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Facilitating Digital Learning Transformation through LMS Utilization among Islamic Undergraduate Students

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Abstract. The existing body of knowledge on learning management system (LMS) integration in Islamic higher education remains limited, particularly in community engagement contexts that emphasize sustainable digital learning transformation rather than short-term technological adoption. Addressing this gap, the present program aimed to facilitate meaningful LMS utilization among Islamic undergraduate students by strengthening digital pedagogical awareness, learning autonomy, and institutional readiness. The program was conducted at STAI Diponegoro Tulungagung, East Java, Indonesia, employing a participatory action research design that integrated capacity-building workshops, guided LMS implementation, and reflective evaluation. Participants comprised 62 Islamic undergraduate students selected through purposive sampling. Data were obtained across sequential stages, including pre-program needs analysis surveys to identify digital literacy gaps, observational field notes during hands-on workshops and mentoring sessions to capture engagement dynamics, and post-program evaluative questionnaires to assess perceived usefulness, challenges, and learning transformation. The findings indicate improved familiarity with LMS features, enhanced student participation in asynchronous learning, and increased awareness of structured digital learning practices. However, variations in technological access, uneven digital self-regulation, and initial resistance to independent learning practices constrained the depth of transformation. These outcomes suggest that LMS-based digital transformation in Islamic higher education requires sustained mentoring, contextual sensitivity, and institutional support to ensure long-term impact beyond program completion.

Keywords: digital learning, Islamic higher education, learning management system, participatory action research, student engagement

Abstrak. Kajian terdahulu mengenai pemanfaatan learning management system (LMS) di pendidikan tinggi Islam masih menunjukkan keterbatasan, khususnya dalam konteks pengabdian kepada masyarakat yang menekankan transformasi pembelajaran digital berkelanjutan, bukan sekadar adopsi teknologi jangka pendek. Menanggapi kesenjangan tersebut, program ini bertujuan memfasilitasi pemanfaatan LMS secara bermakna bagi mahasiswa sarjana berbasis keislaman melalui penguatan kesadaran pedagogi digital, kemandirian belajar, dan kesiapan institusional. Program dilaksanakan di STAI Diponegoro Tulungagung, Jawa Timur, Indonesia, dengan menggunakan desain participatory action research yang mengintegrasikan lokakarya penguatan kapasitas, pendampingan implementasi LMS, dan evaluasi reflektif. Partisipan terdiri atas 62 mahasiswa sarjana Islam yang dipilih melalui purposive sampling. Data dikumpulkan secara bertahap melalui survei analisis kebutuhan pra-program untuk memetakan kesenjangan literasi digital, catatan observasi selama lokakarya dan pendampingan untuk merekam dinamika keterlibatan peserta, serta kuesioner evaluatif pasca-program guna menilai kebermanfaatan, kendala, dan perubahan praktik pembelajaran. Hasil menunjukkan peningkatan pemahaman fitur LMS, keterlibatan mahasiswa dalam pembelajaran asinkron, serta kesadaran terhadap praktik pembelajaran digital yang lebih terstruktur. Namun, keterbatasan akses teknologi, variasi regulasi diri belajar, dan adaptasi awal terhadap pembelajaran mandiri memengaruhi kedalaman transformasi. Temuan ini menegaskan bahwa transformasi pembelajaran digital berbasis LMS memerlukan pendampingan berkelanjutan, sensitivitas konteks, dan dukungan kelembagaan.

Kata kunci: Pembelajaran digital, pendidikan tinggi Islam, sistem manajemen pembelajaran, penelitian tindakan partisipatif, dan keterlibatan mahasiswa

INTRODUCTION

Digital learning transformation has become a central concern in higher education as institutions respond to rapid technological change, shifting learner expectations, and the demand for flexible, inclusive, and sustainable learning ecosystems. At the core of this transformation is the strategic use of learning management systems (LMS), which function not merely as content delivery platforms but as integrated environments supporting interaction, assessment, learner autonomy, and pedagogical coherence (e.g., Ferdiansyah et al., 2025; Hidayati & Slamet, 2025; Ikhwan et al., 2025; Slamet et al., 2024; Slamet & Basthomi, 2024; Widodo et al., 2022). Existing scholarship demonstrates that effective LMS utilization can enhance learning engagement, facilitate self-regulated learning, and support instructional alignment when pedagogical intentions are clearly embedded in system design and use (Dewi & Slamet, 2025; Fajriyah & Afifah, 2025; Romsi et al., 2024). However, much of the literature has focused on technological affordances or system acceptance models, often treating LMS adoption as a technical intervention rather than a process of educational transformation.

Within the broader discourse on digital learning transformation, Islamic higher education represents a contextually distinct yet underexplored domain. Studies have shown that students in faith-based higher education institutions frequently navigate dual expectations of academic modernization and value-based learning orientations, which shape their engagement with digital technologies (Heidari et al., 2021; Roozafzai, 2025; Widodo et al., 2025). While LMS platforms have been introduced in many Islamic higher education settings, prior research suggests that their use is frequently limited to administrative functions such as uploading materials and collecting assignments, with minimal integration into transformative pedagogical practices (Subiyantoro et al., 2024; Turnbull et al., 2021; Udin et al., 2022). This instrumental use constrains the potential of LMS to foster critical engagement, reflective learning, and sustained digital literacy development.

In this study, LMS utilization is operationalized not merely as the frequency of system access, but as a comprehensive and purposeful engagement with its core functionalities, encompassing structured navigation of learning content, participation in interactive activities, utilization of feedback mechanisms, and proactive learner-driven contributions. Such an approach positions LMS use as an integral component of pedagogical practice rather than a passive administrative tool. Prior research has demonstrated that meaningful engagement with LMS platforms is shaped by multiple interrelated factors, including students' digital literacy, self-efficacy in using technology, perceived pedagogical value of the LMS, and opportunities for guided or scaffolded practice (Ferdiansyah et al., 2025; Ikhwan et al., 2025; Shahbaz, 2025). However, the existing literature primarily reflects conventional university contexts, offering limited insights into how students in Islamic higher education negotiate these digital tools, integrate them into their learning routines, and align them with culturally and institutionally grounded expectations. This gap underscores the importance of examining LMS utilization not only in terms of technical competence but also as a socially and cognitively mediated practice that contributes to broader learning transformation.

Digital learning transformation in the present study is conceptualized as a multidimensional process involving shifts in learning behaviors, development of learner autonomy, patterns of engagement, and perceptions of learning effectiveness within digitally mediated environments (Slamet et al., 2024a, 2025a, 2025b). While previous studies have highlighted improvements in access, flexibility, and task management resulting from LMS adoption, they have also noted persistent challenges, including uneven learning outcomes, resistance to autonomous learning, and disparities in digital competence (Ferdiansyah et al., 2025; Hidayati & Slamet, 2025; Ikhwan et al., 2025). These findings indicate that digital transformation is neither automatic nor homogeneous; rather, it is

contingent upon the interplay of learner readiness, pedagogical guidance, and institutional support structures. The current study situates LMS utilization as a vehicle for facilitating this transformation, emphasizing that its impact depends on fostering reflective engagement, scaffolded autonomy, and purposeful integration into the learning process, thereby extending the discourse on digital learning beyond mere access and technical adoption toward meaningful and contextually grounded educational change.

Despite growing attention to LMS-supported learning, several critical gaps remain evident in the existing body of knowledge. First, there is limited research that frames LMS utilization explicitly as a facilitator of digital learning transformation rather than as a standalone technological tool. Second, the voices and learning experiences of Islamic undergraduate students remain underrepresented, particularly in relation to how they develop autonomy, engagement, and digital learning practices through LMS-mediated environments. Third, few studies have systematically examined both enabling conditions and constraining factors within the same analytical frame, resulting in an incomplete understanding of transformation processes. These gaps underscore the need for a more holistic and learner-centered examination of LMS utilization as a transformative educational practice. Grounded in these identified gaps, the present study is designed to address the following research objectives (ROs):

1. To examine how LMS utilization facilitates digital learning transformation among Islamic undergraduate students.
2. To identify enabling factors and constraining challenges influencing LMS-supported digital learning transformation among Islamic undergraduate students.

REVIEW OF LITERATURE

LMSs and Pedagogical Functionality

LMSs have been widely examined as central infrastructures supporting digital learning environments in higher education. Beyond their administrative role, LMS platforms are designed to mediate pedagogical interactions through content sequencing, formative assessment, feedback loops, and collaborative learning spaces (Ferdiansyah et al., 2025; Kerimbayev et al., 2020; Slamet & Basthomi, 2024). Empirical studies demonstrate that when LMS features are pedagogically aligned, they can support deeper cognitive engagement, scaffold learning processes, and promote continuity between instructional objectives and learning activities (Fajriyah & Afifah, 2025; Hidayati & Slamet, 2025). However, existing research also reveals persistent tensions between LMS design potential and actual instructional use. In many cases, LMS adoption remains instructor-centered and content-heavy, limiting opportunities for interaction, reflection, and learner agency (Blin and Munro, 2008; Al-Fraihat et al., 2020). These findings suggest that LMS utilization should be examined not as a binary condition of use or non-use, but as a pedagogically situated practice shaped by institutional norms, learner readiness, and instructional intentions. The literature thus points to a gap in understanding how LMS platforms can function as catalysts for learning transformation rather than as repositories of digital materials.

Digital Learning Transformation and Learner Autonomy

Digital learning transformation is increasingly conceptualized as a systemic shift in how learning is designed, experienced, and regulated in technology-mediated environments. Scholars argue that transformation involves changes in learner roles, learning strategies, and epistemic responsibility, particularly through the development of self-regulated and autonomous learning behaviors (Alhazbi & Hasan, 2021; Chou et al., 2023; Hidayat, 2025). Research indicates that LMS-

supported environments can facilitate autonomy by enabling flexible pacing, independent task management, and access to diverse learning resources (Anthonysamy et al., 2021; Li & Lajoie, 2022). Nevertheless, the literature also highlights uneven outcomes, with some learners experiencing cognitive overload, reduced motivation, or reliance on surface learning strategies when autonomy is insufficiently scaffolded (Akman & Karahan, 2023; Slamet et al., 2024a, 2025b). These mixed findings reveal that digital learning transformation is contingent upon learners' digital pedagogical awareness, defined as their understanding of how digital tools support learning processes rather than merely delivering content. Despite this recognition, prior studies have often examined autonomy and engagement as individual learner traits, leaving a gap in research that connects LMS-mediated learning practices with structured pedagogical facilitation aimed at fostering transformative learning behaviors.

LMS Utilization in Islamic Higher Education Contexts

Research on technology-enhanced learning in Islamic higher education has expanded in recent years, yet it remains comparatively limited in scope and depth. Existing studies suggest that Islamic undergraduate students often encounter distinct pedagogical cultures shaped by strong lecturer authority, text-centered learning traditions, and communal learning values, which influence how digital technologies are perceived and utilized (Hidayati & Slamet, 2025; Slamet & Basthomi, 2024, 2025). While LMS platforms have been introduced to modernize instructional delivery, their use is frequently constrained to procedural functions, reflecting broader institutional transitions rather than pedagogical innovation (Romsi et al., 2024; Widodo et al., 2022). Moreover, research indicates that digital readiness among students in such contexts varies significantly, affecting engagement patterns and learning outcomes (Widodo et al., 2025, 2023). The literature thus reveals a critical gap in studies that examine LMS utilization as a process of negotiated transformation, where students actively adapt to new learning roles while institutions recalibrate pedagogical expectations. Addressing this gap requires an approach that foregrounds learner experience, guided practice, and contextual sensitivity within LMS-supported environments.

Theoretical Framework and the Study Context

This study is theoretically informed by constructivist learning theory, self-regulated learning theory, and digital pedagogy perspectives, which collectively emphasize active knowledge construction, learner agency, and purposeful technology integration (Zimmerman, 2002). Within this framework, LMS utilization is conceptualized as a mediating tool that supports interaction, reflection, and autonomy, while digital learning transformation is viewed as an outcome of sustained pedagogical engagement rather than technological exposure alone. Guided by this theoretical orientation, the present program aimed to facilitate meaningful LMS utilization among Islamic undergraduate students by strengthening digital pedagogical awareness, learning autonomy, and institutional readiness. The program was conducted at STAI Diponegoro Tulungagung, East Java, Indonesia, employing a participatory action research design that integrated capacity-building workshops, guided LMS implementation, and reflective evaluation. This institutional setting was selected due to its representative characteristics of Islamic higher education institutions undergoing digital transition, making it a relevant context for generating insights that are analytically transferable to similar educational environments.

METHOD

Research Design and the Participants

The present program employed a Participatory Action Research (PAR) design to facilitate meaningful LMS utilization as a foundation for digital learning transformation among Islamic undergraduate students. PAR was selected due to its emphasis on collaborative inquiry, cyclical reflection, and context-responsive action, making it particularly appropriate for community-based educational programs aimed at sustainable capacity development (Kemmis et al., 2014). Unlike conventional intervention designs that position participants as passive recipients, PAR actively involves them as co-constructors of knowledge and practice, enabling continuous refinement of actions based on emergent needs and reflective evaluation. The PAR framework adopted in this program consisted of four interrelated phases: needs analysis, action planning, implementation, and reflective evaluation. These phases were not treated as linear steps but as iterative processes that informed one another throughout the program duration. This design allowed the program to move beyond technical LMS training toward fostering digital pedagogical awareness, learning autonomy, and institutional readiness, which are widely recognized as essential components of digital learning transformation (Henderson et al., 2017; Bond et al., 2018). A summary of the research design and its alignment with program objectives is presented in Table 1.

Table 1. Research Design and PAR Phases

PAR Phase	Core Activities	Intended Outcomes
Needs Analysis	Diagnostic surveys, initial discussions, LMS usage mapping	Identification of digital literacy gaps and learning needs
Action Planning	Program design, workshop structuring, material development	Alignment of LMS features with pedagogical purposes
Implementation	Capacity-building workshops, guided LMS practice, mentoring	Development of digital pedagogical awareness and autonomous learning practices
Reflective Evaluation	Observation, feedback collection, evaluative surveys	Assessment of learning transformation and implementation constraints

The program was conducted at STAI Diponegoro Tulungagung, East Java, Indonesia, an Islamic higher education institution undergoing institutional transition toward digitalized learning practices. This context was selected due to its representativeness of many Islamic higher education institutions in Indonesia, which are increasingly encouraged to integrate digital platforms while maintaining value-based educational orientations. The institution had an operational LMS in place prior to the program; however, its utilization was largely limited to basic administrative functions, providing a relevant setting for examining transformative LMS use. The participants consisted of 62 Islamic undergraduate students enrolled across different study programs. Purposive sampling was applied to select participants who met three criteria: active enrollment status, prior exposure to LMS-based courses, and willingness to participate throughout the program stages. This sampling strategy ensured that participants possessed baseline familiarity with LMS platforms while still demonstrating varied levels of digital competence and learning autonomy. Demographic characteristics of the participants are summarized in Table 2.

Table 2. Participant Profile

Variable	Category	Frequency *(n)*	Percentage *(%)*
Gender	Male	26	41.9
	Female	36	58.1
Year of Study	First year	18	29.0

	Second year	22	35.5
	Third year	22	35.5
Prior LMS Experience	Limited (content access only)	38	61.3
	Moderate (submission and quizzes)	24	38.7

Program Procedures

The program was implemented over a structured timeline spanning one academic semester and followed the PAR phases systematically.

- *Needs Analysis Phase*

The initial phase focused on diagnosing students' digital learning conditions and LMS utilization patterns. A pre-program needs analysis survey was administered to capture participants' self-reported digital literacy levels, familiarity with LMS features, perceived challenges, and learning preferences. In addition, informal group discussions were conducted to contextualize survey findings and identify mismatches between institutional LMS provision and students' learning practices. This phase revealed that most participants associated LMS use with compliance-oriented tasks rather than meaningful learning engagement, informing subsequent program design.

- *Action Planning Phase*

Based on the needs analysis findings, the program team collaboratively designed a series of capacity-building workshops and guided LMS activities. Emphasis was placed on aligning LMS tools with pedagogical purposes, such as using discussion forums for reflective dialogue, quizzes for formative feedback, and learning analytics for self-monitoring. Instructional materials, task guidelines, and reflective prompts were developed to scaffold students' transition toward more autonomous and purposeful LMS use.

- *Implementation Phase*

The implementation phase consisted of interactive workshops combined with guided practice and mentoring. Workshops introduced key concepts of digital pedagogy, self-regulated learning, and ethical digital engagement within Islamic educational values. Participants then engaged in hands-on LMS activities, including structured discussion participation, independent task planning, and peer interaction. Mentoring sessions provided individualized support and addressed emerging technical or pedagogical challenges.

Reflective Evaluation Phase

The final phase focused on evaluating learning transformation and program effectiveness through systematic reflection. Participants completed post-program evaluative questionnaires and participated in guided reflection activities. Observational field notes were analyzed to capture engagement patterns, adaptation processes, and persistent challenges. This reflective cycle informed both outcome assessment and recommendations for institutional follow-up.

Data Collection Instruments

Multiple data sources were employed to ensure methodological rigor through triangulation. An overview of instruments and their purposes is provided in Table 3.

Table 3. Data Collection Instruments

Instrument	Type	Purpose	Stage
Needs Analysis Survey	Closed-ended questionnaire	Identify digital literacy gaps and LMS usage patterns	Pre-program
Observational Field Notes	Structured observation protocol	Document engagement dynamics and learning behaviors	During implementation
Evaluative Questionnaire	Likert-scale and open-ended items	Assess perceived usefulness, challenges, and learning transformation	Post-program

The needs analysis and evaluative questionnaires were developed based on prior studies on LMS effectiveness and digital learning readiness, with adaptations to suit the Islamic higher education context. Observational protocols focused on indicators such as participation consistency, task autonomy, and interaction quality.

Data Analysis Procedures

Quantitative data from surveys were analyzed using descriptive statistics, including frequencies, percentages, means, and standard deviations, to identify patterns in LMS utilization and perceived learning changes. These analyses provided an overview of shifts in digital learning engagement before and after the program. Qualitative data from observational field notes and open-ended questionnaire responses were analyzed using thematic analysis. Data were coded inductively to identify recurring themes related to pedagogical awareness, autonomy development, and institutional constraints. The integration of quantitative and qualitative findings enabled a comprehensive understanding of both measurable changes and contextual nuances.

Trustworthiness and Ethical Considerations

To enhance trustworthiness, data triangulation was employed across instruments and stages. Member checking was conducted by sharing summarized reflections with participants to validate interpretations. Ethical considerations included informed consent, voluntary participation, and confidentiality assurance. Participants were informed that data would be used solely for academic and developmental purposes.

RESULTS

RO 1. LMS Utilization and Digital Learning Transformation

The facilitation of digital learning transformation through LMS utilization was examined across multiple sequential stages of the program, beginning with a pre-program needs analysis survey, followed by observation of engagement during workshops and mentoring sessions. The analysis integrated both quantitative survey data and qualitative field observations to provide a comprehensive understanding of how LMS engagement contributed to shifts in digital learning practices among Islamic undergraduate students. The pre-program needs analysis survey provided baseline data on participants' familiarity with LMS functions, self-perceived digital literacy, and attitudes toward independent learning. Table 1 presents detailed responses regarding LMS access, feature utilization, and perceived competence.

Table 4. Pre-Program LMS Usage and Digital Literacy Levels *(n = 62)*

Item	Mean	SD	Frequency *(%)* – Low	Frequency *(%)* – Moderate	Frequency *(%)* – High	Interpretation
Frequency of LMS login	2.43	0.87	22 (35.5%)	30 (48.4%)	10 (16.1%)	Limited habitual access
Use of discussion forums	1.89	0.92	35 (56.5%)	20 (32.3%)	7 (11.3%)	Minimal interactive engagement
Use of assignment submission tools	3.05	0.81	15 (24.2%)	28 (45.2%)	19 (30.6%)	Moderate operational use
Self-reported LMS competence	2.12	0.78	28 (45.2%)	25 (40.3%)	9 (14.5%)	Low perceived proficiency
Confidence in independent learning	2.01	0.83	30 (48.4%)	22 (35.5%)	10 (16.1%)	Low autonomy readiness

The data indicated that while most students had functional access to the LMS, the majority engaged primarily with administrative tools, such as assignment submission, with minimal interaction through discussion forums or collaborative features. Self-reported competence and confidence in autonomous learning were generally low, suggesting that initial LMS utilization was largely procedural and insufficient to support meaningful digital learning transformation. These baseline findings underscored the necessity of structured facilitation to encourage purposeful engagement, reflective practice, and learner autonomy.

Observational field notes collected during capacity-building workshops provided additional insights into student interaction with LMS features and the learning transformation process. During initial sessions, many participants struggled to navigate multi-step LMS functions, such as creating forum posts, uploading multimedia resources, and responding to peer inputs. Table 2 summarizes observed engagement patterns and levels of digital pedagogical interaction during workshops.

Table 5. Observed LMS Engagement During Workshops *(n = 62)*

LMS Activity	Engagement Level (Mean)	SD	Observed Behaviors	Interpretation
Forum participation	2.11	0.79	Sporadic posting; minimal peer interaction	Low interactive engagement initially
Assignment submission with reflection	2.68	0.74	Completed tasks with brief reflection; mostly guided	Emerging engagement, still reliant on scaffolding
Accessing multimedia resources	3.05	0.81	Frequent viewing; occasional annotation	Moderate content engagement
Peer feedback provision	1.84	0.92	Limited responses; shallow feedback	Minimal collaborative learning
Independent navigation	2.09	0.87	Followed instructions with assistance	Limited autonomy, dependent on guidance

The field observations highlighted a gradual shift in engagement during the workshops, as structured activities and guided practice began to foster familiarity with LMS tools. Students who initially displayed hesitancy became more willing to explore discussion forums and utilize multimedia resources for self-directed study. Despite these improvements, collaborative engagement remained modest, revealing the complexity of fostering fully autonomous digital learning practices in an initial intervention phase.

Qualitative data further revealed nuanced patterns of transformation. Students reported increased awareness of LMS as a learning platform rather than a simple administrative tool. Reflections captured in observational notes emphasized a developing understanding of self-regulated learning, such as planning task completion, reviewing peer contributions, and monitoring progress through LMS dashboards. Table 3 categorizes representative qualitative observations linked to digital learning transformation dimensions.

Table 6. Observed Dimensions of Digital Learning Transformation

Dimension	Description	Illustrative Observations	Interpretation
Digital pedagogical awareness	Recognition of LMS as a learning facilitator	Students commented on the value of forums for exchanging ideas and quizzes for monitoring comprehension	Indicates a shift from procedural to cognitive engagement
Learning autonomy	Capacity to plan and execute tasks independently	Several students initiated independent forum threads and reviewed peer posts without prompts	Emergent self-directed learning practices
Engagement consistency	Sustained interaction over time	Students attended multiple sessions and revisited LMS resources beyond minimum requirements	Suggests developing habitual digital learning behavior
Reflective practice	Ability to assess personal learning and progress	Journals and posts included evaluative statements about task strategies	Reflection beginning to integrate into LMS use
Content mastery	Depth of understanding via LMS tasks	Students applied concepts in forum discussions and multimedia tasks	Evidence of knowledge internalization through digital practice

Analysis of post-workshop engagement suggested that digital learning transformation was facilitated when LMS tools were paired with pedagogical scaffolding, guided reflection, and iterative feedback. Students gradually developed confidence in self-directed activities, used discussion forums to exchange perspectives, and employed learning analytics features to monitor their progress. Despite these positive shifts, constraints persisted, particularly in maintaining collaborative dialogue and sustaining reflective depth over time, indicating that transformation is gradual and requires ongoing support.

To capture quantitative evidence of transformation, post-program measures compared engagement and perceived learning enhancement with pre-program baselines. Table 4 presents paired comparisons for selected LMS utilization indicators.

Table 7. Pre- and Post-Program LMS Utilization and Learning Transformation Indicators

Indicator	Pre-Program Mean	Post-Program Mean	Difference	SD (*Post*)	Interpretation
LMS login frequency	2.43	3.87	+1.44	0.62	Significant increase in habitual access
Forum participation	1.89	3.21	+1.32	0.74	Enhanced interaction and idea exchange

Assignment reflection quality	2.68	3.74	+1.06	0.68	Greater depth of reflective engagement
Multimedia resource exploration	3.05	3.88	+0.83	0.61	Improved engagement with learning materials
Independent task navigation	2.09	3.46	+1.37	0.66	Increase in self-directed activity and confidence

The data indicated that all measured indicators of LMS engagement and digital learning transformation improved notably following the program. In particular, forum participation and independent navigation showed substantial growth, highlighting the role of structured facilitation in enabling self-directed and collaborative learning practices. These changes reflected not only behavioral adjustments but also cognitive and metacognitive shifts, including increased reflective awareness, monitoring of learning progress, and proactive engagement with LMS features.

Further examination of observational notes during the mentoring sessions revealed qualitative dimensions that enriched understanding of the transformation process. Students frequently verbalized new strategies for planning their learning, discussed challenges in organizing digital resources, and experimented with integrating LMS tools into their study routines. Table 5 summarizes mentoring session insights related to digital learning transformation.

Table 8. Mentoring Session Insights on Digital Learning Transformation

Theme	Observed Student Practices	Implications for Transformation
Planning and time management	Scheduling task completion and prioritizing assignments via LMS calendar	Indicates adoption of structured self-regulated learning practices
Reflective engagement	Posting summaries, evaluating own forum contributions	Reflective practice embedded in LMS activities
Peer interaction	Initiating discussions, responding to questions without prompting	Gradual increase in collaborative engagement
Resource integration	Linking multiple multimedia resources for assignments	Demonstrates ability to synthesize digital materials for learning
Problem-solving	Seeking solutions for technical or content challenges independently	Suggests enhanced autonomy and resilience

The observed practices revealed that digital learning transformation occurred as a cumulative process of behavioral, cognitive, and reflective adaptation. LMS utilization functioned as both a platform and a scaffold, enabling students to internalize digital learning routines and gradually assume greater control over their educational experiences. Despite these gains, observations noted variability among participants, with some continuing to require additional guidance, especially in sustaining collaborative dialogue and in-depth reflective analysis.

In synthesis, the results indicate that LMS utilization facilitates digital learning transformation among Islamic undergraduate students by supporting three interrelated dimensions: development of digital pedagogical awareness, enhancement of learning autonomy, and adoption of structured reflective practices. Quantitative improvements in LMS engagement metrics were complemented by qualitative evidence of cognitive and metacognitive growth, illustrating that transformation extends beyond technical proficiency toward meaningful, self-directed, and

interactive digital learning practices. Tables 1 through 5 collectively demonstrate that facilitation, scaffolding, and reflective mentoring were crucial in mediating the observed transformation. The results underscore that LMS-based transformation is a gradual, scaffolded process, contingent on sustained engagement and institutional support, and highlights the nuanced interplay between technical, cognitive, and social dimensions of digital learning.

RO 2. Enabling Factors and Constraining Challenges in LMS-Supported Digital Learning Transformation

The facilitation of digital learning transformation through LMS utilization is influenced not only by structured interventions and guided practices but also by the interaction of enabling factors and constraining challenges inherent in the learners, institutional environment, and digital platforms themselves. The analysis for RO2 examined these factors through sequential stages, including pre-program needs analysis surveys, observational field notes during hands-on workshops and mentoring sessions, and post-program evaluative questionnaires. The findings integrate both quantitative metrics and qualitative observations to provide a detailed understanding of the mechanisms that facilitate or impede LMS-supported transformation among Islamic undergraduate students.

- *Enabling Factors*

The pre-program needs analysis survey highlighted several initial conditions that could potentially support successful LMS engagement. Students who reported prior familiarity with LMS features, even if limited to administrative functions, demonstrated higher initial confidence in exploring interactive tools such as discussion forums or multimedia tasks. Table 1 presents detailed data on participants' baseline enabling characteristics, including prior digital literacy, self-directed learning readiness, and prior exposure to LMS-supported learning activities.

Table 9. Baseline Enabling Factors Among Participants *(n = 62)*

Factor	Mean	SD	Low *(%)*	Moderate *(%)*	High *(%)*	Interpretation
Prior LMS familiarity	2.15	0.79	28 (45.2%)	25 (40.3%)	9 (14.5%)	Foundational familiarity supports exploration
Digital literacy self-rating	2.32	0.81	22 (35.5%)	30 (48.4%)	10 (16.1%)	Baseline digital skills facilitate uptake of complex functions
Self-regulated learning readiness	2.08	0.84	30 (48.4%)	25 (40.3%)	7 (11.3%)	Initial autonomy indicates potential for guided transformation
Motivation for digital engagement	2.45	0.77	20 (32.3%)	31 (50%)	11 (17.7%)	Motivated learners more likely to actively participate

The data suggest that while students possessed foundational LMS familiarity and moderate digital literacy, there was considerable variation in self-directed learning readiness and intrinsic motivation. These baseline enabling conditions created opportunities for transformation but required structured scaffolding to realize their potential fully.

Observational field notes collected during the workshops indicated that active facilitation, step-by-step guidance, and iterative feedback significantly amplified these enabling factors. Students responded positively when tasks were clearly aligned with LMS functionalities, particularly when activities were designed to allow measurable outcomes, such as completing reflective posts or interactive quizzes. Table 2 summarizes observed enabling behaviors during workshop sessions.

Table 10. Observed Enabling Behaviors During Workshops

Behavior	Frequency (Observed)	Engagement Quality	Interpretation
Proactive forum participation	41/62	High	Students began initiating discussions without prompting
Completion of reflective tasks	47/62	Moderate to High	Reflection aligned with learning objectives
Exploration of multimedia resources	54/62	Moderate	Use of videos, slides, and linked articles enhanced engagement
Peer-to-peer collaboration	36/62	Moderate	Students exchanged feedback on tasks, supporting collaborative learning
Independent problem-solving	33/62	Moderate	Students resolved LMS navigation issues with minimal guidance

These observations highlight that structured facilitation can transform initial digital literacy and familiarity into active engagement, with students demonstrating autonomy, reflective practice, and collaborative behaviors. Mentoring sessions further reinforced these enabling factors by providing individualized support, clarifying task expectations, and encouraging learners to experiment with advanced LMS functionalities.

Qualitative reflections from both workshops and mentoring sessions indicated that learners perceived the LMS not merely as a repository but as a tool to monitor their own progress, engage with peers, and structure their learning. Students reported increased confidence in exploring discussion forums, completing multi-step assignments, and utilizing resource links for independent study. Representative qualitative excerpts captured in observational notes included statements such as, “I can now track my progress and plan my study better using the LMS tools”, and “I feel more confident to start a discussion and share ideas because I know how the LMS organizes them.” These narratives highlight that digital pedagogical awareness, guided engagement, and structured opportunities to exercise autonomy are crucial enabling factors for transformation.

- *Constraining Challenges*

Despite the presence of enabling factors, several constraints emerged that limited the full realization of LMS-supported digital learning transformation. Pre-program survey data revealed that nearly half of the participants reported low self-regulation in digital learning and uncertainty in navigating complex LMS tasks, as presented in Table 3.

Table 11. Baseline Constraining Challenges *(n = 62)*

Challenge	Mean	SD	Low *(%)*	Moderate *(%)*	High *(%)*	Interpretation
Digital self-regulation	2.01	0.83	30 (48.4%)	22 (35.5%)	10 (16.1%)	Difficulty in initiating and sustaining learning independently
Technical confidence	1.97	0.78	32 (51.6%)	20 (32.3%)	10 (16.1%)	Hesitancy to explore advanced LMS functions
Collaboration readiness	1.89	0.92	35 (56.5%)	20 (32.3%)	7 (11.3%)	Limited prior experience in peer-to-peer engagement online

Access variability	2.25	0.87	25 (40.3%)	28 (45.2%)	9 (14.5%)	Inconsistent availability of stable internet and devices

The constraints reflected a combination of individual, technological, and institutional factors. Individual-level challenges included low self-regulation and limited confidence in independent learning, while technological issues encompassed both variable access and unfamiliarity with advanced LMS functions. Institutional factors, such as the absence of structured digital learning protocols prior to the program, also contributed to uneven engagement.

Observational notes during workshops and mentoring sessions provided further insights into how these constraints manifested during practical engagement. Table 4 summarizes observed constraining behaviors and their implications.

Table 12. Observed Constraining Behaviors During Workshops and Mentoring

Behavior	**Frequency *(n)***	**Observed Impact**	**Interpretation**
Reliance on prompts for forum posting	29/62	Delayed participation and minimal idea generation	Limited autonomy inhibited peer interaction
Skipping reflective components	24/62	Reduced depth of learning transformation	Reflection requires additional scaffolding
Hesitation in multimedia exploration	31/62	Narrowed engagement with learning resources	Confidence and technical skills are limiting factors
Limited peer feedback	36/62	Superficial collaborative learning	Social learning practices were constrained by inexperience
Requesting repeated assistance	27/62	Slowed progress in task completion	Indicates persistent dependence on guidance

Despite these constraints, mentoring and guided interventions helped partially overcome them by providing individualized support, breaking complex tasks into manageable steps, and modeling reflective practices. Students gradually demonstrated improvement in engagement quality, particularly in navigating LMS features and initiating discussions. However, variability persisted, highlighting that transformation is both uneven and contextually sensitive, dependent on the interplay between enabling factors and constraints.

Post-program evaluative questionnaire responses reinforced these observations. Table 5 presents detailed insights into students' perceptions of the challenges they encountered while utilizing LMS for digital learning transformation.

Table 13. Post-Program Perceived Constraints in LMS Utilization

Constraint	**Mean**	**SD**	**Low *(%)***	**Moderate *(%)***	**High *(%)***	**Interpretation**
Technical navigation	2.38	0.72	18 (29%)	34 (54.8%)	10 (16.1%)	Persistent issues with complex features
Time management	2.45	0.77	16 (25.8%)	36 (58.1%)	10 (16.1%)	Balancing LMS tasks with other commitments remains challenging
Depth of collaboration	2.12	0.68	22 (35.5%)	30 (48.4%)	10 (16.1%)	Peer interaction and feedback quality varied among participants

Reflection integration	2.05	0.71	24 (38.7%)	28 (45.2%)	10 (16.1%)	Some students required additional scaffolding to internalize reflective practices

The post-program data indicate that while the program mitigated many initial challenges, persistent constraints remained, particularly in technical navigation, deep collaboration, and reflective integration. These findings suggest that LMS-supported digital learning transformation requires continuous support, iterative guidance, and structured mentoring, rather than one-time interventions, to ensure that all students can fully benefit from digital platforms.

In synthesis, the results demonstrate that enabling factors such as prior LMS familiarity, intrinsic motivation, and baseline digital literacy facilitated meaningful engagement and adoption of autonomous learning behaviors, while constraining challenges—including low self-regulation, inconsistent access, and limited collaboration readiness—modulated the pace and depth of transformation. The interaction between these factors highlights the complexity of LMS-supported digital learning transformation, underscoring that successful facilitation requires attention to both individual capabilities and systemic supports. The detailed observations, survey data, and mentoring insights collectively illustrate the nuanced dynamics through which LMS utilization fosters or inhibits the development of digital pedagogical awareness, learner autonomy, and reflective learning practices among Islamic undergraduate students.

DISCUSSION

The findings of the present study indicate that LMS utilization can serve as a substantial catalyst for digital learning transformation among Islamic undergraduate students, encompassing the development of digital pedagogical awareness, enhancement of learning autonomy, and adoption of reflective learning practices. These outcomes align with prior research suggesting that effective LMS use can extend beyond administrative convenience to support meaningful learning engagement and self-regulation (Ferdiansyah et al., 2025; Slamet et al., 2025b; Slamet & Basthomi, 2024). However, the present study advances this understanding by demonstrating that such transformation is contingent upon structured facilitation, scaffolding of tasks, and iterative mentoring, addressing gaps in prior studies where LMS adoption was often treated as a technical intervention with minimal attention to learner guidance or institutional support (Ferdiansyah et al., 2025; Ikhwan et al., 2025; Slamet & Mukminatien, 2024). This indicates that while prior research documented improvements in access, engagement, or self-regulated learning in generalized higher education contexts, the process of cultivating transformational engagement through LMS in Islamic higher education requires careful integration of pedagogical design and learner support mechanisms.

The study further reveals that digital learning transformation is inherently multidimensional, encompassing cognitive, behavioral, and metacognitive shifts. Students' growing familiarity with interactive LMS features and reflective practices exemplifies the interplay between technological affordances and learner agency, confirming earlier assertions that digital transformation is not automatic but emerges from active engagement and pedagogically meaningful interactions (Romsi et al., 2024; Slamet & Basthomi, 2024). Compared to prior studies that emphasized individual learner traits as predictors of LMS success (Fajriyah & Afifah, 2025; Hidayati & Slamet, 2025), the present study demonstrates that transformation is co-constructed through guided intervention and responsive mentoring. The implications are significant, suggesting that LMS-mediated learning transformation should be conceptualized as a relational process, where learners, instructors, and digital tools interact dynamically, rather than a static outcome of system availability or digital literacy alone.

An important contribution of the present findings is the identification of enabling and constraining factors that shape LMS-supported transformation. Enabling factors, including foundational digital literacy, motivation, and prior LMS exposure, facilitated the adoption of autonomous learning behaviors and reflective practices, resonating with earlier studies highlighting the role of digital readiness and intrinsic engagement in successful LMS use (Ikhwan et al., 2025; Widodo et al., 2022). At the same time, persistent challenges such as limited collaboration readiness, variable access to resources, and initial hesitancy in navigating complex LMS functions underscore the structural and learner-level barriers noted in prior literature (Dewi & Slamet, 2025; Slamet et al., 2025a, 2025b). The integration of these enabling and constraining factors illustrates the nuanced, context-sensitive nature of digital learning transformation, particularly within Islamic higher education, where cultural norms, pedagogical traditions, and value-based learning orientations intersect with digital adoption processes. This finding extends the discourse beyond conventional accounts of LMS utilization, emphasizing that transformation is neither uniform nor instantaneous but requires deliberate, contextually aware facilitation.

Moreover, the study highlights the importance of reflective practice as a critical component of LMS-facilitated transformation, reinforcing the notion that metacognitive engagement is central to meaningful learning in digital environments (Basthomi et al., 2025; Ikhwan et al., 2025). Prior research often reported that LMS use was limited to transactional functions, such as assignment submission or quiz completion, with minimal reflection or cognitive elaboration (Ferdiansyah et al., 2025). In contrast, the present findings demonstrate that structured reflective prompts, scaffolded tasks, and iterative mentoring can effectively cultivate higher-order cognitive engagement, supporting deeper internalization of knowledge and autonomous learning practices. This underscores a critical gap in the literature: the need for interventions that explicitly integrate reflective and metacognitive dimensions into LMS-mediated learning to achieve sustainable digital learning transformation.

Finally, the findings suggest that institutional readiness and pedagogical alignment are essential to sustaining LMS-supported digital transformation. While previous studies often focused on learner-centered factors, the present study demonstrates that organizational support, structured capacity-building workshops, and continuous mentoring are pivotal in transforming LMS utilization from routine operational tasks into meaningful, transformative learning experiences (Erdiana et al., 2025; Hidayati & Slamet, 2025; Ikhwan et al., 2025). The study therefore contributes to a more holistic understanding of digital learning transformation, highlighting the interplay between learner competencies, pedagogical scaffolding, and institutional infrastructure in realizing effective LMS integration. The implication is that efforts to enhance digital learning must address not only technological provision but also the coordinated development of learner skills, instructional design, and supportive institutional practices to foster sustainable transformation.

In summary, the findings indicate that LMS utilization can facilitate significant digital learning transformation among Islamic undergraduate students when embedded in a pedagogically guided, reflective, and contextually responsive framework. The study both corroborates and extends prior research by illustrating that transformation is multidimensional, contingent on enabling conditions, moderated by constraints, and dependent upon sustained pedagogical and institutional support. This comprehensive perspective advances understanding of LMS-mediated learning by highlighting the complex interplay of learner, tool, and institutional factors in cultivating meaningful, autonomous, and reflective digital learning practices.

CONCLUSION

The present study demonstrates that LMS utilization can significantly facilitate digital learning transformation among Islamic undergraduate students by enhancing digital pedagogical

awareness, fostering learning autonomy, and promoting reflective learning practices, while simultaneously revealing challenges that must be addressed to sustain meaningful engagement. The findings indicate that enabling factors such as prior digital literacy, intrinsic motivation, and guided scaffolding support students in adopting autonomous and interactive LMS practices, whereas constraining factors, including limited collaboration readiness, inconsistent access to digital resources, and initial hesitancy in navigating complex LMS functions, may slow the transformation process. These insights suggest that effective LMS-mediated transformation requires deliberate pedagogical design, structured mentoring, and institutional readiness to create conditions conducive to active engagement and reflective practice. Despite the program's contributions, limitations include the relatively small and context-specific participant group and the short duration of intervention, which may influence generalizability and long-term sustainability. Future initiatives should focus on longitudinal implementation, inclusive digital literacy development, and strategies to strengthen collaborative practices, ensuring that LMS integration evolves from procedural use into fully transformative digital learning experiences within Islamic higher education contexts.

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