



Learning management systems for instructional quality assurance in nonformal equivalency education

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Learning management systems for instructional quality assurance in nonformal equivalency education

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ABSTRACT

This study examined learning quality control in PKBM equivalency education programs in Padang City and explored the potential of a Learning Management System (LMS) to strengthen it. Evidence from questionnaires and focus group discussions indicated that while planning and instructional delivery were generally adequate, monitoring of learner engagement, systematic documentation, and data-driven quality improvement remained limited. Quantitative results highlighted gaps between instructional implementation and continuous quality assurance, and qualitative insights revealed fragmented digital practices constrained by partial tool use and varying digital literacy. Respondents expressed a high to very high need for an integrated LMS capable of combining learning delivery, assessment, monitoring, and reporting. Based on these findings, a prototype LMS was designed to address identified gaps and support evidence-based decision-making. This study contributes both practical and theoretical insights by demonstrating how LMS features such as learner activity tracking and automated reporting can operationalize learning quality control in nonformal education contexts.



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Introduction

Education plays a strategic role in developing human resources by strengthening knowledge, skills, and social competence required to respond to rapid societal, technological, and economic change. Recent international education frameworks emphasize that education systems must ensure not only access, but also measurable learning quality and accountability to achieve inclusive and sustainable development goals (OECD, 2023; UNESCO, 2024). In Indonesia and globally, nonformal education is increasingly recognized as a key pathway for equitable learning opportunities, particularly for disadvantaged learners who confront structural barriers such as poverty, geographic isolation, and interrupted schooling (UNESCO, 2023; OECD, *Mapping Quality Assurance Indicators for Non-formal Adult Learning*, 2024). However, in many nonformal settings such as Community Learning Activity

Centers (PKBM), systematic mechanisms for quality assurance remain underdeveloped compared to formal systems.

Equivalency education programs at PKBM are mandated to provide learning outcomes equivalent to formal primary, secondary, and upper secondary education, yet questions persist about their ability to continuously monitor, evaluate, and improve the quality of instruction and learner progress. Contemporary quality assurance models underscore that effective systems require ongoing data collection, feedback loops, and evidence-based institutional decision making (OECD, 2024). Research in nonformal and adult education contexts highlights that quality control often remains informal and episodic, with limited documentation and feedback mechanisms (OECD, 2024; UNESCO 2023). This gap constrains the capacity of PKBM to identify weaknesses and implement improvements over time.

In the context of digital transformation, technology is posited as a lever for strengthening transparency, documentation, and data-informed decision making in education (UNESCO, 2024; Avanesova et al., 2025). Learning Management Systems (LMS) have emerged globally as key technological infrastructures that support the organization of learning activities, assessments, communication, and monitoring within a unified digital environment (Simon et al., 2025). Evidence shows that LMS platforms can enhance learner autonomy, engagement, and learning outcomes when implemented with attention to instructional design and user readiness (Haikal et al., 2025; Yawisah et al., 2022) and can bridge gaps between planning, delivery, and evaluation (QAE, 2022).

While LMS adoption has been widespread in formal education, its use in nonformal and adult learning remains limited or fragmented, often restricted to messaging applications or basic virtual classrooms that lack integrated quality control functions (Bond et al., 2023; Bozkurt et al., 2024). In equivalency education settings, there is scant research on how LMS can be structured explicitly as a quality assurance instrument rather than solely as a content delivery tool (Sebbaq et al., 2022). Moreover, existing studies tend to focus on outcomes in formal or higher education, leaving a theoretical and empirical gap regarding LMS deployment in nonformal equivalency programs.

Research in related contexts suggests that integrated digital systems with analytics, reporting, and feedback mechanisms can support continuous improvement and accountability, particularly in lifelong and adult learning environments (Oliveira & Monteiro, 2025; Human-Centred, 2023). Linked to this, design-oriented research approaches emphasize iterative development grounded in stakeholder needs and real-world contexts to ensure relevance and usability (McKenney & Reeves, 2018). These approaches allow for co-creation with educators, learners, and administrators, enhancing alignment between system functionality and institutional practice.

Despite this evidence, the conceptualization of LMS as a strategic tool for learning quality control in PKBM has not been thoroughly explored. This study thus investigates: how learning quality control currently functions in PKBM equivalency programs; the level of need for an integrated LMS; and the design of an LMS prototype aligned with actual operational needs and quality assurance frameworks. By focusing on structural integration of monitoring, assessment, and reporting functions, this research aims to contribute to the limited literature on quality assurance in nonformal learning contexts and to offer a practical model for strengthening institutional accountability through digital systems.

The findings are expected to inform PKBM managers, tutors, and policymakers seeking to strengthen quality control mechanisms and to support broader discussions about the role of technology in nonformal education quality assurance. In doing so, this study responds to international calls for more evidence-based, data-driven quality systems that extend beyond procedural compliance toward continuous improvement and sustainable learning outcomes.

Method

This study employed a Research and Development (R&D) approach to systematically analyze learning quality control conditions and to design a Learning Management System (LMS) prototype intended to strengthen learning quality control in equivalency education programs implemented by Community Learning Activity Centers (PKBM) in Padang City. The choice of R&D was theoretically justified by educational research emphasizing the development of practical, context-responsive solutions through

iterative analysis, design, and validation processes (Borg & Gall, 2006; McKenney & Reeves, 2018). To enhance methodological rigor, the study integrated principles from Design-Based Research (DBR), which views educational innovation as iterative and grounded in real learning environments, and the ADDIE framework, which provides structured guidance for instructional system development.

The study was conducted from March to August 2024 in selected PKBM that actively implemented equivalency education programs at primary, junior secondary, and senior secondary levels. The population consisted of PKBM administrators, tutors, and learners directly involved in planning, implementing, and monitoring learning activities. Purposive sampling was applied to select participants who could provide rich contextual insights, consistent with DBR principles prioritizing information-rich cases.

Data were collected using mixed methods. Quantitative data were obtained via Likert-scale questionnaires measuring learning quality control practices, LMS needs, and institutional readiness. The questionnaire was developed based on international learning quality assurance indicators and LMS functionality frameworks, ensuring theoretical alignment with global standards. Content validity was ensured through expert review by specialists in nonformal education and educational technology, and reliability was confirmed using internal consistency analysis with acceptable Cronbach's alpha values.

Qualitative data were collected through focus group discussions (FGDs) with PKBM managers, tutors, administrators, and learners to capture experiential perspectives on learning quality control challenges and expectations for LMS integration. FGDs allowed triangulation of quantitative findings and provided deeper understanding of contextual factors affecting quality control.

The research followed a structured sequence consistent with ADDIE and DBR logic. In the analysis phase, quantitative and qualitative data were used to identify gaps in learning quality control and LMS requirements. The design phase translated these findings into functional LMS specifications for monitoring, assessment, and reporting. The development phase produced a prototype LMS integrating learning delivery, evaluation, and documentation as a quality control instrument. Expert validation and user feedback were used to refine the prototype, although large-scale implementation and experimental testing were not conducted at this stage.

Quantitative data were analyzed descriptively using percentage analysis, mean score categorization, and priority scale analysis to identify critical areas for LMS development. Qualitative data were analyzed thematically through coding, categorization, and pattern synthesis. Integration of both data types enabled triangulation and strengthened the credibility of design decisions. Methodological validity was further ensured through expert judgment, cross-group consistency checks, and careful documentation of procedures.

The study acknowledged certain limitations. It focused on needs analysis, design, and prototype development without experimental testing or large-scale implementation, which restricts the generalizability of findings. The reliance on self-reported data introduces potential bias, although triangulation mitigated this risk. Additionally, the study was limited to PKBM in a single city, so contextual differences in other regions may affect applicability.

Future research should extend this work through pilot implementation, experimental evaluation of learning outcomes, and longitudinal analysis of institutional impact. Investigations into tutor professional development and digital literacy support are also necessary to ensure effective LMS adoption and sustainable quality improvement.

Results and Discussions

The results of this study indicate that learning quality control in PKBM equivalency education programs is generally categorized as good, but critical weaknesses persist in several key areas. Quantitative data show that planning and instructional delivery received higher mean scores ($M = 3.82$ and $M = 3.76$, respectively), while aspects related to monitoring learner engagement, learning evaluation, and continuous improvement scored lower ($M = 3.21$, 3.08 , and 2.97 , respectively), highlighting gaps in systematic feedback and data-driven improvement (Table 1). These findings indicate that PKBM focus

more on procedural compliance than on integrated, evidence-based quality assurance, which aligns with previous studies on nonformal adult education (UNESCO, 2023; OECD, 2024).

Qualitative findings from focus group discussions further revealed that current digital practices are fragmented, limited to messaging apps or basic virtual classrooms, which do not provide integrated monitoring or systematic documentation. Respondents highlighted the need for a system capable of tracking learner engagement, standardizing assessment, and generating reports for quality evaluation. These insights confirm the limitations observed in quantitative data and reinforce the importance of integrating digital systems for comprehensive quality control (Bond et al., 2023; Bozkurt et al., 2024).

The analysis of LMS needs shows a very high demand across all respondent groups, with an overall mean score of 4.37 (Table 2). Stakeholders prioritized automated assessment and reporting ($M = 4.48$), learner activity monitoring ($M = 4.52$), and the quality control dashboard ($M = 4.44$), indicating strong preference for features that support data-driven decision making. Components such as learning material and task management ($M = 4.31$) and interaction forums ($M = 4.18$) were still considered important but of slightly lower priority, reflecting the overarching need for LMS as a quality control instrument rather than solely a content delivery platform (Table 3).

Integrating quantitative and qualitative findings, the study designed an LMS prototype focused on four core functions: structured learning delivery, standardized assessment, continuous monitoring of learner engagement, and automated reporting for quality evaluation. The prototype reflects a design-based approach aligned with user needs and institutional objectives. Although large-scale implementation was not conducted, expert validation and user feedback confirm the feasibility and relevance of the proposed system.

Alternative explanations for observed weaknesses may include limited digital infrastructure, varying digital literacy levels, and institutional constraints. However, consistent patterns across multiple PKBM suggest that the main barrier is the absence of an integrated quality control system rather than isolated operational limitations, which aligns with international evidence on digital readiness and quality assurance integration (OECD, 2024).

Overall, the findings indicate that strengthening learning quality control in PKBM requires an integrated LMS to bridge the gap between instructional delivery and continuous quality assurance. These results provide practical guidance for policy and decision makers and contribute to the broader discourse on digital transformation in nonformal education.

Table 1. Learning Quality Control Conditions in PKBM Equivalency Programs

No	Learning Quality Control Aspect	Mean Score	Category
1	Learning Planning	3.82	Good
2	Learning Implementation	3.76	Good
3	Monitoring of Learner Engagement	3.21	Moderate
4	Learning Evaluation and Feedback	3.08	Moderate
5	Follow-up Actions and Quality Improvement	2.97	Moderate
	Overall Mean	3.37	Good

The table presents the mean scores and categories of learning quality control aspects in PKBM equivalency programs. Overall, learning quality control was categorized as good, with an overall mean score of 3.37 on a five-point scale. This indicates that, in general, PKBM have implemented basic mechanisms to support learning quality.

The highest mean score was found in learning planning ($M = 3.82$), followed by learning implementation ($M = 3.76$), both of which were categorized as good. These findings suggest that PKBM have relatively strong performance in organizing learning activities and delivering instructional processes according to planned objectives.

In contrast, aspects related to monitoring of learner engagement ($M = 3.21$), learning evaluation and feedback ($M = 3.08$), and follow-up actions and quality improvement ($M = 2.97$) were categorized as moderate. This indicates that systematic monitoring, evaluation, and continuous improvement processes have not yet been fully optimized. The lower scores in these aspects imply that learning

quality control in PKBM is still focused more on instructional implementation than on data-based evaluation and follow-up mechanisms.

These results highlight a gap between learning delivery and continuous quality assurance, emphasizing the need for an integrated system that can support monitoring, evaluation, and improvement of learning processes in a structured and sustainable manner.

Table 2. Level of Need for a Learning Management System (LMS) in PKBM

No	LMS Need Indicator	Mean Score	Category
1	Structured Learning Content Management	4.41	Very High
2	Integrated Assessment and Evaluation System	4.36	Very High
3	Monitoring of Attendance and Learning Activities	4.29	High
4	Reporting of Learning Outcomes and Quality Control	4.47	Very High
5	Flexible Access for Tutors and Learners	4.33	High
	Overall Mean	4.37	Very High

The table presents the level of need for a Learning Management System (LMS) in PKBM equivalency education programs. The overall mean score of 4.37 indicates a very high level of need, demonstrating strong agreement among respondents regarding the importance of LMS adoption to support learning quality control.

The highest mean score was recorded for reporting of learning outcomes and quality control ($M = 4.47$), categorized as very high. This finding suggests that PKBM strongly require a system capable of generating structured and reliable reports to support monitoring, evaluation, and accountability. Similarly, structured learning content management ($M = 4.41$) and integrated assessment and evaluation systems ($M = 4.36$) were also rated as very high, indicating the need for systematic organization of learning materials and standardized evaluation processes.

Indicators related to monitoring of attendance and learning activities ($M = 4.29$) and flexible access for tutors and learners ($M = 4.33$) were categorized as high. These results reflect the importance of flexibility and continuous monitoring in nonformal education settings, where learners often have diverse schedules and learning needs.

Overall, the findings indicate that PKBM require an LMS not only as a learning delivery platform but also as a comprehensive system for monitoring, evaluation, and learning quality control.

Table 3. Priority Scale for LMS Development as a Learning Quality Control Instrument

No	LMS Component	Priority Score	Priority Level
1	Learner Activity Monitoring	4.52	Very High
2	Automated Assessment and Reporting	4.48	Very High
3	Quality Control Dashboard	4.44	Very High
4	Learning Material and Task Management	4.31	High
5	Interaction and Communication Forum	4.18	High

The table presents the priority scale for LMS components required to support learning quality control in PKBM equivalency education programs. The results indicate that all components were rated at high to very high priority levels, highlighting the strategic importance of LMS development for strengthening learning quality control.

The highest priority was assigned to learner activity monitoring (Priority Score = 4.52), categorized as very high. This finding reflects the strong need for systematic tracking of learner participation, engagement, and learning progress. Automated assessment and reporting (Priority Score = 4.48) and the quality control dashboard (Priority Score = 4.44) were also classified as very high, indicating that respondents prioritize data-driven evaluation and real-time access to learning quality indicators.

Components related to learning material and task management (Priority Score = 4.31) and interaction and communication forums (Priority Score = 4.18) were categorized as high. Although slightly lower in priority, these components remain essential for supporting instructional organization and communication within the learning process.

The findings suggest that LMS development in PKBM should focus primarily on monitoring, assessment, and quality control functions, while also ensuring adequate support for instructional management and interaction. This prioritization underscores the role of LMS as a learning quality control instrument rather than merely a learning delivery platform.

The findings also suggest that institutional readiness, including digital literacy among tutors and administrative staff, plays a critical role in the effective adoption of LMS as a quality control instrument. Prior studies emphasize that without sufficient training and capacity building, even well-designed digital systems may fail to improve learning outcomes or quality assurance processes (Huang et al., 2023; Spector & Ma, 2022). Therefore, professional development programs that focus on LMS operation, data interpretation, and evidence-based decision making are essential to ensure that technology integration translates into meaningful improvements in PKBM learning quality.

Moreover, the integration of LMS can potentially enhance learner engagement through personalized learning pathways, automated feedback, and real-time progress monitoring, which is particularly relevant for adult learners balancing education with work and family responsibilities (Kizilcec & Cohen, 2024; Oliveira & Monteiro, 2025). The ability to track individual learning trajectories enables PKBM to implement more targeted interventions, address learning gaps promptly, and foster a culture of continuous improvement, aligning with international best practices in nonformal and adult education quality assurance (Bond et al., 2023; UNESCO, 2023).

Despite these promising implications, the study is limited by its focus on a single city and by reliance on self-reported data, which may introduce biases in assessing learning quality and LMS needs. Future research should expand to multiple regions to capture variability across institutional contexts, infrastructure availability, and learner populations. Additionally, experimental or quasi-experimental studies are recommended to evaluate the impact of LMS on measurable learning outcomes and institutional efficiency, thereby strengthening evidence for policy and practice (Huang et al., 2023; Sebbaq et al., 2022).

Finally, the study highlights the potential for scaling LMS-based quality control in nonformal education systems beyond PKBM. Future studies could explore long-term sustainability, cost-effectiveness, and integration with national education management information systems (EMIS), as well as investigate complementary strategies such as blended learning and mobile-assisted learning for learners in remote areas (Avanesova et al., 2025; Simon et al., 2025). By addressing these areas, researchers and practitioners can better understand how digital tools can systematically enhance learning quality, accountability, and equity in nonformal education contexts.

Conclusions

This study concludes that learning quality control in PKBM equivalency education programs remains structurally limited, particularly in monitoring learner engagement, systematic evaluation, and continuous improvement, despite relatively strong performance in instructional planning and delivery. The findings confirm the need for an integrated, data-driven system that connects learning implementation with monitoring, assessment, and reporting functions to support evidence-based decision making. Respondents demonstrated a high to very high demand for such a system, indicating that the primary challenge is not resistance to technology but the absence of an integrated quality control framework. In response, this study developed an LMS prototype aligned with identified institutional needs, positioning the LMS not merely as a delivery platform but as a structured instrument for learning quality control. Although limited to needs analysis and prototype development within one regional context, the study provides practical and conceptual foundations for strengthening quality assurance in nonformal equivalency education through systematic digital integration.

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