contributing to improved grades and overall learning outcomes. This is particularly important given the research problem that many students in online learning environments experience low motivation and limited engagement, which can hinder their academic success.

Building on these benefits, AI can further amplify motivation, satisfaction, and engagement by personalizing learning content and interactions to individual needs, increasing relevance, enjoyment, and sustained involvement. Through interactive features such as chatbots and virtual assistants, AI can increase the sense of social presence and offer quick informational and entertainment-based rewards, both of which can strongly contribute to user satisfaction and continued engagement. AI-generated and AI-curated content supports hedonic motivation by creating enjoyable and culturally meaningful experiences that can encourage users to stay motivated and take action. Furthermore, AI can enable adaptive gamification by adjusting challenges, rewards, and feedback to individual users, which can further strengthen motivation and enhance overall engagement.

By conducting this SLR, we aim to address these gaps and provide a modern, comprehensive understanding of how LMS, SM, and AI integration can enhance student satisfaction, engagement, and academic success in higher education. Given the increasing role of LMS and SM in university education, this review seeks to answer the following research questions:

RQ1: In the evolving digital learning environment, how do Learning Management Systems influence student satisfaction, engagement, and academic success in higher education?

RQ2: In the context of technology-enhanced education, how does social media influence student satisfaction, engagement, and academic success in higher education?

RQ3: How is artificial intelligence integrated across Learning Management Systems and social media to shape student engagement and satisfaction in higher education?

2. Methodology

Following established SLR standards, the methodology consists of planning, conducting, and reporting phases, including a structured search strategy, clearly defined inclusion and exclusion criteria, and systematic quality assessment. Because of the nature of the topic and research goals, the SLR was designed and executed in two parts. The first part focused on studies addressing LMS and SM integration in higher education, aiming to establish the current state of knowledge and identify possible developments or shifts in findings up to 2025. The second part involved an additional, targeted search examining the role and impact of AI within LMS and SM supported learning environments, allowing the review to capture emerging evidence and gaps in knowledge on how AI influences motivation, engagement, and academic outcomes.

In the planning phase, the scope and criteria for both parts of the review were defined. For the first part, the review applied limits to peer-reviewed, English-language empirical studies published between 2021 and 2025 to capture the most recent evidence. Scopus and Web of Science were selected for their comprehensive coverage of educational technology research. For the second, AI-focused part of the review, Scopus and Web of Science were used as well, and no publication-year restriction was applied in the AI search because an initial scoping check indicated a relatively small number of relevant studies.

For Scopus, the following search string was used for the first and second research question:

(TITLE-ABS-KEY(e-learning) OR TITLE-ABS-KEY(online education) OR TITLE-ABS-KEY(distance learning)) AND (TITLE-ABS-KEY(lms) OR TITLE-ABS-KEY(learning management system)) AND (TITLE-ABS-KEY(social media) OR TITLE-ABS-KEY(social network)) AND PUBYEAR > 2020.

This search returned **1,857 articles**. To refine the results, additional filters were applied:

(TITLE-ABS-KEY(e-learning) OR TITLE-ABS-KEY(online education) OR TITLE-ABS-KEY(distance learning)) AND (TITLE-ABS-KEY(lms) OR TITLE-ABS-KEY(learning management system)) AND (TITLE-ABS-KEY(social media) OR TITLE-ABS-KEY(social network)) AND PUBYEAR > 2020 AND (LIMIT-TO (SUBJAREA, "COMP")) AND (LIMIT-TO (DOCTYPE, "cp") OR LIMIT-TO (DOCTYPE, "ar")) AND (LIMIT-TO (LANGUAGE, "English")).

This refinement reduced the number of articles to **176**.

For Web of Science (WoS), the initial search query was:

TS=("e-learning" OR "online education" OR "distance learning") AND TS=("LMS" OR "learning management system") AND TS=("social media" OR "social network").

This search returned **73 articles**. Additional filters were applied:

TS=("e-learning" OR "online education" OR "distance learning") AND TS=("LMS" OR "learning management system") AND TS=("social media" OR "social network") AND PY=(2021-2025) AND DT=("ARTICLE" OR "PROCEEDINGS PAPER") NOT TS=("review" OR "systematic review") AND LA=(ENGLISH).

This refinement resulted in **17 articles**.

After retrieving the articles, a systematic screening process was performed in two stages: title and abstract screening, followed by full-text analysis. In **Scopus**, after reading the titles and abstracts, **55 articles** were selected for detailed reading. In **Web of Science**, duplicate studies were removed, and after screening, **8 articles** remained. For the full-text analysis, all selected articles were evaluated for methodological rigor, relevance and contribution to the research questions. Out of the **55 Scopus articles**, **18 were inaccessible**, leaving **37 for full review**. After detailed reading, **26 articles** were found to be relevant. In **WoS**, all **8 articles** were accessible and considered suitable for inclusion. Data extraction was performed using predefined categories, including study objectives, methodology, key findings, and relevance to the research questions. The extracted data was synthesized to identify recurring themes related to SM features and LMS.

The final dataset consisted of **34 articles (26 from Scopus and 8 from WoS)**, which were systematically analyzed to extract insights into the role of SM in LMS. The findings were categorized into key themes such as communication, collaboration, content delivery, engagement, and academic success. The results provide a comprehensive understanding of how SM functionalities can enhance LMS, offering valuable insights for future research and practical implementation in higher education. Table 1. presents the number of articles identified from the initial search across different scientific databases, along with the filtering process through additional criteria and qualitative analyses. Figure 1. illustrates the article selection process, detailing the number of articles identified, filtered, and analyzed from both Scopus and WoS databases.

Table 1: Summary of retrieved articles

Science database	Number of articles found	Number of articles after additional criteria	Number of articles after (initial) qualitative analysis of titles and abstracts	Number of articles after qualitative analysis of the entire text
WoS	73	17	8	8
Scopus	1857	176	55	26

For the third research question, the same query used in Scopus was also applied in Web of Science, however, it returned only a single article, which was already included among the Scopus results. Therefore, no additional unique records were obtained from WoS for this stage of the analysis.

The search query applied was:

(TITLE-ABS-KEY("artificial intelligence" OR "AI") AND TITLE-ABS-KEY("learning management system" OR LMS OR "online learning" OR "e-learning") AND TITLE-ABS-KEY("social media" OR "social network" OR "digital platform*") AND TITLE-ABS-KEY("higher education" OR university OR "college student*") AND TITLE-ABS-KEY("student satisfaction" OR "student engagement" OR "student experience")).*

This search identified 11 documents published between 2014 and 2025, with six studies appearing between 2023 and 2025 and the remaining five predating 2020. The limited number of retrieved studies is not indicative of a narrow search strategy but rather reflects the nascent nature of research simultaneously addressing AI, LMS, and SM within higher education learning contexts. The wide range and limited number of publications highlight that research at this intersection is still emerging and requires further investigation. All identified studies were analysed using the same screening and extraction criteria as in the previous phases, focusing on the methodological design, variables measured, and reported outcomes related to AI-driven integration of LMS and SM in higher education contexts.

Following the PRISMA logic (Page et al., 2021), the inclusion process and results were systematically documented to ensure replicability and transparency. The final dataset thus provides a comprehensive overview of current evidence and identifies significant research gaps - most notably the recent but underexplored intersection

between AI, SM, and LMS in higher education. Figure 2. illustrates the article selection process, followng the PRISMA framework.

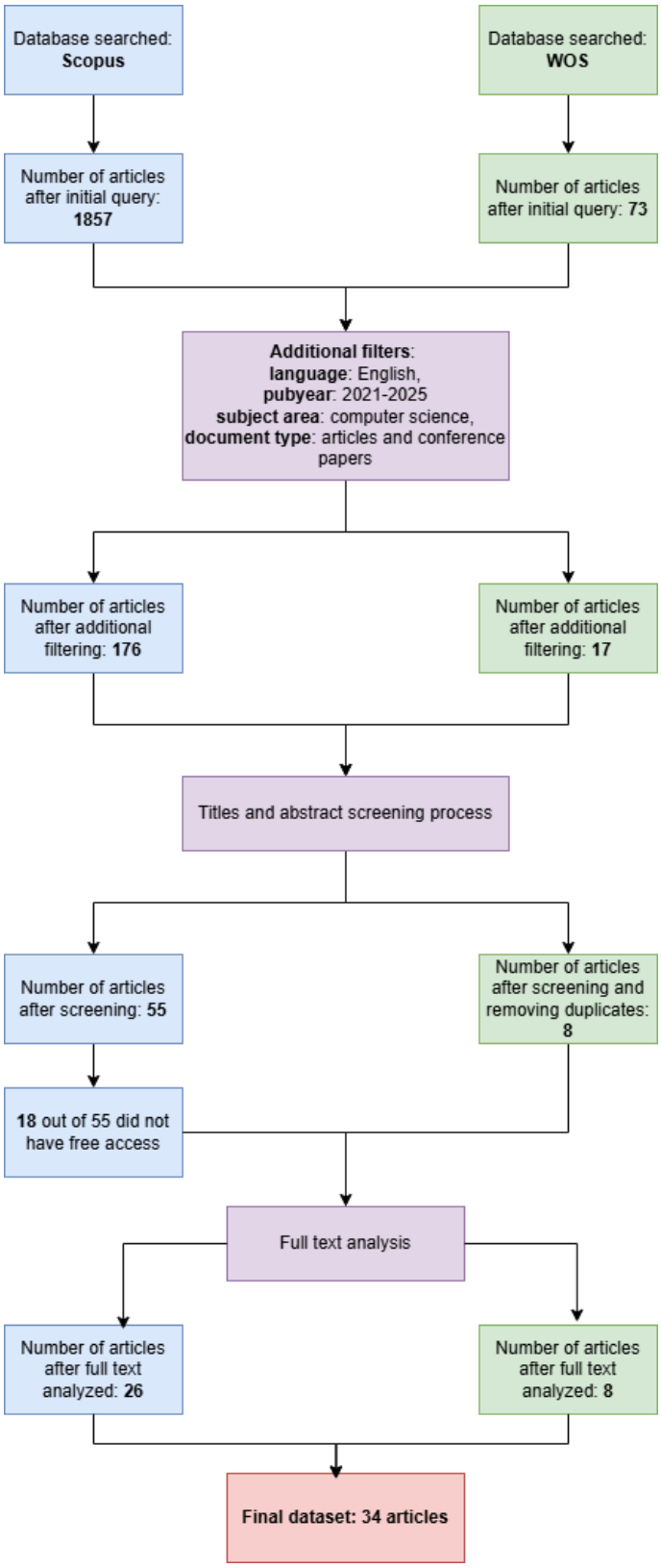

Figure 1: Article selection process for RQ1 and RQ2

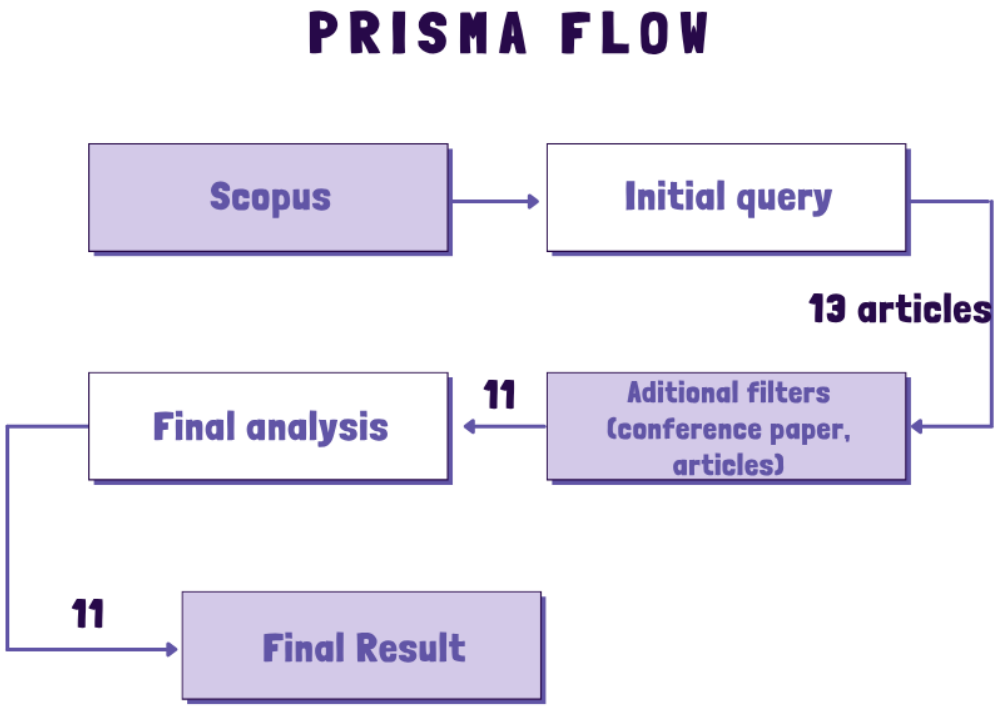

Figure 2: Prisma flow for RQ3

3. Literature Review and Findings

In this chapter, a synthesis of existing studies and the study's research findings is presented in relation to the RQs, with a primary focus on LMS and SM as the two central digital environments shaping student satisfaction, engagement, and academic performance in higher education. While prior research encompasses a wide range of digital tools, this review prioritizes recurring patterns that explain how and under what conditions LMS and SM influence student learning outcomes, rather than offering an exhaustive account of all technologies used in higher education.

To maintain analytical clarity, the findings are discussed through three interrelated lenses:

1. pedagogical value, including perceived usefulness, interaction, and feedback;
2. student experience, encompassing satisfaction, engagement, and motivation; and
3. contextual constraints, such as technological access, digital literacy, and institutional support.

AI and other emerging digital tools are considered cross-cutting enhancements that can modify or amplify LMS and SM functionalities. This framing ensures that AI is acknowledged without creating a third “pillar” of the chapter.

A study comparing students in Israel and Australia using official LMS platforms versus unofficial resources, like YouTube and Wikipedia, showed similar improvements in learning experiences when both were integrated (Cohen, A., Soffer, T., & Henderson, M., 2022). Microsoft Teams and social network sites also enhanced learning by improving resource access, collaboration, and peer–instructor support (Sobaih, A. E. E., Hasanein, A., & Elshaer, I. A., 2021). Additionally, mobile learning and SM promoted collaboration, resource sharing, and entrepreneurial skills but could cause distractions or smartphone addiction (Chen & Ifenthaler, 2021). Table 2. lists the studies in which positive and negative impacts of LMS, SM, and AI in online education were identified.

Table 2: The matrix of references

	POSITIVE INFLUENCE	NEGATIVE INFLUENCE
LMS	(Cohen, A., Soffer, T., & Henderson, M., 2022),(A. E. Sobaih, A. E. E., Hasanein, A., & Elshaer, I. A., 2021), (Saleh et al., 2022), (Navarro et al., 2021), (Kuzmina, N. N., Korotkova, E. G., & Kolova, S. M., 2021), (Pokrovskaia et al., 2021), (Aulia &	(Yunus et al., 2023), (Arefin et al., 2023), (Mabasa, 2023), Bamaga, A., Zafar, B., & Terzis, S., 2023), (Vázquez-Cane & Diez-Arcón, 2021), (Palve S.S. & Palve S.B., 2023), (Petratos, S., Botha, R., & Mtshabe,

	POSITIVE INFLUENCE	NEGATIVE INFLUENCE
	Utami, 2021), (Hasan et al., 2022), (Llantos & Estuar, 2021), (Nasome et al., 2022), (Alkoudmani et al., 2021), (Mabasa, 2023), (Bamaga, A., Zafar, B., & Terzis, S., 2023), (B. A. A. Abbas et al., 2024), (Atmane et al., 2025), (Rafiq, S., Iqbal, S., & Afzal, D., 2024), (Biney & Asamoah, 2023)	M., 2024), (Abbas, 2022), (B. A. A. Abbas et al., 2024)
SOCIAL MEDIA	(Cohen, A., Soffer, T., & Henderson, M., 2022), (Sobaih, A. E. E., Hasanein, A., & Elshaer, I. A., 2021), (Černá & Borkovcová, 2023), (Van Osch et al., 2021), (Liu et al., 2022), (Al-Rahmi et al., 2022), (Yu & Motlhabane, 2022), (Shahbazi et al., 2021), (Ulla & Perales, 2021), (Serradell-Lopez, E., Lara-Navarra, P., & Martínez-Martínez, S., 2023), (Lavlinskaya et al., 2022), (Bamaga, A., Zafar, B., & Terzis, S., 2023), (Petratos, S., Botha, R., & Mtshabe, M., 2024), (Biney & Asamoah, 2023)	(Chen & Ifenthaler, 2021), (Petratos, S., Botha, R., & Mtshabe, M., 2024), (Arefin et al., 2023), (Akbari, 2021), (Elenurm, 2022),(Ibrahim, 2022)
AI	(Kyrilov & Noelle, 2014), (Brown et al., 2024), (Murdoch & Lin, 2023), (Unsriana et al., 2025), (Alieksieieva et al., 2025), (Mbogho, 2017; Stanca & Felea, 2016), (Zelick, 2013), (Delaney & Redman, 2014),	(Warford, 2025), (Atmane et al., 2025)

3.1 How do Learning Management Systems (LMS) Influence Student Satisfaction, Engagement, and Academic Success in Higher Education

Various pieces of research have focused on the benefits of LMS in higher education, particularly the effect of LMS on students' satisfaction, engagement, and academic performance. The research results from Senegal also tell us that LMS platforms contribute more to student engagement than other digital tools (Saleh et al., 2022). In another study combining the Technology Acceptance Model (TAM), the key drivers using learning management system were found to be a perception of academic usefulness and ease-of-use experience among engineering students during COVID-19 pandemic (Navarro et al., 2021). Supportive of previous studies, these constructs suggest that LMS tools such as quizzes, discussion forum, and real-time feedback mechanisms beneficial for learning and thus have a positive effect on student performance.

LMS and SM-based blended models improve academic success.(Kuzmina, N. N., Korotkova, E. G., & Kolova, S. M., 2021) examined how LMS platforms enhance language skills, motivation, and participation. Additionally, a study on digital communication tools found that LMS platforms integrated with SM enhance student engagement by providing flexibility and supporting collaboration (Pokrovskaia et al., 2021). Another study on e-learning effectiveness highlighted that digital tools like discussion boards, multimedia resources, and virtual labs further strengthen engagement and learning outcomes (Aulia & Utami, 2021).

Such sentiments are further reflected in a study exploring the incorporation of Knowledge Management (KM) with Blended Learning during the COVID-19 pandemic. With the integration of KM strategies, network learning helped students stay engaged across, positively on their satisfaction, engagement, and retention during the times of crisis (Hasan et al., 2022). Research on LMS, such as „my.eskewela“, highlighted interactive environments that strengthen collaboration among stakeholders, contributing to academic achievement (Llantos & Estuar, 2021). Platforms like „KnowMore“, which rely on LMS features along with Machine Learning (ML) and Natural Language Processing (NLP), have also been proven to improve student engagement and personal knowledge management (Nasome et al., 2022). Studies examining the effectiveness of Schoology as e-learning tool also support the positive influence of LMS in educational settings, noting a significant improvement in knowledge scores among pharmacy students and professionals (Alkoudmani et al., 2021). (Shahbazi et al., 2021) conducted a study to explore the use of SM in collaborative learning environments and found that platforms like Edmodo led to increased group performance and student engagement.

Use of technology such as discussion forums has been highlighted as impactful for student retention and success in an Open Distance e-Learning (ODeL) context. The close interaction in these forums helps reduce isolation and encourages engagement. However, academic performance is also influenced by social and economic

backgrounds, access to digital resources, and the quality of feedback mechanisms (Mabasa, 2023). Research on mobile learning (m-learning) highlights the flexibility and accessibility of LMS, allowing students to engage with content anytime and anywhere. M-learning not only supports inclusivity but also enhances digital literacy, preparing students for future digital academic environments (Bamaga, A., Zafar, B., & Terzis, S., 2023). Research on interactive lecture platforms designed and built using MATLAB AppDesigner demonstrated tremendous increases in engagement and satisfaction for LMS personalization features: content selection and dual language interface (English and Arabic). Yet some features, such as content sharing, had neutral-related feedback since the system was unfamiliar to users (B. A. A. Abbas et al., 2024).

The integration of AI in LMS platforms has also shown promise in enhancing student engagement and retention. AI-powered tutoring systems and personalized support mechanisms have been found to significantly reduce dropout rates in e-learning environments (Atmane et al., 2025). Moreover, the integration of gamification, virtual office hours, and immediate feedback through LMS platforms has also correlated with increased motivation and enhanced academic success (Rafiq, S., Iqbal, S., & Afzal, D., 2024).

While LMS offer numerous benefits, they also present challenges that negatively impact student satisfaction, engagement, and academic success. A major problem is low student engagement caused by technical barriers. In the LMS used in this study (UNPAK), students experienced unstable access, difficulty following lecture materials, and reduced engagement (Yunus et al., 2023). Limited internet access and poor LMS usability further hinder student engagement in online environments, contributing to weaker academic outcomes (Arefin et al., 2023).

Research on Open Distance e-Learning (ODeL) institutions also highlights challenges related to digital inequality and technological barriers. Although online discussion forums can encourage participation, disadvantaged students facing poverty, digital inequity, and limited technological resources often cannot engage fully, resulting in disparities in academic outcomes (Mabasa, 2023). M-learning provides flexibility but brings issues like device incompatibility and reduced focus due to frequent distractions, which limit interaction (Bamaga, A., Zafar, B., & Terzis, S., 2023).

A big problem is that LMS platforms are much less flexible compared to SM, which enables more fluid and interactive communication. A comparative study in distance education found students preferred SM with its informal nature over the rigidity of LMS (Vázquez-Cane & Diez-Arcón, 2021). What LMS is still unable to provide is a sense of community and social presence, which SM platforms have become synonymous for. LMS sites might also be challenged by insufficient teacher training and student ability, leading to reductions in motivation and learning (Palve S.S. & Palve S.B., 2023).

Furthermore, LMS platforms are limited in their ability to support various learning styles. In a study focused on digital skills in higher education, it was found that lower levels of digital literacy had a negative impact on student engagement and learning experience in terms of navigation in LMS (Petratos, S., Botha, R., & Mtshabe, M., 2024). The absence of an integration between LMS and personalized learning approaches,challenges the effective implementation of critical thought and independent learning (Abbas, A., Martín-Núñez, J. L., & Iqbal, K., 2022). For instance, an interactive lecture platform developed using MATLAB AppDesigner allowed students to personalize their learning by choosing their own pace and content. However, certain features, such as answer scrambling and content sharing, were not as effective due to students' unfamiliarity with the platform, highlighting the challenge of balancing innovative LMS features with student adaptability to ensure optimal engagement and usability (B. A. A. Abbas et al., 2024).

3.2 How Does Social Media Influence Student Satisfaction, Engagement, and Academic Success in Higher Education

Studies show that SM use in higher education positively influences student satisfaction, engagement, and academic success. A longitudinal study found improvements in satisfaction and engagement when Instagram, WhatsApp, and Microsoft Teams were integrated into online learning (Černá & Borkovcová, 2023). WhatsApp and Facebook facilitate academic interaction, while YouTube, Wikipedia, and X provide essential learning resources (Sobaih, A. E. E., Hasanein, A., & Elshaer, I. A., 2022). Enterprise SM in classroom projects, such as Microsoft Teams, strengthens teamwork, knowledge sharing, and productivity, improving student outcomes (Van Osch et al., 2021). Among Chinese university students, SM promoted collaborative and active learning, even when perceived ease of use and usefulness were not significant factors (Liu et al., 2022). In Malaysia, SM did not directly predict satisfaction but strongly influenced performance, highlighting constructivist learning and task-technology fit (Al-Rahmi et al., 2022).

WhatsApp is often seen as a personal, immediate, and collaborative tool, though some students view it mainly as SM, which may reduce its effectiveness as a learning tool (Yu & Motlhabane, 2022). SM also plays a significant role in enhancing academic success by promoting peer interaction, collaboration, and informal learning. During COVID-19, platforms like Facebook improved autonomous learning, creativity, and academic discussion (Ulla & Perales, 2021). Features such as real-time discussion, content sharing, and interactive forums increase student motivation and participation (Serradell-Lopez, E., Lara-Navarra, P., & Martínez-Martínez, S., 2023). Integration of chatbot-assisted learning in SM platforms further supports personalized learning and academic performance (Lavlinskaya et al., 2022). SM can act as a moderator in e-learning, fostering peer contact and collaborative learning, and when combined with formal LMS, enhances instruction and student retention (Bamaga, A., Zafar, B., & Terzis, S., 2023).

It is important to balance the use of SM with other digital learning tools to maintain academic focus. Furthermore, digital literacy is crucial for student success and retention, as students with higher levels of digital literacy are more likely to use social networks effectively to enhance their learning experiences (Petratos, S., Botha, R., & Mtshabe, M., 2024).

While SM offers several benefits for student engagement and academic success, it also presents challenges that can negatively impact these areas. One of the most important concerns is distraction. The overuse of SM affects cognitive capabilities, focus, and the management of time, all of which are essential in academic success for students. According to the study examining students' SM engagement in relation to their academic focus, SM use occurs in the absence of systematic learning, compromising academics (Petratos, S., Botha, R., & Mtshabe, M., 2024).

Additionally, technical and infrastructure challenges significantly affect student access to SM-based learning, particularly in developing countries. For instance, a study from Bangladesh found that poor socio-economic conditions and limited internet access, along with a lack of training in Information and Communication Technology (ICT), constrain effective use of SM in education (Arefin et al., 2023). Similarly, research on the effectiveness of SM-based learning during the COVID-19 pandemic highlighted that students in low-resource settings struggled with unreliable connectivity and insufficient devices, which undermined the benefits of SM for learning (Akbari, 2021). Misinformation and lack of credibility of user-generated content are additional challenges. SM facilitates learning but exposes students to unverified information, requiring instructor guidance (Elenurm, 2022). Moreover, these multiple challenges revolving around data security and digital citizenship are further compounded by privacy concerns and ethical issues surrounding interactions on SM within an academic context. These concerns highlight the need to acquaint students with responsible SM use as a tool in educational settings (Ibrahim, 2022).

Recent empirical studies from our own research (Jaksic & Stancin, n.d.; Stancin, K., Jaksic, D., & Petrovic, A., 2025) further confirm the positive influence of SM and LMS-integrated communication tools on student satisfaction and engagement. Consistent with prior findings on the role of SM in supporting collaboration, immediacy, and interaction (Černá & Borkovcová, 2023; Serradell-Lopez, E., Lara-Navarra, P., & Martínez-Martínez, S., 2023), our results showed that real-time communication, peer collaboration, and flexibility strongly enhance satisfaction (Jaksic & Stancin, n.d.). Another study emphasized the value of improving LMS features that mirror SM dynamics, particularly real-time interaction, informal communication, and enjoyable study-break activities (Stancin, K., Jaksic, D., & Petrovic, A., 2025). Both studies also identified challenges such as distraction, privacy concerns, and unequal participation. Importantly, these findings extend existing research by showing that students increasingly expect seamless integration between LMS and SM, balancing structured academic content with the interactive and adaptive qualities of digital communication environments.

3.3 The Integration of Artificial Intelligence Across Learning Management Systems and Social Media and its Role in Shaping Student Engagement and Satisfaction

The combination of AI, LMS, and SM is changing higher education nowadays. These three technologies combined have the potential to reshape how student engagement and satisfaction develop in online learning environments. This chapter reviews current studies to understand how AI is used across LMS and SM to improve engagement and satisfaction in higher education. The relationships between these tools and student outcomes are illustrated in Figure 3.

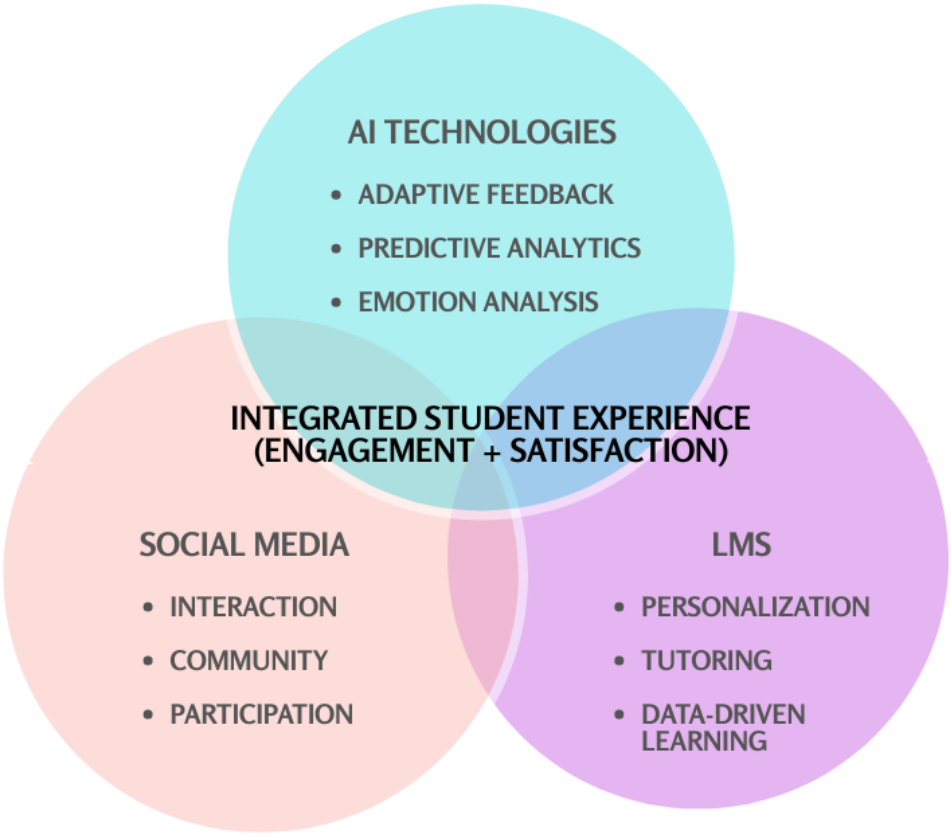

Figure 3: Contribution of each category to student engagement and satisfaction

3.3.1 AI integration within LMS environments

Within LMS environments, AI primarily operates as a supportive mechanism that enhances personalization, feedback and instructional responsivenes which are key drivers of student engagement and satisfaction. Rather than transforming LMS structures, AI tools intensify existing affordances by making learning paths more adaptive and feedback more immediate.

One study introduced a Case-Based Reasoning system acting as a virtual tutor, giving personalized feedback for programming tasks, improving student engagement and satisfaction while reducing teacher workload (Kyrilov & Noelle, 2014).

Later research highlights more advanced data-driven tools. In (Brown et al., 2024) the authorsfound that AI-generated formative practices in an e-textbook LMS increased student reading and interaction, supporting the "doer effect," where active learning improves outcomes and satisfaction. Similarly, (Warford, 2025) studied AI-based annotation tools such as Perusall, which use automated scoring and playful feedback to encourage social learning. While engagement increased, excessive gamification could reduce the perceived value of participation, indicating the need for careful, educationally sound AI use.

One more study examined AI-powered tutoring and predictive analytics in French university LMS, showing that adaptive, data-driven personalization improved engagement and satisfaction by offering individualized support and preventing disengagement (Atmane et al., 2025). However, poor usability and social isolation reduced motivation, highlighting the importance of both technical and emotional considerations. Together, these studies show that AI makes LMS more responsive, personalized, and interactive, with satisfaction arising from both academic performance and digital support.

Overall, these studies suggest that AI enhances LMS-based satisfaction and engagement when it reinforces personalization and feedback while preserving meaningful human interaction.

3.3.2 AI's role in building social and emotional engagement

Beyond cognitive support, AI also contributes to social and emotional engagement, particularly by strengthening perceptions of care, presence, and responsiveness within LMS environments. These factors are closely linked to student satisfaction in online learning.

In (Murdoch & Lin, 2023) online English-Mediated Instruction courses in Korean universities used AI-like adaptive feedback and social networking tools to maintain engagement during the pandemic. Students reported higher satisfaction when data-informed interventions supported communication and instructor presence, suggesting that AI indirectly enhances engagement by reinforcing social connectedness.

In gamified, culturally adapted Japanese literature courses, NLP tools offered adaptive feedback and personalized pacing, while gamification boosted motivation. Engagement increased by over 70%, and satisfaction improved due to more meaningful interactions. However, digital tools may not fully convey cultural elements, reminding educators that AI must fit learning contexts (Unsriana et al., 2025). Similarly, LMS-integrated chatbots in Ukrainian universities provided academic and emotional support during wartime, helping maintain engagement and continuity (Alieksieieva et al., 2025).

Taken together, these studies position AI not as a replacement for social interaction, but as a mechanism that stabilizes and amplifies social presence within LMS environments.

3.3.3 The role of social media In AI-Driven learning

While some studies do not directly foreground AI, research on SM in education provides important context for understanding AI's role in LMS–SM integration. SM platforms have been shown to support collaborative and participatory learning, emphasizing the value of interaction and peer connection (Mbogho, 2017; Stanca & Felea, 2016). These human-centered findings show how SM features such as interaction, instant communication, and peer collaboration resemble what AI tries to automate and improve. When combined with AI analytics, these platforms could offer intelligent moderation, adaptive participation tracking, and personalized social feedback that further deepen engagement.

Web 2.0 technologies have also been examined as part of this evolution, with research describing AI integration as the next step from participatory media toward intelligent learning ecosystems (Zelick, 2013). The move from passive to interactive, student-centered learning through blogs, wikis, and SM has already changed engagement and satisfaction. AI continues this change by adding predictive and emotional analytics to these environments, making interactions more personal and scalable.

3.3.4 Cross-Platform integration of AI for student engagement

Across the reviewed literature, AI consistently enhances engagement and satisfaction by intensifying personalization, interaction, and social presence across LMS and SM platforms. Intelligent chatbots, adaptive recommendations, and emotion-aware analytics support continuous communication and inclusivity, reinforcing key determinants of student satisfaction (Delaney & Redman, 2014).

Importantly, several studies caution against excessive automation. Poorly explained or overly mechanical AI systems can undermine intrinsic motivation and weaken engagement (Atmane et al., 2025; Warford, 2025). The most effective implementations position AI as a supportive layer that augments, rather than replaces, human interaction.

Thus, AI's contribution to digital learning is best understood not as a separate domain, but as an enabling mechanism that strengthens LMS-SM integration, fostering engagement that is both academically and emotionally meaningful.

4. Summary and Discussion

This literature review synthesizes research on how LMS and SM, both independently and in conjunction with AI, influence student satisfaction and engagement in higher education. Particular attention is given to AI-enabled functionalities within LMS and SM environments and how these technologies reshape digital learning experiences. While academic performance is considered where relevant, the primary analytical focus is on how AI-enhanced digital learning ecosystems influence student satisfaction, engagement, and overall student success.

Integration of LMS within blended learning models further boosts motivation, particularly when linked to SM platforms that extend learning beyond formal instructional spaces. For example, a study at the University of Ghana illustrates how combining LMS-based content delivery and assessment with SM-supported discussion can enhance engagement and academic support (Biney & Asamoah, 2023).

The structured environment provided by LMS platforms, along with their ability to facilitate access to educational resources and interactive learning experiences, positively influences student outcomes. LMS-enhanced tools, such as discussion forums, quizzes, and real-time feedback mechanisms, have been shown to increase student engagement and academic performance. Moreover, the incorporation of LMS into blended learning models significantly boosts motivation and participation, particularly when it includes embedded connections to SM platforms. SM, in contrast, serves as a dynamic space for collaboration, fostering peer interaction and informal learning. According to some authors, platforms such as Facebook, X, and WhatsApp enhance student engagement and satisfaction by enabling real-time communication and access to a diverse range of learning materials (Sobaih, A. E. E., Hasanein, A., & Elshaer, I. A., 2022). Importantly, the use of SM in academic settings has been linked to higher motivation and increased knowledge sharing. However, overuse of SM can lead to distractions, reduced cognitive focus, and misinformation, all of which negatively affect academic success.

Despite these advantages, challenges remain in the implementation of LMS and SM-based learning. Certain LMS platforms lack adaptability, and students still face technical barriers, including limited connectivity and usability issues. Moreover, digital inequality continues to pose a significant problem, as students from disadvantaged backgrounds often struggle with technological and financial barriers that hinder their access to digital learning resources. Addressing these challenges requires institutional support, investment in digital infrastructure, and targeted initiatives to improve digital literacy among students. Additionally, the findings suggest that there is still room to optimize the ways LMS platforms are utilized. Universities should provide clear guidelines on the appropriate use of SM in academic settings, ensuring that these platforms enhance rather than detract from the learning experience. Improving LMS usability and functionality can further support student learning.

The fundamental challenge lies in designing a pedagogical model that balances the structured nature of LMS platforms with the informal accessibility of SM, thereby creating an enriched learning experience for students. By effectively integrating LMS and SM, educators can foster a positive learning environment that meets students' needs and promotes greater satisfaction, engagement, and academic success for all involved.

Finally, the integration of AI across both LMS and SM is reshaping student engagement and satisfaction in higher education by fostering adaptive, interactive, and emotionally supportive learning environments. AI's influence extends from personalized learning analytics and intelligent tutoring to socially responsive communication and peer interaction facilitation. The literature consistently affirms that when AI is used ethically and with clear pedagogical purpose, it enhances both engagement and satisfaction by humanizing digital learning spaces. However, sustainable success requires aligning AI's technical capabilities with instructional design principles and social interaction frameworks - ensuring that automation complements rather than replaces the human dimensions of teaching and learning.

Despite promising developments, a significant knowledge gap remains, identification of which is a key scientific contribution of this paper. AI in higher education, especially integrated with both LMS and SM, is a relatively new research area. Only 11 empirical studies were identified, six published since 2020, showing the field is still emerging. This highlights the potential for deeper investigation into structured e-learning environments combining LMS, SM, and AI. Future research could explore how such integrated platforms, with suitable pedagogical methods and ethical frameworks, enhance student motivation, engagement, satisfaction, and learning outcomes.

This research makes an important contribution by showing how LMS AI and SM can work well together and by opening the door to more advanced blended learning systems. AI can make LMS and SM platforms more powerful by offering personalized feedback, instant help for students and interactive virtual classrooms. The study looks ahead to the future of education, where digital tools play a bigger role. Use of new technologies such as AI in combination with well explored approaches such as LMS and SM, could make online learning more flexible and engaging, but only if built on sound methodical framework and existing good.

The findings of this SLR are summarized in the Venn diagram in Figure . illustrating the key benefits and challenges of LMS, SM, and AI.

4.1 Strategies and Policy Recommendations for Diverse Educational Settings

Although LMS, AI, and SM all show benefits to student engagement and academic performance, challenges like digital inequality, limited usability, and inconsistent integration persist, even nowadays. Institutions should aim to improve digital infrastructure and access to ensure all students can connect reliably and use available resources. Promoting digital literacy through training for students and faculty helps them use these technologies more effectively.

Clear guidelines on academic SM and AI use can maximize collaboration and engagement while minimizing distractions and misinformation. Optimizing LMS usability - through mobile compatibility, accessible interfaces, and personalized learning pathways - supports diverse learning needs. Faculty support is important as well, with professional development helping educators integrate AI, LMS and SM to foster ethical and interactive learning. Continuous feedback and evaluation mechanisms can allow institutions to adapt policies and platforms in real time.

Implementing these strategies will enable higher education institutions to create inclusive, engaging and contemporary digital learning environments, enhancing student satisfaction, engagement, and academic outcomes across diverse settings.

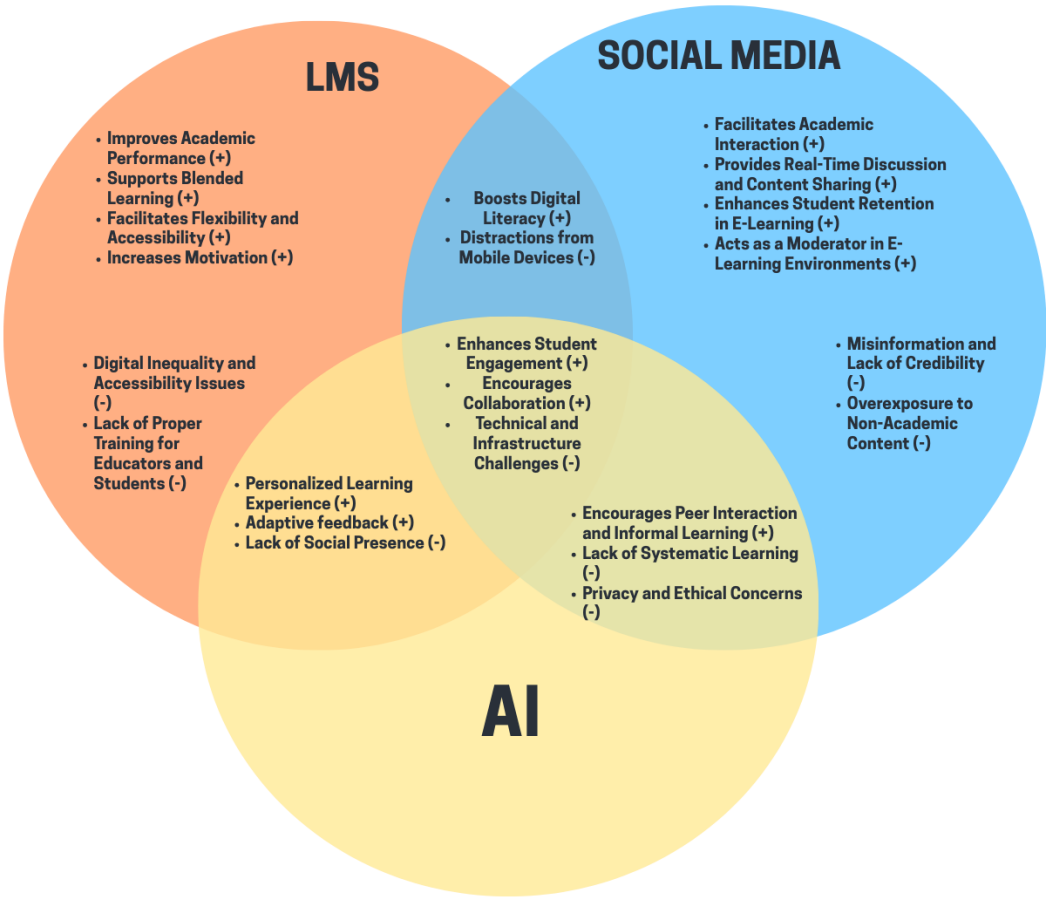

Figure 4: Venn diagram – key benefits and challenges

5. Conclusion and Future Work

This systematic literature review examined how LMS and SM, both independently and in combination with AI, influence student satisfaction and engagement in higher education. The findings indicate that LMS and SM play complementary roles within digital learning environments: LMS platforms provide structure, consistency, and formal academic support, while SM platforms foster interaction, immediacy, and peer-driven learning beyond institutional boundaries. When thoughtfully aligned, these systems can enhance student motivation, engagement, and perceived learning value.

However, the review also shows that despite widespread recognition of the benefits of LMS and SM integration, most existing studies remain descriptive or context-specific. Few propose structured, pedagogically grounded models that clearly define how LMS and SM should be aligned to support learning outcomes in higher education. Reported challenges such as digital distraction, uneven participation, usability constraints, and persistent digital inequalities indicate that integration alone is insufficient without purposeful instructional design and institutional support.

A key contribution of this review lies in its synthesis of emerging evidence on the role of AI within LMS and SM environments. While some studies examine AI-enhanced LMS or AI-supported interaction on SM platforms, the literature reveals a clear absence of empirically validated models that integrate AI, LMS, and SM into a coherent learning ecosystem. This identifies a critical opportunity for advancing digital pedagogy in higher education.

The findings suggest that AI-enabled features including adaptive learning pathways, learning analytics, automated feedback, and conversational agents may help address several limitations identified in LMS-SM integration by supporting personalization, timely intervention, and sustained engagement, particularly in diverse higher education contexts. By clarifying these gaps, this research provides a foundation for improving online and blended learning through a more coherent and pedagogically informed system design, while also informing institutional decision-making related to educational technology planning and curriculum development.

Future research should move beyond exploratory accounts and investigate empirically validated models for AI-enabled LMS-SM integration that are both pedagogically aligned and socially integrated. In particular, longitudinal and mixed-method studies are needed to examine how AI-driven tools, such as chatbots for academic or emotional support, adaptive recommendation engines, and early-warning analytics, influence student motivation, satisfaction, and engagement over time. At the same time, future studies should systematically examine the potential risks associated with AI and SM enabled learning environments, including issues of distraction, over-automation, data privacy, algorithmic transparency, digital inequality, and student well-being. Further research may also explore immersive and virtual social learning spaces, including metaverse-based environments, and their capacity to combine community-building with academic rigor. Overall, this review establishes a pathway toward designing next-generation learning ecosystems that are holistic, adaptive, and student-centered.

AI-enhanced LMS architectures, supported by transparent and ethically governed data practices and human-in-the-loop oversight, have the potential to bridge methodological gaps and promote equitable and impactful digital learning. By aligning the structured design of LMS platforms, the social affordances of SM, and the adaptive capabilities of AI, higher education institutions can cultivate online and blended learning environments that more effectively support student motivation, engagement, and academic success.

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AI Statement: The authors declare that AI tools were not used in the conception of the study, data collection or analysis, interpretation of results, or in the writing of the manuscript, including the creation of figures and tables. AI tools were used only at a later stage for language editing and improving the readability of the English text. The authors reviewed and approved all revisions and take full responsibility for the content of the manuscript.

Ethics Statement: This research did no involve human participants, animal subjects, or any material that requires ethical approval.

Competing interests: The authors declare that they have no competing interests.

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Appendix 1

Papers that were included in the SLR.

First query output (LMS + SM)	
No.	**Reference**
1.	Abbas, A., Martín-Núñez, J. L., & Iqbal, K. (2022). Is Team-Based Online Learning Activities Enhances Critical Thinking Skills of Engineering Students or Not? An Exploratory Study During the COVID-19 Pandemic. *INTERNATIONAL JOURNAL OF ENGINEERING EDUCATION*, *38*(5), 1577–1583.
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6.	Atmane, E., Hatim, R., Yassine, J., Boutahir, M. K., Bourray, H., & El Ouadghiri, D. (2025). Analyzing University Dropout Rates in E-Learning and the Potential of Artificial Intelligence to Reduce Them: A Case Study of French Universities. *Data & Metadata*, *4*. https://doi.org/10.56294/dm2025468
7.	Aulia, F., & Utami, W. B. (2021). Evaluation of e-Learning Towards Improving 21st Century Learning Skills. *2021 7th International Conference on Education and Technology (ICET)*, 167–170. https://doi.org/10.1109/ICET53279.2021.9575106
8.	Bamaga, A., Zafar, B., & Terzis, S. (2023). Explaining Instructional Factors Affecting M-Leaming Using the Moderator of Social Media: An Extension of the IS and TAM Models. *Proceedings - 2023 7th International Conference on E-Society, E-Education and E-Technology, ESET 2023*, 38–43. https://doi.org/10.1109/ESET60968.2023.00013
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Second query (AI + LMS + SM)	
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