

Adoption of Learning Management System (LMS) in Managing the Complexity of Class Management: A Literature Study

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Abstract:

This study aims to analyze the role of Learning Management Systems (LMS) in managing the complexity of classroom management in contemporary education. The main focus is directed toward the transformation of learning paradigms from conventional teacher-centered models to authentic technology-based classrooms. Key concepts employed include pedagogical anomaly, authentic classroom, blended learning, flipped learning, and LMS ecosystem reconstruction. This research adopts a qualitative descriptive approach through a systematic literature review of scientific publications, educational policies, and recent studies on digital learning technologies. The scope of analysis covers classroom management practices within formal educational institutions in the digital era. The findings reveal that LMS can effectively reduce classroom management complexity when supported by instructional design reconstruction and socio-technical ecosystem readiness. LMS functions not merely as a digital repository but as an immersive learning environment that facilitates cognitive, constructivist, and reflective interactions. Major challenges include the gap between macro-level policies and micro-level readiness, limited digital literacy among educators, and the dominance of technocratic paradigms in system implementation. Therefore, this study recommends shifting from IT Support toward Instructional Design Support as the foundation for sustainable LMS implementation. Practically, the results contribute to the development of more humanistic, adaptive, and meaningful digital education policies.

Keywords: authentic classroom; blended learning; classroom management; digital education; flipped learning; pedagogical anomaly.

INTRODUCTION

The study of classroom management in the era of 21st-century education necessitates a deeper rereading of the learning space as a complex, dynamic field, fraught with epistemological and technological tensions. The classroom can no longer be understood simply as a physical space where teachers transmit knowledge, but rather as a pedagogical ecosystem containing power relations, information flows, heterogeneous student backgrounds, and increasingly layered administrative pressures. Watkins and Wagner have identified the classroom from the beginning as a busy, public, simultaneous space, and always containing unexpected events, a classic conception that remains relevant today because this complexity has become even more intense as learning enters the digital, networked realm (Watkins & Wagner, 2000). In the current context, this complexity no longer stems solely from face-to-face interactions, but from the often asynchronous intersection of pedagogical logic and technological logic. This is where the Learning Management System is present not just as a tool, but as a new epistemic structure that regulates the rhythm, flow, and even the meaning of learning itself, as emphasized by Ellis that LMS is an automated framework that integrates administration and learning delivery to reduce technical barriers while increasing the regularity of the learning process (Ellis, 2009).

However, despite the rapid growth of discourse on LMSs, a significant research gap remains, particularly on how LMSs truly function as classroom management tools capable of taming cross-disciplinary pedagogical complexity. Most recent research remains trapped in a normative narrative that positions LMSs as technocratic solutions that appear neutral and value-free, without examining the interplay between scientific methodology and the design of the digital system itself. Yet, teachers in subjects such as Mathematics, Language Arts, or Social Sciences face distinct epistemological demands, ranging from hierarchical cognitive structures to dialogic discursive needs. Cognitivism demands the systematic management of factual, conceptual, procedural, and metacognitive knowledge (Sultanova, 2025), while Constructivism emphasizes the importance of authentic learning experiences through discovery and problem-based learning (Mohamad Hsbollah & Hassan, 2022). In the digital space, these two approaches are often not optimally accommodated because LMS are designed more oriented towards administrative logic than reflective pedagogical logic, an issue that has rarely been critically addressed in previous studies.

Firman (2021) did show that using an LMS can save time and help develop more structured materials. However, these findings emphasized technical efficiency and did not address the philosophical and practical dimensions of how the LMS structure influences how teachers construct learning and how students interpret the learning experience (Firman, 2021). Similarly, many other studies highlight improvements in academic performance or user satisfaction, but have not delved deeply into the relationship between the complexity of classroom management and the transformation of teachers' roles as digital learning managers. However, from a critical pedagogy perspective, technology is never neutral, as it always carries certain values, assumptions, and logic that can either strengthen or erode teachers' pedagogical autonomy (Selwyn, 2020a). Thus, there is a significant conceptual gap between the optimism surrounding technology in the LMS discourse and the practical reality in classrooms, which are still plagued by coordination problems, administrative burdens, and fragmented student attention.

Technological infrastructure readiness is also a crucial variable that is often treated superficially in previous studies. While the National Education Standards (Standard Pendidikan Nasional) position classroom management as a subsystem aimed at producing critical and creative thinking students, implementation in the field demonstrates unequal access, diverse teacher digital competencies, and a learning culture that is not yet fully adaptive to online learning. Hasanah and Shabira (2024) found that technology integration in classroom management significantly contributes to improving Higher Order Thinking Skills, but they also noted that this success depends heavily on teacher pedagogical readiness and institutional

support, not solely on system sophistication (Hasanah & Shabira, 2024). These findings suggest that technology is only effective to the extent that it is accompanied by a transformation in the teaching paradigm, from simply delivering material to designing reflective, learner-centered learning experiences.

In a global context, demands for efficiency in time, energy, and finances are increasingly pressuring educational institutions to adopt technology on a large scale. Trilling and Fadel assert that technological proficiency is a key pillar of 21st-century society, as the ability to manage information and collaborate digitally is a prerequisite for existence in a knowledge society (Trilling et al., 2009). However, in the past five years, there has been increasingly sharp criticism of an overly instrumentalist approach to educational technology. A study by Williamson (2021) shows that the digitalization of education often expands administrative control and the commercialization of learning, shifting the focus from pedagogical relationships to data relationships and performativity (Hassanli et al., 2021). This means that LMSs not only regulate the learning process but also produce learners who are tied to metrics, reports, and evaluation algorithms, a situation that has the potential to diminish the humanistic dimension of education.

Tarigan (2024) stated that interactive digital education system management can create a conducive environment for national education implementation while supporting the vision of future education. However, this statement still leaves room for criticism, as the interactivity in question is often limited to technical features such as discussion forums, online quizzes, or automated assignment submission, rather than dialogic interactions that foster critical awareness. Bond's research shows that while LMSs provide a space for interaction, the quality of these interactions is largely determined by pedagogical design and the teacher's active role as a facilitator of reflection (Hodges et al., 2020). Without it, LMSs tend to become sterile administrative spaces, where learning is reduced to a series of clicks and file uploads.

Based on this theoretical and empirical landscape, it is clear that there is a research gap that has not been adequately filled: the absence of integrative studies that position LMSs not merely as learning technologies but as classroom management instruments operating within a complex pedagogical, epistemological, and cultural context. Much of the research remains fragmented between technical approaches that assess system effectiveness and pedagogical approaches that assess learning quality, without bridging the two within a coherent conceptual framework. Yet, classroom management in the digital era demands a synthesis between technological logic and educational logic, between system efficiency and the depth of meaningful learning, between administrative order and students' intellectual freedom (Laursen & Jensen, 2025).

Therefore, the main objective of this study is to formulate a more comprehensive conceptual understanding of the role of LMS as a classroom management instrument in the context of 21st Century Education, by examining how the system interacts with cross-disciplinary pedagogical complexity, technological infrastructure readiness, and the transformation of the roles of teachers and students (Xin & Chen, 2025). Specifically, this study aims to identify patterns of LMS integration in classroom management, analyze their implications for the quality of pedagogical interactions, and formulate a conceptual model that can bridge the need for technological efficiency with the humanistic demands of education. Thus, this study not only seeks to fill the empirical gap but also offers a theoretical contribution to enrich the discourse on digital classroom management as a reflective, critical, and meaningful pedagogical practice.

Within this framework, this research assumes that educational technology cannot be treated as an instant solution but rather as a field of interpretation that must be continuously and critically negotiated by educational actors. The LMS, in this case, is understood as a pedagogical text containing specific structures, meanings, and ideologies, so its analysis

demands both theoretical sensitivity and reflective courage. With such an approach, it is hoped that this research will be able to go beyond superficially optimistic narratives and provide a deeper understanding of how digital classroom management can become an emancipatory space that is not only technically efficient, but also intellectually and ethically fertile, in line with the ideals of education as a practice of liberation and the formation of the whole person.

LITERATURE REVIEW

Contemporary classroom management studies are inextricably linked to the dynamic transition of learning spaces from physical entities to increasingly fluid and networked digital ecosystems. Classically, classrooms are understood as social spaces brimming with cultural diversity, intense interactions, and behavioral uncertainty, demanding both pedagogical sensitivity and managerial skills from teachers. Watkins and Wagner describe classrooms as bustling public spaces, where various activities occur simultaneously and are not always predictable, thus requiring flexible and adaptive management strategies (Petropoulos et al., 2026). The metaphor of the classroom as a bustling "marketplace" or a silent "graveyard" is not merely rhetorical, but rather a symbolic reflection of the spectrum of classroom conditions that can shift from hyperactivity to apathy, depending on the quality of the pedagogical interactions being built. In the past five years, recent studies have confirmed that this complexity has not diminished, but rather increased, with the incorporation of digital technology into the heart of learning practices (Williamson, 2021).

The transition from physical to digital classrooms has shifted the classroom management paradigm from direct control of behavior to system-based management of interaction flows. Classrooms are no longer limited by walls and schedules, but by networks, platforms, and algorithms that implicitly shape the learning experience. Selwyn (2020) asserts that educational technology creates new forms of datafactive pedagogical relationships, where student attendance, participation, and performance are represented in numbers, graphs, and activity logs (Selwyn, 2020b). This situation requires teachers to develop new competencies as digital mediators capable of orchestrating asynchronous and synchronous interactions, while maintaining the humanistic dimension of learning so that it is not reduced to a mere administrative process. Thus, the complexity of the contemporary classroom stems not only from student behavior but also from the technological architecture that frames the learning process itself.

From a psychological perspective, successful classroom management is largely determined by a teacher's internal belief in their capacity as a pedagogical agent. Richardson (2001) asserts that teachers' beliefs about learning serve as an epistemic compass that guides their classroom teaching practices (Richardson, 2001). Teachers with high self-efficacy tend to be more proactive in designing learning strategies, more resilient in the face of failure, and more open to methodological innovation. These findings are reinforced by Guskey and Passaro, who demonstrated that teachers with strong self-efficacy significantly influence student achievement, even in heterogeneous and less conducive classroom contexts (Guskey & Passaro, 2004). From a recent perspective, teacher self-efficacy is not only related to conventional pedagogical skills but also to digital literacy and adaptive readiness for learning technology (Teo et al., 2020).

The concept of self-efficacy is closely correlated with locus of control, which is an individual's psychological orientation in interpreting the source of control over their success or failure. Hoy (2001) explains that teachers with an internal locus of control tend to interpret classroom dynamics as the result of their own actions and decisions, making them more reflective and responsible in managing learning (Hoy, 2001). Conversely, teachers with an external locus of control are more likely to blame external factors, such as student character or institutional policies, which ultimately weakens their innovative capacity. In the context of technology, an

internal locus of control is an important prerequisite for the creative adoption of an LMS, as teachers must interpret technology not as an additional burden, but as an opportunity for pedagogical transformation (Tondeur et al., 2019). In other words, integrating technology into classroom management requires not only technical competence but also a psychological disposition that supports a lifelong learning attitude.

Learning Management Systems then emerged as a pedagogical infrastructure that promised to harmonize the complexity of the classroom and the demands of effective learning. LMSs are no longer positioned merely as administrative software, but rather as platforms capable of integrating various pedagogical approaches within a single digital ecosystem. Through content management features, asynchronous discussions, synchronous video conferencing, and learning analytics, LMSs provide space for the simultaneous implementation of structured Cognitivism, dialogic Constructivism, and reinforcement-oriented Behaviorism (Al-Fraihat et al., 2020). In a VUCA context characterized by volatility and ambiguity, LMSs offer structural stability that enables teachers to manage uncertainty through systematic and flexible planning.

Bond et al.'s (2020) research shows that LMS-based learning during the global transition to online learning expanded access and continuity of education, but also revealed new challenges in the form of digital fatigue, decreased social interaction, and increased cognitive load for students (Hodges et al., 2020). This indicates that LMSs are not a single, problem-free solution, but rather a medium that requires continuous pedagogical critique and refinement. Williamson (2021) even cautions that LMSs have the potential to become new governance instruments in education, where learning practices are increasingly governed by the logic of data and performativity, shifting the focus from dialogic to instrumental relationships (Williamson, 2021).

From a teleological perspective, LMS integration can be read as a response to Maslow's self-actualization needs, namely the need to develop, create, and find meaning in the learning process. 21st-century education is no longer solely oriented toward knowledge transmission; it must facilitate higher-order thinking skills, including critical, complex, and creative thinking. Hasanah and Shabira (2024) found that technology integration in classroom management significantly contributes to the improvement of Higher Order Thinking Skills, especially when teachers are able to design reflective and collaborative activities based on LMS (Hasanah & Shabira, 2024). This finding strengthens the argument that technology is only meaningful to the extent that it is integrated within a humanistic pedagogical framework and oriented toward developing the full potential of students.

However, much of the literature still shows a fragmentation between psychological studies of teacher efficacy, pedagogical studies of learning strategies, and technological studies of LMS. Research rarely integrates all three within a coherent conceptual framework. In fact, the complexity of classroom management in the digital age lies precisely in the intersection of these psychological, pedagogical, and technological dimensions. Scherer et al. (2019) assert that the successful adoption of educational technology is heavily influenced by the interaction between individual beliefs, institutional culture, and system design (Tondeur et al., 2019). This means that LMS cannot be understood separately from the subjects who use them and the social context surrounding them.

Based on this literature synthesis, it can be concluded that the main research gap lies in the absence of an integrative model that positions LMS as a classroom action management instrument capable of bridging the complexity of learning spaces, teacher psychological efficacy, and the demands of 21st-century pedagogy (Archambault et al., 2022). Most research remains partial, assessing LMS effectiveness from a technical perspective or user satisfaction perspective, without exploring how these systems reshape pedagogical relations and power structures in the digital classroom. Therefore, this study seeks to fill this gap by formulating a more holistic conceptual understanding of the role of LMS as a pedagogical platform that is not only

operationally efficient but also philosophically meaningful and emancipatory in shaping educational practices towards Society 5.0.

METHOD

This research employed a descriptive-qualitative approach with an exploratory study design. This approach was chosen because it captures social and pedagogical phenomena in depth, contextually, and reflectively, particularly in examining complex and dynamic technology-based learning practices (Creswell & Poth, 2018). A qualitative approach allows researchers to understand the meanings, perceptions, and experiences of research subjects in a natural context without manipulating variables (Merriam & Tisdell, 2016).

The research flow was designed cyclically, referring to a qualitative data analysis model that includes three main stages: description (orientation), reduction (focus), and selection (synthesis). This model aligns with the interactive analysis framework proposed by Miles, Huberman, and Saldaña (2014), which positions the processes of data collection, data reduction, data presentation, and conclusion drawing as simultaneous and iterative activities (Miles et al., 2014).

In the description stage, the researcher conducts an initial identification of the research problem using the grand tour question technique to map out needs comprehensively (needs assessment). This technique is used to obtain a broad overview of the social and pedagogical context under study before entering a more focused analysis (Spradley, 2016). The main focus at this stage is to explore various classroom management issues that arise in Learning Management System (LMS)-based learning practices, particularly those related to teacher-student interactions, learning activity management, and technical and pedagogical constraints.

To strengthen the empirical findings, the researchers conducted a Focus Group Discussion (FGD) involving cross-disciplinary experts, including academics, educational theorists, learning practitioners, and higher education technologists. FGDs were chosen because they are effective in capturing collective meaning construction, enriching perspectives, and revealing the dynamics of discourse among participants (Krueger & Casey, 2015). Through these group discussions, the researchers gained an in-depth perspective on the role of cybertechnology in classroom action management, particularly in the context of blended and digital learning that demands pedagogical flexibility.

The reduction stage was conducted through a systematic and comprehensive literature review. The literature reviewed included theoretical and empirical sources relevant to the issue of educational paradigm shifts in the Industry 4.0 and Society 5.0 eras. This process aligns with the principles of thematic literature review, which aims to build a conceptual framework based on the synthesis of previous research findings (Snyder, 2019). At this stage, researchers filtered and categorized various research findings to build a grand theory that can explain the relationship between classroom complexity, teacher self-efficacy, and the role of LMS as a pedagogical instrument in contemporary learning.

Next, in the selection stage, researchers developed a conceptual and analytical framework as a basis for synthesizing findings and confirming any gaps (research gaps) between field facts and existing theories. This process was circular and reflective, as recommended in the interpretive qualitative approach, where researchers continuously revise conceptual understanding based on the interaction between data and theory (Charmaz, 2014). This stage was conducted between December 2020 and October 2021.

Further data collection involved directly affected subjects, namely lecturers, teachers, students, and learners, through follow-up focus group discussions (FGDs). This subject involvement aimed to explore self-perceptions and owner estimates regarding the effectiveness of the LMS-based classroom management model. This approach aligns with the participatory paradigm in educational research, which positions subjects as reflective partners in the knowledge production process (Cohen et al., 2018). Furthermore, this strategy was used to ensure

dependability and interpretive validity, as recommended in the trustworthiness criteria for qualitative research (Guba & Lincoln, 1985).

With this methodological design, this research is expected to be able to produce a holistic, contextual, and reflective understanding of the implementation of LMS as a strategic instrument in managing the complexity of class management, while strengthening the theoretical and empirical foundations for the development of digital learning models in the 21st Century Education era.

DISCUSSION

Pedagogical Anomalies and the Crisis of Conventional Classroom Management

The pedagogical anomalies plaguing conventional classrooms are essentially symptoms that are not merely rhetorical in global educational discourse, but empirical realities that infiltrate the structure of everyday learning experiences. In modern education driven by the demands of 21st-century skills, traditional classrooms still too often become stages of teacher-centered learning dominance, an instructional model in which the teacher takes on the sole role of informant while students are reduced to passive listeners tasked with merely receiving information (George & Siranchuk, 2025). This model, rooted in the long tradition of schools as places for transmitting facts, is beginning to show sharp signs of obsolescence in the reality of contemporary education, as it is unable to accommodate the diverse cognitive and affective needs of students developing in an environment full of information uncertainty and social dynamics (McDiarmid & Zhao, 2021).

The classroom management crisis arising from this model is not simply a lack of technology or infrastructure, but also a manifestation of a static pedagogical structure that systematically limits the space for active student participation. In practice, classroom communication becomes highly one-way; the teacher speaks, the students listen, and little space is given for reflective dialogue or critical interaction. This aligns with findings that traditional approaches tend to suppress creativity and critical thinking skills because the focus of learning is on the transfer of knowledge from teacher to student without sufficient space for students to process or develop their own ideas (Misrahayu et al., 2024). A systematic review of teaching practices across educational settings shows that the dominance of teacher-centered approaches correlates with low levels of student engagement in collaborative or reflective learning activities, parameters that are essential characteristics of meaningful 21st-century learning (Roshid & Haider, 2024).

What I call a pedagogical anomaly is the phenomenon where a classroom, which should be a two-way interaction, turns into a series of instructive monologues. When communication becomes a monologue, teachers' attention is focused on delivering content and completing the curriculum, with every second of learning time allocated to administrative matters, lectures, or repetition of basic material, leaving little for the affective or innovative aspects that are the lifeblood of human learning (Adem & Berkessa, 2022). In this context, a phenomenon emerges that I term a learning camouflage strategy among students: instead of actively engaging in learning, they strategically adapt to meet the requirements of the administrative system, without truly experiencing deep cognitive processes (Monika et al., 2022). They avoid direct supervision, choose familiar tasks, and concentrate more on the formal aspects of evaluation than on knowledge exploration, a condition that ironically reinforces the cycle of passive learning triggered by the traditional instructive structure itself.

This crisis in classroom management is exacerbated by how the dominance of teacher-centered learning impacts the pedagogical relationship between teachers and students. Educational relationships should be spaces of continuous dialogue, where questions encourage answers, and answers foster new curiosity (Woods & Copur-Gencturk, 2024).

However, in many classrooms still anchored in the traditional model, this relationship is instead built on an information hierarchy in which the teacher holds the key to knowledge and students are positioned as mere recipients. Discursive analysis conducted in several studies shows that this structure not only affects classroom dynamics but also reinforces students' dependence on the teacher as the "sole source of truth," resulting in student creativity collapsing under the burden of administrative routines and meeting prescriptive targets (Nisar & SabboorHussain, 2023).

Furthermore, several recent studies have highlighted that reliance on a teacher-centric approach has serious implications for student engagement in learning, particularly in terms of motivation, quality of understanding, and retention. This reliance on this model often results in students not being cognitively or emotionally engaged in learning activities, as they are positioned as passive recipients of information rather than active participants who process, question, and understand meaning beyond factual memory (George & Siranchuk, 2025). This situation is exacerbated by the pandemic and the advent of online learning, where face-to-face interactions have been drastically reduced and many teachers are still struggling to adapt to effective pedagogical strategies in digital classrooms (Gopal et al., 2021). In the online context, the challenges that arise are not only related to technological access, but more fundamentally, how traditional classroom communication structures are shifted to digital media without adequate pedagogical transformation.

Ironically, while 21st-century competency demands emphasize the importance of critical thinking, collaboration, communication, and creativity—often referred to as the 4Cs—many classrooms still fail to integrate these abilities into daily learning practices due to the limitations of teacher-centered models (Monika et al., 2022). When students are not given the space to raise questions, construct arguments, or explore concepts collaboratively, they not only miss opportunities to develop these essential skills but also experience shallow learning, which in turn reinforces reliance on purely transmission-based instruction. Empirical studies show that this challenge is particularly significant in schools where teacher training on 21st-century skills-based pedagogy is minimal and not systematically integrated into their professional training (Roshid & Haider, 2024).

Therefore, pedagogical anomalies and classroom management crises should be read not merely as technical or diagnostic problems, but as symptoms of a mismatch between the demands of the times and the legacy of old educational models. This mismatch not only hinders students' intellectual development but also creates a gap between the goals of formal education and the needs of learners living in an interconnected, complex, and information-saturated world. In such situations, classrooms become less responsive to the psychological and social dynamics of students, so that their individual potential, personal interests, and unique talents are often neglected in favor of fulfilling rigid curriculum routines (Leek et al., 2026).

This problem is compounded by the fact that the traditional paradigm persists in many educational contexts around the world, not because it is superior, but because it has become institutionalized in broad educational practices, assessments, and organizational structures (George & Siranchuk, 2025). When teacher-centered learning models remain the norm, effective classroom management—which should include adapting to individual needs, differentiating learning strategies, and responding to each student's learning style and cognitive pace—is left as a mere ideal, lacking meaningful implementation. This reflects a situation in which educational structures reinforce methodical rigidity rather than empowering innovation, so that classrooms, which should be spaces for anticipatory education, often become mere laboratories of routine and repetition.

This traditional pedagogical approach, if not immediately reformed through a paradigm shift toward more participatory and learner-centered learning, will continue to fuel deficits in student engagement, innovation, and cognitive resilience. Furthermore, this pedagogical

transformation cannot be achieved solely through technology or digital devices, but requires a reconstruction of the very way of thinking about education, so that the classroom becomes an arena where student voices are given weight, where questions are valued equally with answers, and where active engagement is seen as the core of a genuine learning experience. Without such structural changes, teacher-centered learning will continue to be at the root of the classroom management crisis that hinders the evolution of education toward true meaning in the 21st century (Busa & Chung, 2024).

Paradigm Gap: From VUCA to Technology-Based Authentic Classrooms

The paradigm shift in contemporary education reflects the acute tension between a fast-paced, uncertain, complex, and ambiguous world—referred to in the literature as VUCA (Volatility, Uncertainty, Complexity, Ambiguity)—and the profound need for meaningful, authentic, and connected learning. The world of education is now forced to stand at a crossroads between the legacy of traditional models and the innovative opportunities offered by cutting-edge technologies such as artificial intelligence (AI) and the Internet of Things (IoT) (Papadakis, 2024). This phenomenon is not simply a shift in instruments; it is an epistemological revolution that awakens the deepest pedagogical values and the very existence of the classroom itself. Old paradigms rooted in one-way instruction must be revised to create classrooms that are not only interactive but also authentic—spaces where learning is not simply the accumulation of information but the transformation of meaning and the intellectual capacity of learners (Cappiali, 2023).

In a VUCA-driven education landscape, uncertainty and complexity are not merely theoretical terms, but realities experienced daily by teachers and students. Recent research examining teachers' experiences in Southeast Asia found that interactions with generative technologies, such as generative AI, often leave teachers in a state of instability and unrooted in established pedagogical practices (George & Siranchuk, 2025). The study confirmed that teachers feel compelled to continually change methods, while existing policies and training do not provide sufficient guidance for systematically addressing these changes. This sense of disequilibrium is at the heart of the VUCA paradigm in education: the volatility of change, the ambiguity of new norms, the complexity of technological choices, and the uncertainty of learning outcomes (Sum, 2022). This condition emerges not merely as a technical challenge, but as an epistemic void that demands a reconstruction of educational goals.

In response to this epistemic vacuum, contemporary education needs to move toward authentic, technology-based classrooms that position technology not merely as a digital tool but as an instrument for transforming educational values. This thinking demands a deeper question: how can technology transform learning experiences to be relevant to students' real-life contexts? A systematic literature review on the use of technology for authentic assessment found that digital technology can design assessment practices that reflect real-world challenges, by integrating multi-screen, collaborative experiences, and higher-order thinking (Villaruel et al., 2025). These findings demonstrate that technology is not merely a tool for efficiency, but has the potential to create valuable, complex, and contextual learning experiences that bridge the gap between the world of education and the needs of future professional lives (Alam & Mohanty, 2023).

The need for authentic classrooms is further heightened when we realize that learning solely focused on formal academic outputs often fails to develop critical thinking, collaboration, and creativity—collectively referred to as 21st-century skills. This paradigm has been addressed in numerous studies that emphasize the importance of meaningful, contextually relevant, and task-based learning. According to a recent report from the Organization for Economic Co-operation and Development (OECD), the integration of digital technology in education can enhance student engagement, collaboration, and self-directed learning, but its success depends heavily on

how technology is integrated into appropriate pedagogical practices and not simply as a substitute for traditional instruction (Shek, 2025). These findings underscore the fact that technology can be a transformative force only when pedagogy and technology work synergistically, a harmony that is at the heart of an authentic classroom oriented toward meaningful learning.

However, this change is not easy. The penetration of technologies such as AI and IoT into the educational space often gives rise to a psychological phenomenon known as tech shock. This phenomenon suggests that the abundance of information—coming not only from teachers, but from various digital sources—actually exacerbates confusion, uncertainty, and cognitive stress in both students and teachers. When learners are confronted with a flood of unstructured and irrelevant data, they tend to experience cognitive overload, which hinders in-depth learning. In many cases, technology is adopted without adequate pedagogical guidance, thus merely accelerating content delivery without improving the quality of understanding or higher-order thinking skills. Studies on digital pedagogy show that ad hoc use of technology often reinforces traditional learning practices, rather than substantively transforming them into authentic and participatory experiences (Park, 2024).

Addressing this paradigm gap requires a fundamental rethinking of authentic learning. An authentic approach means creating learning spaces that immerse students in situations that mimic real-world professional and social realities (Damaševičius & Sidekerskienė, 2024). An authentic approach demands contextual, collaborative, problem-solving, and reflective learning—a learning style that goes beyond simply memorizing facts or completing administrative tasks. The application of technology in such contexts is not used merely to expedite administrative tasks, but to support situated experiences, namely learning in contexts where knowledge is actually used (Yigitcanlar et al., 2024).

We can define an authentic technology-based classroom as a space where technology becomes a tool to create learning experiences relevant to real-life challenges, not simply a means of delivering digital content. In this context, the principle of TRUE (Truthfulness, Resilience, Uncertainty-Friendly, Eminence) becomes crucial. Truthfulness, or pedagogical truthfulness, refers to openness and honesty in the use of technology; students are not simply given automated answers, but are guided to verify, validate, and understand the thought processes underlying problem solutions (Lubbe et al., 2025). Resilience means learning that strengthens students' capacity to persist in the face of the complexity and uncertainty of digital information, rather than simply introducing them to rapidly obsolete technology (Naeem & Mushibwe, 2025). Uncertainty-Friendly implies that the classroom must prepare students to embrace uncertainty as part of the learning experience, learn from ambiguity, and manage ambiguous information as material for meaningful inquiry (Bähr et al., 2024). Finally, Eminence implies an aspiration to achieve the highest quality of learning: not just graduation or grades, but the formation of thinking capacity, creativity, and intellectual integrity that can stand the test of time (Devi & Ray, 2024).

Within this framework, technology must be repositioned as a tool to empower pedagogy that creates intellectual engagement and personal value. Technology is no longer a new cognitive burden, but an instrument that facilitates teachers' construction of dialogic, participatory, and reflective learning experiences. Findings from international studies indicate that successful digital pedagogical practices are those that balance the use of digital tools with learner-centered learning strategies, where teachers act as facilitators of experiences, not simply as operators of technology (Kerimbayev et al., 2023).

Each learner has a unique learning path, and authentic, technology-based classrooms must support self-directed learning combined with collaborative inquiry. Recent research underscores the importance of empowering learners in interaction-rich digital environments, where students utilize digital tools to explore, create, and collaborate with their peers through digital platforms designed to support active engagement (Novoa-Echaurren, 2024). These practices strengthen

students' metacognitive abilities to evaluate information sources, work in teams, and optimize collective knowledge to address complex learning challenges.

However, the transition from the VUCA paradigm to authentic, technology-based classrooms is not without challenges. The most fundamental challenges are pedagogical structures and educational cultures that remain tied to summative formative assessments, reward systems that rely too heavily on scores, and institutional infrastructure that is slow to evolve. Authentic learning, however, requires a shift in how learning success is assessed—moving from test-based assessments to assessments that reflect students' abilities to complete complex, real-world tasks, think critically, and collaborate effectively. Recent research on authentic assessment suggests that technology can enrich assessment by presenting challenges that mirror professional work, but its integration requires the development of new skills for teachers as designers of authentic tasks (Kerimbayev et al., 2023).

Furthermore, authentic classrooms cannot be engineered solely through technology; they must be guided by a pedagogical framework that prioritizes meaning, connectedness, and holistic learning. This places a significant responsibility on teachers to become mediators who not only master technology but also understand how technology can enrich pedagogical interactions by taking into account the social, cultural, and psychological contexts of learners. Pedagogical readiness and technological readiness must go hand in hand for authentic, technology-based classrooms to truly become spaces capable of transforming learning experiences not only from a technical perspective, but also from the perspective of the values and meaning of future education (Ghalia & Karra, 2023).

Reconstructing the LMS Ecosystem: From Technical Infrastructure to Instructional Design

The reconstruction of the Learning Management System (LMS) ecosystem essentially marks a fundamental shift from a technocratic perspective to a more reflective and transformative pedagogical horizon. For more than a decade, the discourse on LMS implementation in many educational institutions has remained trapped in infrastructure logic, focusing on questions of server availability, network stability, storage capacity, and the sophistication of technical features. This paradigm has given rise to an IT Support orientation that positions the LMS solely as a web-based academic information system, rather than as a learning space. Yet, recent research shows that the primary failure of LMS implementation lies not in the technological aspect, but in the absence of instructional design that is coherent with pedagogical objectives (Nasution et al., 2025). In other words, the fundamental issue is not whether an LMS is available, but rather in what purpose and how it is used as a meaningful learning medium.

The gap between macro-policy and micro-readiness further emphasizes this ecosystem problem. At the policy level, many countries have adopted digital transformation in education through national regulations and roadmaps. However, at the educational unit level, implementation often takes place in symbolic and administrative terms. Teachers and lecturers are encouraged to use LMSs, but without adequate instructional design support. As a result, LMSs function only as repositories of digital materials, places to upload PDF modules, or online assignment submissions, without providing a substantively different learning experience from conventional classrooms (Sari & Al Hamidi, 2024). This phenomenon demonstrates that significant technology investment does not automatically result in pedagogical innovation unless accompanied by a paradigm shift in the role of teachers and the structure of learning.

From a contemporary instructional design perspective, an LMS should be understood as an immersive pedagogical space capable of holistically integrating various learning approaches. A blended learning approach, for example, does not simply mean a combination of face-to-face and online learning, but rather a strategic integration of synchronous and asynchronous interactions

designed based on the characteristics of the material and the needs of the learners (Zakaria & Ningsih, 2024). Systematic research shows that effective blended learning requires explicit planning of learning activities, including the determination of objectives, interaction scenarios, and assessment strategies aligned with learning outcomes (Hill & Smith, 2023). In this context, an LMS acts as a pedagogical architecture that orchestrates the learning flow, not simply as an information storage platform.

Furthermore, LMS reconstruction also requires the integration of immersion methods, namely learning methods that place students in a learning environment that resembles real-world reality. In digital environments, immersion is realized through simulations, problem-based projects, collaborative discussions, and exploration of open learning resources. Recent research shows that LMSs designed with immersion principles can increase students' cognitive engagement and learning motivation, because they become not just consumers of information, but active actors in the knowledge construction process (Novoa-Echaurren, 2024). Here, the LMS functions as a pedagogical platform that enables contextual, reflective, and authentic problem-solving-oriented learning.

This transformation is also closely related to the implementation of flipped learning, which is a reversal of the learning structure from a lecture-based classroom model to independent exploration outside the classroom. In flipped learning, basic content is presented through videos, interactive modules, or digital resources in an LMS, while synchronous time is used for discussions, case analysis, and collaborative activities. Empirical research shows that LMS-based flipped learning contributes significantly to improving students' critical thinking skills and learning independence (Khairiniza & Rizki, 2025). Thus, the LMS is no longer an extension of the lecture method, but rather an instrument for reallocating pedagogical energy from knowledge transmission to facilitating in-depth understanding.

The reconstruction of the LMS ecosystem also necessitates a shift in the role of teachers from technology operators to learning designers. Within the Instructional Design Support paradigm, teachers are required to master learning design principles, such as analyzing learning needs, formulating instructional objectives, selecting interaction strategies, and developing authentic assessments. Recent research shows that the success of LMS implementation is heavily influenced by teachers' digital pedagogical competencies, not the sophistication of the platform itself dipengaruhi oleh kompetensi pedagogis digital guru, bukan oleh kecanggihan platform itu sendiri (Zahra, 2025). Teachers with instructional design literacy are able to utilize LMS features to create adaptive, personalized, and learner-centered learning flows.

In the era of artificial intelligence, the reconstruction of LMSs is increasingly taking on new dimensions. The integration of generative AI into LMSs opens up significant opportunities for personalized learning, automated feedback, and real-time learning data analysis. However, without a clear instructional design framework, AI has the potential to reinforce shallow learning and students' reliance on instant answers. Recent studies emphasize that AI integration into LMSs should be directed at enriching, not replacing, the thinking process, by positioning AI as a cognitive partner that helps students reflect on their learning (Zhu, 2025). Within this framework, AI is not simply a technical feature but rather part of a pedagogical ecosystem that supports meaningful learning.

The reconstruction of the LMS ecosystem ultimately implies a redefinition of the meaning of technology in education. Technology is no longer understood as an end in itself, but as a medium for pedagogical transformation. The ideal LMS is not a feature-packed system, but rather one capable of orchestrating learning experiences in a coherent, relevant, and reflective manner. Cross-contextual research shows that LMSs designed with an instructional design approach can improve the quality of interactions, student engagement, and long-term learning outcomes (Novoa-Echaurren, 2024). Thus, LMS reconstruction is not a technical project, but rather an epistemological one that touches on the very purpose of education itself.

Broadly speaking, the reconstruction of the LMS ecosystem requires a shift in institutional culture. Educational institutions need to shift from a project-oriented to a process-oriented approach, from a procurement-oriented to a capacity-building-oriented approach (Martinsuo et al., 2022). The LMS must be treated as an evolving learning ecosystem, not a finished product that can simply be installed and abandoned. Without this cultural shift, the LMS will continue to serve as a repository of digital documents, a symbol of modernity lacking pedagogical meaning. Conversely, with thoughtful instructional design, the LMS can transform into a pedagogical engine that transforms the role of the teacher into a facilitator of advanced learning and shapes learners as active subjects in the ongoing construction of knowledge.

CONCLUSION

Based on the overall results of the study, this research answers the main question regarding the extent to which a Learning Management System (LMS) is capable of managing the complexity of classroom management in the context of contemporary education. The main findings indicate that an LMS cannot be understood simply as a digital technical instrument, but rather as a pedagogical ecosystem that demands a paradigm reconstruction from conventional learning to authentic learning based on instructional design. The dominance of teacher-centered learning, high administrative burdens, and the phenomenon of learning camouflage are strong indicators of pedagogical anomalies in traditional classrooms. An LMS, when managed appropriately, has been shown to have the potential to reduce these anomalies through the automation of administrative processes, personalization of learning, and strengthening cognitive, affective, and reflective interactions between students. Thus, the complexity of classroom management is not primarily caused by student resistance, but by the misalignment between old pedagogical structures and the epistemic dynamics of the digital society.

Theoretically, this research has implications for strengthening the constructivism and connectivism paradigms in digital education. LMS functions as an epistemological medium that enables network-based learning, knowledge collaboration, and independent reflection. These findings broaden the understanding that educational technology is not value-neutral, but rather has ontological consequences for how we learn, how we know, and how we construct meaning. LMS is not simply an instructional tool, but part of a transformation in the structure of pedagogical awareness toward an authentic classroom that positions uncertainty, complexity, and ambiguity as productive learning resources.

Practically, this research emphasizes the importance of shifting institutional policy from an IT Support paradigm to Instructional Design Support. Technology investment without a reconstruction of work culture, digital literacy, and pedagogical capacity risks creating a technology stagnation phenomenon, where the LMS functions only as a passive document repository. Therefore, LMS development must be preceded by multidimensional planning that simultaneously encompasses cultural-ware, brain-ware, software, and hardware. Teachers and lecturers need to be positioned not as system operators, but as learning architects capable of utilizing the LMS to design immersive, reflective, and sustainable learning experiences.

This research's limitations lie in its desk-based nature, which means it doesn't fully represent the empirical dynamics across various educational institution contexts. Variations in organizational culture, infrastructure readiness, and student characteristics cannot be directly generalized. Furthermore, this study hasn't quantitatively measured the impact of LMS use on learning outcomes, intrinsic motivation, or the development of 21st-century competencies longitudinally.

Therefore, further research is recommended to develop mixed-methods empirical studies that combine qualitative analysis and quantitative measurements. Future research should

directly test the effectiveness of LMSs in creating authentic classrooms, reducing teachers' administrative burdens, and improving the quality of pedagogical interactions. Furthermore, exploring the integration of artificial intelligence, learning analytics, and adaptive design within LMSs is a strategic agenda for understanding the future of classroom management in the digital education era.

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