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Development and Preliminary Evaluation of a Laravel-Based Digital UKBM Management System at MTsN 1 Bukittinggi

Afilla Dwi syahdini[1,*]

[1]*Universitas Islam Negeri Sjech M. Djamil Djambek Bukittinggi, Bukittinggi,* Indonesia

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Correspondence

E-mail: afilladwis@gmail.com

A B S T R A C T

The management of Independent Learning Activity Units (UKBM) at MTsN 1 Bukittinggi is still carried out manually using printed documents, resulting in the distribution of UKBM, assignment submission, assessment, document storage, and student progress monitoring not being integrated into a single system. This study aims to develop a web-based UKBM digitalization system for the Merdeka Curriculum using the Laravel Framework to support integrated UKBM management. The study employed a Research and Development (R&D) method using the Waterfall development model, consisting of Communication, Planning, Modeling, Construction, and Deployment. Data were collected through observation, interviews, documentation, and questionnaires. The developed system provides features for user data management, UKBM development, learning materials, learning activities and evaluations, assessment, and student progress monitoring. The evaluation results showed a validity score of 0.87 or 87%, categorized as valid; a reported practicality index of 0.91123, pending verification against Table 4; and a reported student G-Score of 0.897, pending verification against Table 5. These results indicate that the developed system meets the validity, practicality, and effectiveness criteria based on the instruments and evaluation criteria used in the study. The system can serve as a digital support platform for UKBM management and integrate learning management, evaluation, assessment, and student progress monitoring within a single platform.

Abstrak

Pengelolaan Unit Kegiatan Belajar Mandiri (UKBM) di MTsN 1 Bukittinggi masih dilakukan secara manual menggunakan dokumen cetak, sehingga distribusi UKBM, pengumpulan tugas, penilaian, penyimpanan dokumen, dan pemantauan perkembangan belajar siswa belum terintegrasi dalam satu sistem. Penelitian ini bertujuan mengembangkan sistem digitalisasi UKBM Kurikulum Merdeka berbasis web menggunakan Framework Laravel untuk mendukung pengelolaan UKBM secara terintegrasi. Penelitian menggunakan metode Research and Development (R&D) dengan model pengembangan Waterfall yang meliputi Communication, Planning, Modeling, Construction, dan Deployment. Data dikumpulkan melalui observasi, wawancara, dokumentasi, dan angket. Sistem dikembangkan dengan fitur pengelolaan data pengguna, penyusunan UKBM, materi pembelajaran, aktivitas dan evaluasi, penilaian, serta monitoring perkembangan siswa. Hasil pengujian menunjukkan nilai validitas sebesar 0,87 atau 87% dengan kategori valid, nilai praktikalitas yang dilaporkan sebesar 0,91123 (menunggu verifikasi terhadap data pada Tabel 4) dan nilai efektivitas yang dilaporkan sebesar 0,897 (menunggu verifikasi terhadap data pada Tabel 5) ; kedua nilai terakhir memerlukan rekonsiliasi terhadap nilai individu yang disajikan. Sistem dapat digunakan sebagai media pendukung pengelolaan UKBM secara digital serta membantu mengintegrasikan pengelolaan pembelajaran, evaluasi, penilaian, dan monitoring perkembangan siswa dalam satu platform.

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1. Introduction

Digital platforms can bring learning documents, assignment submissions, and assessment records into a single environment. However, integrating these functions does not, in itself, demonstrate improved learning outcomes. At the school under study, the central issue was how to accommodate a

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previously paper-based Independent Learning Activity Unit (UKBM) workflow in a school-specific system, rather than merely reproducing general learning management system (LMS) functions [1].

UKBM consists of learning activities organized in stages and completed by students in a prescribed sequence. Its digital implementation must accommodate learning materials, assignment submissions, teacher feedback, and records of learning progress. The availability of software alone cannot be treated as evidence of increased learner autonomy [2].

Developing a digital education management system can help schools maintain traceable records. Nevertheless, general trends in educational digital transformation cannot establish the effectiveness of a particular product. This study therefore focuses on designing a UKBM management system and conducting a preliminary assessment of its product characteristics, rather than evaluating the implementation of the Merdeka Curriculum as a whole [3].

Previous research on learning management systems (LMSs) has examined the management of materials, assignments, and assessments in digital environments [4]. Although general-purpose LMSs can provide these functions, the UKBM workflow in this setting requires staged unit development, role-based publication, assessment records, and individual completion monitoring. These distinctions must be demonstrated through workflow coverage and evidence from user evaluations, not merely through the choice of development framework.

Independent learning involves learners setting goals, managing activities, and monitoring their progress; these competencies cannot be inferred simply from the provision of online materials [5]. The UKBM system provides access to staged learning units and completion information, but this study did not specifically measure self-directed learning competencies.

Within the Merdeka Curriculum, a school-specific UKBM system could support access to learning activity units and the management of learning records. Its practical value must be assessed in relation to the activities it supports, the quality of usage evidence, and testing conditions. Accordingly, conclusions from a development study conducted at a single school must remain within the scope of the product evaluation actually undertaken.

Observations and interviews at MTsN 1 Bukittinggi indicated that UKBM management still relied on printed documents. Teachers distributed UKBM materials directly to students, collected completed work, checked submissions manually, and recorded marks in their teaching administration records. These procedures were time-consuming, particularly given the large student population. Teachers also had to prepare subsequent UKBM units for students who completed the preceding activities sooner, further increasing their administrative workload.

Another observed concern was that students tended to prioritize completing UKBM documents over developing a deeper understanding of the learning material. Paper-based management also increased the risk of lost documents and delays in material distribution, while making it difficult for teachers to monitor individual learning progress. With 991 students, conventional learning administration was insufficiently efficient to support the school's implementation of the Merdeka Curriculum.

Earlier studies have addressed digital educational records, general LMSs, and UKBM materials for particular subjects [6], [7]. The literature cited in this manuscript has not sufficiently explained how the complete UKBM workflow can be represented through user roles, learning-unit components, assessment records, and completion status within a single school-specific application. This gap is contextual and implementation-oriented; it does not demonstrate that comparable products have never been developed.

This study contributes a system design integrating UKBM preparation and publication, student activities, assessment records, and learning-progress displays for administrators, teachers, and

students. The application was implemented in Laravel using the Model–View–Controller (MVC) architecture. Its distinguishing contribution lies in the mapping of UKBM requirements and preliminary product evaluation, not in claiming that Laravel or MVC is a novel technology.

In response to these problems, this study aimed to develop a web-based UKBM management system at MTsN 1 Bukittinggi, describe its role-based functions, and report preliminary evaluations by experts, teachers, and students. It was not designed to demonstrate long-term learning effects or a causal relationship between system use and academic achievement.

2. Methodology

2.1. Research Design

This study employed a research and development (R&D) approach to produce a web-based system for digitizing Independent Learning Activity Units (UKBM) using the Laravel framework. R&D was selected because the investigation aimed not only to examine a phenomenon but also to develop a product addressing problems identified in the field [8]. The resulting product was intended to support more effective UKBM management, facilitate teachers' learning administration, and assist the use of information technology in implementing the Merdeka Curriculum.

The system was developed using the Waterfall model, which comprises five phases: Communication, Planning, Modeling, Construction, and Deployment. This model was selected for its systematic, structured, and sequential phases, which suited the requirements identified at the outset of the development process [9].

2.2. Research Setting and Participants

The study was conducted at MTsN 1 Bukittinggi. The site was selected on the basis of preliminary observations showing that UKBM activities were still managed using printed documents. Material distribution, assignment collection, assessment, and student-progress monitoring had not been integrated into a digital system. These conditions provided the basis for developing a web application that could bring UKBM management activities together on one platform.

Participants included teachers and students at MTsN 1 Bukittinggi. Teachers contributed to the needs analysis and product practicality assessment, while students participated as users in the effectiveness assessment. The study also involved three expert validators who assessed product validity: Efmi Maiyana, S.Kom., M.Kom.; Ahmad Zaki, M.Kom.; and Dr. Supratman Zakir. Each expert evaluated 17 validation items. Their reported scores were 0.97, 0.89, and 0.76, respectively, with a reported overall mean of 0.87, which was categorized as valid.

The practicality assessment involved 10 teachers. They were selected because they directly managed UKBM and classroom learning and could assess the system's ease of use, applicability, and alignment with instructional needs. The effectiveness assessment involved nine students as system users and sought to obtain data on the product after its use in learning activities.

2.3. Sampling Technique

Participants were selected through purposive sampling. Teachers were included because of their involvement in teaching and UKBM management at MTsN 1 Bukittinggi, enabling them to assess the system through direct use. Students were selected according to their characteristics as intended users and their involvement in UKBM activities. Nine students participated in the effectiveness assessment to ensure that the evaluation included learners who had directly used the system.

2.4. System Development Procedure

System development followed the Waterfall model, consisting of Communication, Planning, Modeling, Construction, and Deployment, as illustrated in Figure 1 [10].

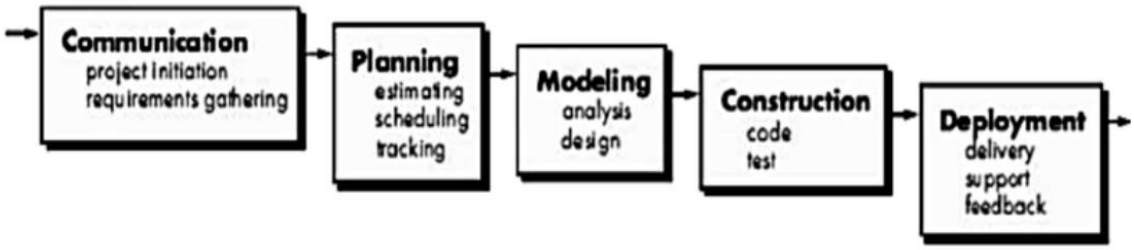


Figure 1. Waterfall Stages**1**

2.4.1. Communication

During the Communication phase, the researchers engaged with MTsN 1 Bukittinggi to identify existing UKBM management practices and system requirements. Requirements were gathered through observation, interviews, and document analysis. Observation captured UKBM implementation in practice; interviews with teachers explored management processes and challenges; and documents provided UKBM materials and supporting data. The findings indicated that UKBM distribution, assignment submission, grading, and student-progress monitoring remained manual processes.

2.4.2. Planning

The Planning phase addressed development requirements, time estimates, scheduling, and progress monitoring. The development tools included the Laravel framework, PHP, a MySQL database, and XAMPP as the development environment. Three user roles were defined: administrator, teacher, and student. Activities were scheduled in line with the development sequence, and progress tracking was used to monitor whether each activity followed the planned timetable.

2.4.3. Modeling

The Modeling phase covered analysis and design. System requirements gathered during Communication were analyzed and translated into system specifications. Modeling used Unified Modeling Language (UML) diagrams, including use case, activity, sequence, and class diagrams. Database structures, entity relationships, application architecture, and user interfaces were also designed to meet the needs of administrators, teachers, and students.

2.4.4. Construction

The Construction phase comprised coding and testing. The design was implemented as a web application using Laravel, PHP, and MySQL. The system was developed to manage users, classes, subjects, academic years, teaching assignments, UKBM units and components, materials, assignments, assessments, student-progress monitoring, and learning reports. Functional testing was conducted to check whether system functions met the identified requirements. Product quality was also assessed in terms of validity, practicality, and effectiveness.

2.4.5. Deployment

Deployment comprised delivery, support, and feedback. The completed and tested system was made available to users at MTsN 1 Bukittinggi. Delivery provided system access appropriate to each role: administrator, teacher, and student. Support included assistance with system use and troubleshooting during implementation. User feedback was collected to inform evaluation and product improvement.

2.5. Research Instruments

The research instruments consisted of observation and interview guides, documentation, validation instruments, practicality instruments, and effectiveness instruments. Three expert validators

assessed product feasibility using 17 validation items. Ten teachers completed a practicality instrument addressing ease of use and applicability. Nine students completed an effectiveness instrument following system use. Observation and interview instruments were used during needs analysis, while documents provided supporting information on UKBM and learning processes at MTsN 1 Bukittinggi.

2.6. Data Collection Procedures

Data were collected through observation, interviews, document analysis, and questionnaires. Observations examined UKBM management at MTsN 1 Bukittinggi. Teachers were interviewed about existing practices, challenges, and system requirements. Relevant UKBM materials and supporting documents were collected during development. Once the product was completed, validation questionnaires were administered to three expert validators, followed by practicality questionnaires for 10 teachers who had used the system. Effectiveness was assessed among nine students using instruments administered before and after system use.

2.7. Data Analysis

Validity was analyzed using Aiken's V based on 17 items rated by three validators. The manuscript reports an aggregate index of 0.87, but item-level ratings and calculation details are needed to confirm it. The practicality assessment involved 10 teachers. Table 2 identifies Moment Kappa as the analytical method, whereas an earlier description also refers to the percentage of the maximum achievable score. As these procedures are not equivalent, the formula and scoring basis must be confirmed. Nine students completed initial and final measurements. The reported G-Score requires verification against source scores, maximum possible scores, and calculation sheets. Accordingly, aggregate values are treated as author-reported findings that have not been independently revalidated. Functional testing is mentioned, but module-level test results are not presented.

2.8. Validity and Reliability

Three expert validators assessed the product using 17 instrument items. The reported individual indices were 0.97, 0.89, and 0.76, with an aggregate value of 0.87. These values have been retained as reported in the source manuscript and require verification against item-level ratings and the Aiken's V formula. Although the manuscript refers to reliability, no reliability coefficient, estimation method, or supporting calculation sheet is provided; therefore, instrument consistency cannot be considered established.

2.9. Ethical Considerations

The study took account of the protection of school, teacher, and student data. Data collection was conducted after permission had been obtained from MTsN 1 Bukittinggi. Information gathered through observations, interviews, documents, and questionnaires was used solely for research and system development. Students' personal information and individual academic records were not publicly disclosed in the publication. Data were presented in aggregate form where needed for analysis. System access was restricted according to the roles of administrators, teachers, and students. School and user data were not used for purposes beyond the research without authorization from the relevant parties.

3. Results and Discussion

3.1. Results

3.1.1. Needs Analysis

The needs analysis drew on observations and interviews at MTsN 1 Bukittinggi to identify existing UKBM management practices, user challenges, and system requirements. It showed that UKBM continued to be administered through printed documents. Students submitted work on paper, requiring teachers to collect, sort, check, and store physical documents, which increased the time required for administration. Interviews also suggested that teachers spent considerable time checking

assignments and compiling learning records. They had to prepare subsequent UKBM units for students who finished earlier so learning could proceed at an appropriate pace. Paper-based administration also exposed documents to loss, damage, and inconsistencies.

On the basis of these findings, system requirements were organized around three user roles: administrator, teacher, and student. Administrators needed facilities to manage teacher and student records, classes, subjects, academic years, and teaching assignments. Teachers needed tools to create and administer UKBM units and components, manage materials, activities, assessments, and grades, and monitor student progress. Students needed access to published UKBM units, learning materials, activities and assessments, assignment-upload functions where relevant, and learning results. These requirements informed the system functions, data structure, user interfaces, and outputs.

3.1.2. System Design and Implementation

The system was designed using Unified Modeling Language (UML), including use case, activity, sequence, and class diagrams. Design work also covered the database structure and user interfaces. The application was subsequently implemented using Laravel and MySQL. During Construction, the design was translated into program code, the database was created, features were integrated, and modules were functionally tested against the requirements. Three access roles were implemented. Administrators manage master data; teachers administer UKBM units, learning components, materials, assessments, grades, and monitoring; and students access UKBM units, study materials, complete activities and assessments, and view learning results. The implementation produced Home, Login, Administrator Dashboard, Teacher Dashboard, Student Dashboard, Teacher Data, Student Data, Subject Data, Class Data, Academic Year Data, Teaching Assignment Data, UKBM Data, UKBM Builder, UKBM Learning Page, and Progress Monitoring pages.

Within the UKBM Builder, teachers can organize UKBM components in a structured manner. Students can then access published units, read materials, view learning media, complete activities, answer assessment questions, and monitor their completion progress. A monitoring page enables teachers to view unit-completion status, completed activities, and student assessment results.

Table 1. System Outputs

No.	System Output	Kode	Description
1	Dashboard Admin	OP-01	Displays teacher, student, class, subject, academic-year, and UKBM data.
2	Dashboard Guru	OP-02	Displays UKBM, student, assessment-result, and learning-activity information.
3	Dashboard Siswa	OP-03	Displays available UKBM units, learning status, and completion progress.
4	Halaman Belajar UKBM	OP-04	Displays UKBM materials, activities, learning media, and assessments.
5	Hasil Evaluasi	OP-05	Displays assessment results and student grades.
6	Laporan Nilai UKBM	OP-06	Displays a summary of student grades for each UKBM unit.
7	Monitoring Progress Siswa	OP-07	Displays each student's UKBM completion progress.

3.1.3. Product Evaluation

Product evaluation was conducted to assess the validity, practicality, and effectiveness of the developed system. The instruments were administered to expert validators, teachers serving as practicality assessors, and students participating in the effectiveness assessment.

Table 2. Product Evaluation Indicators

Evaluation Aspect	Respondents	Evaluation Indicators	Number of Items	Rating Scale	Analysis Method	Category
Validity	3 expert validators	Feasibility of the developed product	17 item	1–5 scale	Aiken's V	Valid
Practicality	10 teachers	Ease of use, interface clarity, user instructions, and system efficiency	18 item	1–5 scale	Moment Kappa	Highly Practical
Effectiveness	9 students	Changes in initial and final scores after system use	10 item	Initial–final scores	G-Score	Highly Effective

3.1.3.1. Validity Assessment

Three experts assessed the product using a 17-item instrument with a five-point scale. Table 3 presents values of 0.97, 0.89, and 0.76, with a reported aggregate of 0.87. The study classified the product as valid according to its stated threshold. Verification of these indices requires item-level scores and the inputs used in the calculations.

Table 3. Validity Assessment Results

Validator	Aiken's V	Category
Validator 1	0,97	Valid
Validator 2	0,89	Valid
Validator 3	0,76	Valid
Mean	0,87 (87%)	Valid

These ratings provide preliminary expert assessment evidence for the product. The basis for the 0.60 threshold and the procedure used to obtain the aggregate index of 0.87 must be checked against the original assessment protocol.

3.1.3.2. Practicality Assessment

Ten teachers evaluated the system using an 18-item practicality instrument. Table 4 presents 10 coefficients ranging from 0.611 to 1.000. The reported aggregate is 0.91123, whereas the arithmetic mean of the 10 tabulated values is approximately 0.9012. The difference between the reported aggregate, the tabulated values, and the procedure described as Moment Kappa must be reconciled with the original calculation records before the result is presented as final.

Table 4. Practicality Assessment Results

No.	Practicality Assessor	Moment Kappa	Category
1	Hidayati Azani	0,611	High
2	Mardiati, S.Pd.	0,869	Highly Practical
3	Khairatni, S.Pd.	0,884	Highly Practical
4	Elfiyanti, S.Pd.	0,940	Highly Practical
5	Widia Liza, S.Ag.	0,927	Highly Practical
6	Dina Soraya, S.Pd.	0,899	Highly Practical
7	Emeliazola	0,953	Highly Practical
8	Fitria Hayati, S.Pd.	0,989	Highly Practical
9	Lendri Yeni	0,940	Highly Practical
10	Indra Marianti, S.Pd.	1,000	Highly Practical
Mean		0,91123 (91%)	Highly Practical

Teacher ratings suggest a positive initial perception of the application. However, the interpretation of its practicality level requires confirmation of the aggregation procedure and the appropriateness of the coefficient used.

3.1.3.3. Effectiveness Assessment

Nine students completed measurements with initial (Si) and final (Sf) scores. Table 5 presents normalized-gain-type coefficients for participants S1–S9. The original item-level scores and the

denominator based on the maximum possible score must be checked to make the calculation procedure traceable.

Table 5. Effectiveness Assessment Results

No.	Respondents	Si	Sf	G-Score	Category
1	S1	5	25	1,000	Highly Effective
2	S2	5	25	1,000	Highly Effective
3	S3	6	20	0,736	Highly Effective
4	S4	6	25	1,000	Highly Effective
5	S5	5	23	0,900	Highly Effective
6	S6	10	21	0,733	Highly Effective
7	S7	10	21	0,733	Highly Effective
8	S8	5	25	1,000	Highly Effective
9	S9	7	23	0,888	Highly Effective
Mean				0,897 (89,76%)	Highly Effective

The manuscript reports an aggregate G-Score of 0.897 (89.76%). However, the simple mean of the nine coefficients in Table 5 is approximately 0.8878. The difference may arise from a different aggregation method, but evidence of such a procedure has not been provided. The reported effectiveness value therefore cannot yet be considered verified from the accompanying documentation.

Overall, the study documents the UKBM management application, expert assessments, teacher responses, and students' initial and final scores. The aggregate practicality and G-Score indices need to be checked against the primary data. Neither index should be treated as independently verified evidence of educational impact.

3.2. Discussion

3.2.1. Interpretation of Key Findings

The main contribution of this study is a madrasah-specific UKBM management workflow linking unit preparation and publication, student activities, assessment records, and progress monitoring. This scope goes beyond digital document storage, although the available evidence remains descriptive and limited to a preliminary product evaluation. Research on LMS adoption indicates that system availability does not automatically ensure meaningful acceptance or use; adoption, instructional integration, and usefulness require distinct forms of evidence [11], [12]. Reviews of learning analytics similarly emphasize that visualizing learning progress is not equivalent to improving learning outcomes or self-regulation [13], [14]. Although the system displays completion status, this study did not test whether that information changed students' learning behavior.

Role-based access allows administrators to manage master data, teachers to develop UKBM units and record assessments, and students to access assigned activities. These functions address the local problems identified in the needs analysis. Nevertheless, favorable teacher responses should be interpreted as preliminary perceptions of practicality, rather than direct measures of administrative time savings. Reviews of self-regulated learning interventions highlight the need to account for learning processes and instructional conditions before linking a digital feature to educational outcomes [15], [16], [17].

3.2.2. Comparison with Previous Studies

A directly relevant development study is the Laravel-based LMS described by Mardiana et al. [12]. Both projects use a web framework to manage learning. The present application differs by representing UKBM units, assessment records, and completion status, although no comparative test against alternative LMS platforms was conducted. Studies of LMS acceptance emphasize user and institutional factors [18], while research on dashboards in primary and secondary education suggests that progress information must be linked to teachers' instructional decisions rather than being treated as an educational outcome in itself [19], [20].

Studies of learning data for teachers emphasize interpretable measures, relevant decision support, and evaluation of how information is used [21], [22]. The UKBM application makes assessment records and completion status available to teachers; whether they use these data to adapt instruction remains an empirical question. Methodologically, content-validity indices must be interpreted in accordance with the assumptions of Aiken's rating-scale approach [23], while student self-regulation requires dedicated measurement instruments and cannot be inferred from application features alone [24], [25].

Research on LMS acceptance and online assessment demonstrates that user experience, pedagogical use, and learning outcomes are separate dimensions [26], [27], [28]. Digital activity traces can also offer insights into learning processes when analyzed systematically and interpreted appropriately [29], [30]. Accordingly, this study's contribution is limited to integrating UKBM workflows at one school; it does not establish architectural novelty or demonstrate improvements in independent learning. The available findings support a preliminary feasibility assessment once inconsistencies in the evaluation results have been resolved.

3.2.3. Practical Implications

In practical terms, the application provides a single environment for preparing UKBM units, enabling student access, recording assignments, and displaying learning progress. These functions could reduce the fragmentation of paper-based administration, but neither reductions in working time nor paper consumption were measured. Design-based research points to the importance of user participation, usability evidence, and classroom context when implementing dashboards and digital platforms [22], [31]. Before deployment across additional subjects, the school should examine access permissions and the reliability of assessment records.

3.2.4. Limitations

This single-madrasah development study was limited by its small evaluation samples of three expert validators, 10 teachers, and nine students, as well as insufficient documentation of item-level scores. The mean practicality coefficients and G-Scores in the tables differ from the reported aggregate values, so the rating sheets, formulas, category thresholds, and denominator definitions require verification. Instrument reliability coefficients were not reported. The study did not assess sustained use, savings in teachers' time, the development of independent learning, or effectiveness across subjects. These limitations preclude causal conclusions or broad generalization.

3.2.5. Future Research

Future research should verify the scoring data, provide item-level calculation materials insofar as ethical requirements permit, and test UKBM workflows across a wider range of classes and subjects. Longitudinal assessments could measure teachers' administrative time, patterns of assignment completion, accessibility, and the use of progress information to provide feedback. Evaluation designs should distinguish product quality, technology acceptance, and learning outcomes [18], [27], [32].

A future comparison of printed and digital UKBM could examine differences in submission timeliness, assessment traceability, and instructional decisions. Such outcomes should be measured directly rather than inferred from the existence of an application interface or initial questionnaire responses.

The present study contributes the design and implementation of a Laravel-based UKBM system tailored to one madrasah. Although a preliminary product evaluation was conducted, its calculations still require verification. The system supports UKBM administration and learning activities, but it has not demonstrated improvements in learning outcomes, student self-regulation, or teacher productivity.

4. Conclusion

This study developed a Laravel-based UKBM management system for MTsN 1 Bukittinggi, with role-based functions for unit preparation, learning activities, assessment records, and progress monitoring. The system addresses the organizational needs identified through the school's needs analysis. The preliminary evaluation involved three expert validators, 10 teachers, and nine students. The manuscript reports a content-validity index of 0.87, an aggregate practicality index of 0.91123, and an aggregate student G-Score of 0.897. However, the latter two aggregate values differ from the arithmetic means of the figures presented in Tables 4 and 5 and must be checked against the original data before they are treated as final evidence. The study does not establish a causal improvement in learning outcomes or student autonomy, and its findings cannot be generalized beyond the testing context. Future work should clarify the basis of the calculations and evaluate sustained system use.

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Declarations

Author Contribution Statement

Afilla Swi Syahdini contributed to the study's conceptualization and design, data collection and analysis, system development, and preparation of the original manuscript.

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Data Availability Statement

The study data and school records are not publicly available because they contain confidential student and institutional information. Requests for appropriately de-identified supporting materials may be directed to the corresponding author, subject to school authorization and applicable privacy requirements. Complete instrument records needed to verify every reported index were not included in the submitted manuscript.

Declaration of Interests Statement

The authors declared no relevant financial or nonfinancial conflicts of interest.

AI Use Statement

GPT-6 (OpenAI) assisted with post-review editing and restructuring of the manuscript, literature searching and synthesis, and language refinement. This assistance was not used to generate field data or statistical results. The authors remain responsible for verifying sources, numerical results, and scientific statements and for approving the version submitted to the journal.

Additional Information

Requests for supporting research materials and correspondence may be directed to Afilla Dwi Syahdini through the journal's designated correspondence channel.

ORCID

[Afilla Dwi Syahdini], https://orcid.org/0009-0009-7355-1245

References

[1] N. Westari and R. B. Sumarsono, "Tantangan dan Peluang Transformasi Manajemen Pendidikan di Era Digital (Tinjauan Literatur Sistematis)," *Proc. Ser. Educ. Stud. Semin.*, 2023.

[2] A. Akhmadi, "Penelitian kesiapan pembelajaran berbasis ukbm madrasah ibtidaiyah," *Andragogi J. Diklat Tek. Pendidik. dan Keagamaan*, vol. 8, no. 1, pp. 406–417, 2020.

[3] S. Sukma, P. Hakim, S. Bibliometric, S. Sukma, P. Hakim, and S. Awal, "Bibliometric Analysis of Curriculum Publications Indexed in Scopus : Trends and Future Research Directions To cite this article : Bibliometric Analysis of Curriculum Publications Indexed in Scopus : Trends and Future Research Directions," 2025.

[4] M. N. Rahmadani, T. A. Sandy, N. Khoirun, W. Lauhatur, and S. N. Sari, "Assessing learning effectiveness through Learning Management Systems : Trends from the last five years," vol. 12, no. 1, pp. 57–68, 2024.

[5] M. Y. Wijayakusuma, D. Y. Lutfiansyach, and J. Rahmat, "INSANIA : Jurnal Pemikiran Alternatif

Kependidikan Self-Directed L earning in Indonesian A dult E ducation : A S ystematic R eview for P romoting I nclusive Q uality E ducation A . Introduction," vol. 30, no. 1, pp. 66–93, 2025, doi: 10.24090/insania.v30i1.14006.

[6] F. H. S. Dea Lestari, Suendri, "Pengembangan Sistem Informasi Akademik pada SMP Negeri 3 Tanah Putih Menggunakan Framework Laravel," *J. Sist. Inf. Bisnis (JUNSIBI)*, vol. 6, no. 1, pp. 33–42, 2025.

[7] L. Bara, K. N. Wea, R. Ririnsia, H. Hau, S. P. Fisika, and F. Keguruan, "Pengembangan UKBM Fisika Berbasis Discovery Learning pada Materi Gerak Lurus Kelas X MIA," *J. Pendidik. Tambusai*, vol. 7, no. 2, pp. 16988–16994, 2023.

[8] Sugiyono, *Metode Penelitian Kuantitatif, Kualitatif dan R & D*. Bandung: Alfabeta, 2013.

[9] R.S. Pressman, *Rekayasa Perangkat Lunak (Pendekatan Praktisi)*. Yogyakarta: Andi, 2012.

[10] Permadi Setiawan Sulistiowati Julianto, "Rancang Bangun Aplikasi Pengolahan Data Evaluasi Proses Belajar Mengajar Berbasis Web," vol. 4, no. 2, pp. 1–6, 2015.

[11] M. Y. Doo and M. Zhu, "A meta-analysis of effects of self-directed learning in online learning environments," Journal of Computer Assisted Learning, vol. 40, no. 1, pp. 1–20, 2024. https://doi.org/10.1111/jcal.12865

[12] I. Mardiana, Wahyudin, and E. Junaeti, "Pengembangan Learning Management System dengan Framework Laravel dan Tailwind CSS," MULTINETICS, vol. 10, no. 1, 2024. https://doi.org/10.32722/multinetics.v10i1.6678

[13] L. Paulsen and E. Lindsay, "Learning analytics dashboards are increasingly becoming about learning and not just analytics—A systematic review," Education and Information Technologies, vol. 29, pp. 14279–14308, 2024. https://doi.org/10.1007/s10639-023-12401-4

[14] R. Kaliisa, I. Jivet, and P. Prinsloo, "A checklist to guide the planning, designing, implementation, and evaluation of learning analytics dashboards," International Journal of Educational Technology in Higher Education, vol. 20, art. 28, 2023. https://doi.org/10.1186/s41239-023-00394-6

[15] S. Heikkinen, M. Saqr, J. Malmberg, et al., "Supporting self-regulated learning with learning analytics interventions—A systematic literature review," Education and Information Technologies, vol. 28, pp. 3059–3088, 2023. https://doi.org/10.1007/s10639-022-11281-4

[16] D. Prasse, M. Webb, M. Deschênes, et al., "Challenges in promoting self-regulated learning in technology supported learning environments: An umbrella review of systematic reviews and meta-analyses," Technology, Knowledge and Learning, vol. 29, pp. 1809–1830, 2024. https://doi.org/10.1007/s10758-024-09772-z

[17] A. Boulahmel, F. Djelil, and G. Smits, "Investigating self-regulated learning measurement based on trace data: A systematic literature review," Technology, Knowledge and Learning, vol. 30, pp. 119–156, 2025. https://doi.org/10.1007/s10758-025-09816-y

[18] J. Mella-Norambuena, A. Chiappe, and M. G. Badilla-Quintana, "Theoretical and empirical models underlying the teaching use of LMS platforms in higher education: A systematic review," Journal of Computing in Higher Education, vol. 12, pp. 997–1023, 2025. https://doi.org/10.1007/s40692-024-00336-9

[19] I. Possaghi, B. Vesin, F. Zhang, et al., "Integrating multi-modal learning analytics dashboard in K-12 education: Insights for enhancing orchestration and teacher decision-making," Smart Learning Environments, vol. 12, art. 53, 2025. https://doi.org/10.1186/s40561-025-00410-4

[20] Y. Liu, X. Hu, J. T. D. Ng, et al., "Ready or not? Investigating in-service teachers' integration of learning analytics dashboard for assessing students' collaborative problem solving in K–12 classrooms," Education and Information Technologies, vol. 30, pp. 1745–1776, 2025. https://doi.org/10.1007/s10639-024-12842-5

[21] T. Valtonen, T. Paavilainen, S. López-Pernas, et al., "Elementary and secondary school teachers' perceptions of learning analytics: A qualitative approach," Technology, Knowledge and Learning, vol. 30, pp. 601–619, 2025. https://doi.org/10.1007/s10758-025-09847-5

[22] Z. A. Mohseni and I. Masiello, "Co-designing, developing, and implementing multiple learning analytics dashboards for data-driven decision-making in education: A design-based research approach," Educational Technology Research and Development, vol. 74, pp. 517–548, 2026. https://doi.org/10.1007/s11423-025-10577-9

[23] L. R. Aiken, "Three coefficients for analyzing the reliability and validity of ratings," Educational and Psychological Measurement, vol. 45, no. 1, 1985. https://doi.org/10.1177/0013164485451012

[24] L. de Vreugd, A. van Leeuwen, R. Jansen, and M. van der Schaaf, "Learning analytics dashboard design and evaluation to support student self-regulation of study behaviour," Journal of Learning Analytics, 2024. https://doi.org/10.18608/jla.2024.8529

[25] Q. Li, Y. Jung, and A. F. Wise, "How instructors use learning analytics: The pivotal role of pedagogy," Journal of Computing in Higher Education, vol. 38, pp. 227–255, 2026. https://doi.org/10.1007/s12528-025-09432-w

[26] F. Nurdin, T. N. Santoso, and G. Gamaruddin, "Analisis penerimaan Learning Management System di perguruan tinggi menggunakan Technology Acceptance Model (TAM)," JUSIFO, vol. 9, no. 1, pp. 1–12, 2023. https://doi.org/10.19109/jusifo.v9i1.14012

[27] C. N. Akpen, S. Asaolu, S. Atobatele, et al., "Impact of online learning on student's performance and engagement: A systematic review," Discover Education, vol. 3, art. 205, 2024. https://doi.org/10.1007/s44217-024-00253-0

[28] F. Chen and G. Chen, "Learning analytics in inquiry-based learning: A systematic review," Educational Technology Research and Development, vol. 73, pp. 2131–2161, 2025. https://doi.org/10.1007/s11423-025-10507-9

[29] R. Kleimola, L. Hirsto, and H. Ruokamo, "Promoting higher education students' self-regulated learning through learning analytics: A qualitative study," Education and Information Technologies, vol. 30, pp. 4959–4986, 2025. https://doi.org/10.1007/s10639-024-12978-4

[30] H. M. M. Ahmed, H. A. El-Sabagh, and D. M. Elbourhamy, "Effect of gamified, mobile, cloud-based learning management system on student engagement and achievement," International Journal of Educational Technology in Higher Education, vol. 22, art. 49, 2025. https://doi.org/10.1186/s41239-025-00541-1

[31] A. Hase and P. Kuhl, "Teachers' use of data from digital learning platforms for instructional design: A systematic review," Educational Technology Research and Development, vol. 72, pp. 1925–1945, 2024. https://doi.org/10.1007/s11423-024-10356-y

[32] J. K. Strakos, M. A. Douglas, B. McCormick, and M. Wright, "A learning management system-based approach to assess learning outcomes in operations management courses," The International Journal of Management Education, vol. 21, no. 2, art. 100802, 2023. https://doi.org/10.1016/j.ijme.2023.100802