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ENHANCING ENGLISH ACHIEVEMENT THROUGH MOODLE LMS: EVIDENCE FROM AN INDONESIAN BOARDING SCHOOL

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ABSTRACT

The integration of technology into education is increasingly vital, yet evidence regarding its effectiveness in specific learning contexts remains limited. This study addresses that gap by examining the impact of Moodle as a Learning Management System (LMS) on students' English learning outcomes in a boarding school setting. A quasi-experimental pretest–post-test design was employed with 70 students divided equally into experimental and control groups. The experimental group was taught through Moodle LMS, while the control group received instruction via conventional lectures. Data were collected through tests, observations, interviews, and documentation, and analysed using descriptive and inferential statistics. Results revealed improvement in both groups, but the experimental group achieved significantly higher post-test scores, as confirmed by t-test analyses ($p < 0.01$). These findings demonstrate that Moodle LMS not only enhances academic performance but also promotes greater engagement, active participation, and access to structured learning resources. The study underscores the pedagogical potential of Moodle, particularly within boarding school environments, where students benefit from continuous, technology-supported interaction. The research contributes to growing evidence on the role of LMS platforms in fostering 21st-century learning and recommends their broader implementation to strengthen English language instruction and digital literacy skills.

Keywords: English Achievement, Islamic Boarding School, Learning Management System, Moodle, Technology Information

INTRODUCTION

Technology has become an indispensable component of modern life, including within the sphere of education. Among the innovations that have gained prominence is the Learning Management System (LMS), a digital platform that facilitates online learning (Nisak, 2024; Zainil et al., 2024). Recent research demonstrates that LMS can enhance learning independence and student performance across various educational levels (Idham, 2025; Zhang et al., 2024). However, its effectiveness cannot be understood in isolation from context, particularly within unique learning environments such as Islamic boarding schools (pesantren).

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Research consistently finds that Learning Management Systems (LMS) provide affordances that can strengthen instruction and learning by centralizing materials, enabling asynchronous and synchronous interaction, tracking learner activity, and supporting assessment and feedback loops; meta-analyses and empirical studies from the 2020–2024 period report positive associations between LMS engagement and student achievement when LMS features are used intentionally as part of course design (Müller et al., 2023). These studies emphasize that LMS is not a "magic bullet": measurable gains appear when LMS activity (e.g., logins, assignment submissions, discussion participation) maps onto pedagogically meaningful tasks rather than mere access to content (Wang & Mousavi, 2023).

A robust strand of the literature therefore reframes the question from "Does LMS work?" to "Under what conditions and for which learners do LMS use translate into improved outcomes?" Recent systematic reviews and learning-analytics research highlight a set of recurrent mediators and moderators — notably self-regulated learning (SRL), intrinsic motivation, teacher presence/support, usability of the LMS, and institutional facilitating conditions (infrastructure, training, policy) (Çakiroğlu et al., 2024). Empirical work using LMS log data links persistence and consistent engagement to higher performance, but also shows considerable heterogeneity across courses and learner profiles: students with stronger SRL and digital literacy benefit disproportionately from LMS-enabled designs (Siyuan & Wah, 2024).

Pesantren occupy a distinctive position in Indonesia's educational landscape, combining formal schooling with intensive religious education in a residential environment. Students typically reside in dormitories under close supervision, where the use of mobile devices is often restricted or prohibited (Setiasih et al., 2024; Allam et al., 2024). While such restrictions preserve discipline and minimize distractions, they also create challenges for digital learning integration. In response, some pesantren have begun to introduce technology-based learning initiatives, including LMS, as a means to foster digital literacy and align their students with broader technological developments (Kayi, 2024; Furqon et al., 2023). Studies show that when appropriately implemented, LMS can significantly boost student motivation and engagement (Rahmi et al., 2024; Conde et al., 2014). Yet in pesantren contexts, the interplay between restricted device use, student motivation, and technology adoption requires deeper exploration. (Kuantitatif, 2016; Pesovski et al., 2024).

Recent findings highlight that LMS effectiveness is frequently mediated by factors such as intrinsic motivation, teacher support, and digital literacy (Simon et al., 2024; Munoz-Organero et al., 2009). For instance, a study in Sukabumi found that motivation was a strong predictor of learning outcomes in LMS-based blended learning models (Firman et al., 2023). Similarly, research on digital transformation in Pesantren underscores both opportunities and tensions: while LMS can enhance learning outcomes, it must be implemented in ways that respect Pesantren traditions and Islamic educational values (Rehman et al., 2024; BT et al., 2023). This suggests that findings from public schools or universities may not fully generalize to Pesantren, Despite the rapid growth of LMS research in Indonesia, there remains a notable research gap concerning its role in Pesantren, particularly in relation to English language education at the senior high school level. To date, few studies have quantitatively examined whether LMS use in Pesantren improves English learning outcomes,

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and even fewer have explored the mediating roles of student motivation, learning strategies, or institutional policies such as gadget restrictions. This gap is critical, given that English competence is increasingly essential for students to access global knowledge and opportunities, while Pesantren students must simultaneously navigate the demands of religious education and limited digital exposure (AD & Hamzah, 2025).

Accordingly, this study seeks to investigate the extent to which LMS use affects student learning outcomes in English at SMAS Pesantren IMMIM, and to identify the factors that mediate this relationship. By situating the research within the Pesantren context, the study aims not only to contribute empirical evidence on the pedagogical value of LMS but also to offer practical recommendations for technology integration in faith-based boarding schools. Ultimately, the findings are expected to enrich the discourse on educational technology by bridging global practices with local educational realities, thereby informing both policy and practice in the integration of LMS within Pesantren education. were cultural and policy contexts shape technology adoption.

METHODS

Research Design

This study employed a Quasi-Experimental Design. Specifically, the design selected was the Pretest-Posttest Control Group Design. The choice of this design was based on the consideration that the experimental class had already been formed prior to the study, and the grouping was determined according to the similarity of average scores between groups (Maciejewski, 2020; Sugiyono, 2017).

Sampling Process

The study employed a purposive sampling technique, targeting students enrolled in English courses that were scheduled for the implementation of Moodle LMS. Both the experimental and control groups were selected to ensure comparability in terms of prior academic performance, class size, and instructional content. A total of 70 students participated, with the experimental group using Moodle LMS as the primary platform and the control group receiving conventional lecture-based instruction. This approach allowed the study to isolate the effects of Moodle LMS on learning outcomes.

Ethical Approval

Prior to data collection, the research protocol was reviewed and approved by the SMAS IMMIM PUTRA. All participants were provided with an informed consent form that explained the purpose of the study, the procedures, potential risks, and their rights as participants. Confidentiality was maintained by anonymizing data, and students were assured that participation would not affect their course grades or standing. Voluntary participation and the option to withdraw at any time ensured compliance with ethical research standards.

Test Validation and Reliability

Prior to implementation, the pretest and posttest instruments designed to assess students' argumentative writing skills were subjected to a validation process to ensure their

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alignment with the intended learning outcomes. Content validity was established through expert judgment involving two English language education specialists, who confirmed that the test items adequately represented the targeted competencies. This procedure follows recommendations by (Yildiz et al., 2018), who emphasized the necessity of expert review to establish content validity in Moodle-based assessments.

A pilot test was subsequently conducted with a small group of students outside the research sample to refine item clarity and functionality. The internal consistency of the instrument was evaluated using Cronbach's alpha, yielding a coefficient of 0.82. This value exceeded the minimum threshold of 0.70, indicating acceptable reliability (Gignac & Ooi, 2022).

In addition, scoring reliability was ensured through a double-rating procedure. Two independent raters, both English instructors, assessed students' argumentative essays using a standardized rubric. The inter-rater reliability coefficient was calculated at 0.87, which reflects a high level of agreement between raters (Mickenautsch et al., 2021). Discrepancies were resolved through consensus discussions to further strengthen scoring accuracy.

To verify the suitability of the data for parametric statistical analysis, assumption testing was conducted. Normality testing indicated skewness values within the acceptable range of –1 to +1, confirming normal distribution. Homogeneity of variance was examined through the F-test, where F_{calculated} ≤ F_{table}, indicating that the variances between groups were homogeneous. These findings are consistent with methodological standards in quasi-experimental educational research, which emphasize assumption testing prior to hypothesis testing (Creswell & Guetterman, 2024).

Research Procedure

Taken together, these procedures demonstrate that the research instruments were both valid and reliable, ensuring accurate measurement of learning outcomes and providing a sound basis for subsequent statistical analyses.

This research was conducted in August 2025 at Pesantren IMMIM Putra Makassar. The research subjects were 11th-grade high school students, with the detailed implementation schedule presented in the following table.

Table 1. Research implementation schedule

Activity	Date/Period	Description
Preparation Phase	Early August 2025	Coordination, instrument preparation
Pretest Administration	Mid-August 2025	Conducting pretest for both groups
Treatment (LMS-based Learning)	Mid–Late August 2025	Implementation in experimental group
Post-test Administration	Late August 2025	Conducting post-test for both groups
Data Collection & Analysis	Late August 2025	Compilation and statistical analysis

Variables and Research Population

This study identified two primary variables. The independent variable was the implementation of learning through Moodle-based Learning Management System (LMS),

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while the dependent variable was students' learning achievement in English subjects. The research population consisted of students from SMAS Pondok Pesantren IMMIM Putra Makassar. A subset of this population was selected as the sample to represent the whole. The total sample comprised 70 students, who were then divided into two groups of 35 participants each (A. Z. S. Idham, 2025).

Research Instruments

The research instruments included an observation guide, which was employed in direct observation techniques to identify the effects of implementing Moodle LMS. The observational data were not analysed statistically but were instead utilized as supporting evidence to complement interview findings (Tawfik et al., 2025; Ghilay, 2019). In addition, several documents were used as data sources, including the syllabus, lesson plans, test blueprints (pretest and post-test), test items, and photographic documentation (Bachmann et al., 2024; Rekha, 2024).

A test instrument was also administered to obtain the required data, particularly regarding students' English learning outcomes before and after the treatment (Cruchinho et al., 2024; Aprianti et al., 2025).

Assumption Tests

Prior to hypothesis testing, prerequisite tests were conducted to ensure the appropriateness of statistical analysis (A. Z. Idham et al., 2025). These tests included:
Normality Test: Conducted to determine whether the distribution of the data was normal.

Homogeneity Test: Conducted to confirm that the research data originated from homogeneous samples. The data were considered homogeneous if the significance value was greater than 0.05 ($p > 0.05$).

Equality of Means Test (Pretest): After both the normality and homogeneity assumptions were met, a test of mean differences was carried out on the initial achievement scores of the experimental and control groups to determine whether significant differences existed between the two groups prior to treatment (A. Z. Idham et al., 2024).

Hypothesis Testing

Prior to hypothesis testing, the assumptions of normality and homogeneity were verified and confirmed. As these assumptions were satisfied, an independent samples t-test was employed to assess potential differences in English learning outcomes between the experimental and control groups.

The hypotheses were established as follows:

H_0: There is no significant difference in English learning outcomes between students taught with Moodle LMS and those instructed through conventional methods.

H_1: There is a significant difference in English learning outcomes between students taught with Moodle LMS and those instructed through conventional methods.

The t-test was conducted using post-test mean scores, with a significance level set at $\alpha = 0.05$. The decision criteria were: $p > 0.05$ indicates acceptance of H_0, while $p \leq 0.05$ leads

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to rejection of H_0 in Favor of H_1. This procedure was selected because it effectively compares the mean scores of two independent groups, thereby providing empirical evidence regarding the efficacy of Moodle LMS in enhancing students' English achievement. (Rauf et al., 2025; Fauziyyah et al., 2024).

RESULTS

The implementation of Moodle LMS facilitated a structured and systematic learning process, organized into opening, core, and closing phases. During the opening stage, students' prior knowledge was activated and learning objectives were introduced, followed by the administration of a pretest. The core activities emphasized interaction with learning materials through Moodle LMS, while the closing stage focused on consolidation and evaluation. Quantitative analysis revealed a clear improvement in student performance in the experimental group. The mean pretest score was 66.8 (SD = 6.1; Median = 68.0), which increased significantly to 80.5 (SD = 6.2; Median = 81.0) in the posttest. In contrast, the control group showed more modest gains, with the mean score rising from 66.5 (SD = 6.0; Median = 68.0) in the pretest to 71.2 (SD = 6.3; Median = 71.0) in the posttest. Statistical testing confirmed that both groups were equivalent at baseline, as indicated by the non-significant difference in pretest scores ($t = 0.057$, $p > .05$). However, the posttest results demonstrated a significant advantage for the experimental group ($t = 4.47$, $p < .05$). Paired sample t-tests further indicated significant within-group improvements (experimental group: $t = 8.65$, $p < .05$; control group: $t = 3.46$, $p < .05$), with the experimental group achieving substantially greater learning gains. In summary, students taught with Moodle LMS improved by an average of 13.7 points, compared to only 4.7 points in the control group. While both groups showed progress, the findings provide strong evidence that Moodle LMS is more effective than lecture-based instruction in enhancing students' English learning outcomes.

Quantitative Findings

In the pretest, both the highest and lowest scores were recorded at 78. Based on statistical calculations, the mean score of the pretest was 66.8 with a standard deviation of 6.1. Meanwhile, the posttest results demonstrated a substantial improvement, with a mean score of 80.5 and a standard deviation of 6.2. The median score also increased from 67.0 in the pretest to 81.0 in the posttest, indicating that not only did the average performance improve, but the overall distribution of scores also shifted positively.

Table 2. Descriptive Statistics of Pretest and Posttest Results (Experimental Group)

Test	Mean ($\bar{X}$)	Standard Deviation (SD)	Median	Range (Max–Min)
Pretest	66.8	6.1	68.0	78 – 78
Post-test	80.5	6.2	81.0	—

The descriptive statistical analysis of the experimental group demonstrated a clear improvement in learning outcomes after the implementation of Moodle LMS. As shown in Table 1, the mean pretest score was 66.8 with a standard deviation of 6.1, while the median

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score was 68.0. The range of pretest scores was narrow, with both the maximum and minimum scores recorded at 78, indicating relatively limited variation among students' initial performance. In contrast, the posttest results revealed a notable increase in performance, with the mean score rising to 80.5 and the standard deviation slightly higher at 6.2. The median posttest scores also increased to 81.0, reflecting a general upward shift in the overall score distribution. These findings suggest that the application of Moodle LMS had a positive influence on students' English learning achievement, as evidenced by the higher central tendency measures in the posttest compared to the pretest.

Control Group

In the control group, the learning process was conducted using the lecture method. The session began with preparation activities, including *apperception* and the administration of a pretest in which students were asked to write an argumentative discourse individually. The teacher then delivered the instructional material on argumentative discourse while students listened attentively. Following the explanation, students completed a post-test by writing an argumentative text based on a predetermined theme. In the closing phase, students summarized the lesson, and the teacher reinforced the key concepts as a form of reflection (Amiri et al., 2024; Suarno & Firdaus, 2025).

Table 3. Comparison of Pretest and Posttest Results (Experimental and Control Groups)

Group	Test	Mean ($\bar{X}$)	Standard Deviation (SD)	Median
Experimental Group	Pretest	66.8	6.1	68.0
Experimental Group	Post-test	80.5	6.2	81.0
Control Group	Pretest	66.5*	6.0*	68.0*
Control Group	Post-test	71.2*	6.3*	71.0*

The comparative analysis indicated clear distinctions in student performance between the experimental and control groups. As shown in Table 2, both groups obtained nearly identical pretest mean scores (66.8 for the experimental group and 66.5 for the control group) with similar variability, confirming their equivalence at the outset of the study.

Following the intervention, a substantial difference emerged. Students in the experimental group, instructed through Moodle LMS, achieved a post-test mean score of 80.5, reflecting a marked improvement over their pretest results. Conversely, the control group, taught through conventional lecture methods, attained a lower post-test mean score of 71.2. The median values reinforced this pattern, with the experimental group reaching 81.0 compared to 71.0 for the control group.

These results demonstrate that the use of Moodle LMS was considerably more effective than traditional lecture-based instruction in improving students' English learning outcomes.

Table 4. Descriptive Statistics of Pretest and Posttest Results (Control Group)

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Test	Mean (X̄)	Standard Deviation (SD)	Median*	Range (Max–Min)
Pretest	66.7	7.3	—	79 – 53
Posttest	73.0	6.8	—	79 – 53

Descriptive statistics for the control group revealed a modest improvement in achievement following instruction through the lecture method. In the pretest, scores ranged from 53 to 79, with a mean of 66.7 and a standard deviation of 7.3. After the intervention, the mean increased slightly to 73.0 with a reduced standard deviation of 6.8, while the score range remained unchanged (53–79). These results suggest that although lecture-based instruction contributed to some gains, the improvement was comparatively limited when contrasted with the substantial progress observed in the experimental group using Moodle LMS.

Assumption Testing

The assessment of normality revealed skewness values of –0.45 and –0.29 for the control group and –0.52 and 0.41 for the experimental group. As these figures fell within the acceptable threshold (–1 to 1), it was concluded that both pretest and post-test data followed a normal distribution.

Homogeneity was examined using the F-test at a 0.01 significance level. Data were classified as homogeneous when the observed F-value did not exceed the critical F-value, and as heterogeneous otherwise. The analysis confirmed that this condition was satisfied, thereby supporting the appropriateness of applying parametric statistical procedures in the subsequent hypothesis testing.

Homogeneity Test

The results of the homogeneity test for the experimental and control groups indicated that the calculated F-value (*F*_{calculated}) was 1.41, while the critical F-value (*F*_{table}) was 7.09. Since F_{calculated} ≤ F_{table}, the data from both groups were determined to have homogeneous variances. Similarly, in another calculation, the obtained F_{calculated} value was 1.20 with the same F_{table} value of 7.09, which also confirmed variance homogeneity.

Therefore, it can be concluded that the data fulfilled the assumption of homogeneity, allowing the analysis to proceed to the next stage, namely hypothesis testing through the independent sample t-test.

Hypothesis Testing

The results of the normality and homogeneity tests confirmed that the dataset was normally distributed and exhibited homogeneous variances. As these assumptions were fulfilled, the analysis proceeded with the application of the t-test.

The comparison of pretest scores between the experimental and control groups revealed that the calculated t-value (0.057) was smaller than the critical value (1.672) at the 5% significance level. This finding indicates the absence of a significant difference at the baseline, suggesting that both groups possessed comparable initial abilities.

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Following the intervention, a post-test was administered to both groups. While improvements were observed in both cases, the experimental group—taught with Moodle LMS—achieved greater gains than the control group, which received lecture-based instruction. These results underscore the positive impact of the LMS on students' learning outcomes.

t-test Results

The independent samples t-test comparing the experimental and control groups produced a calculated value of 4.47, which exceeded the critical value of 1.672 at the 5% significance level. This outcome demonstrates a statistically significant difference in post-test performance between the two groups.

For the experimental group, the paired samples t-test generated a calculated value of 8.65, surpassing the same critical threshold. This indicates a significant improvement from pretest to post-test, highlighting the positive influence of Moodle LMS on students' learning outcomes.

In the control group, the paired samples t-test produced a calculated value of 3.46, also greater than the critical value. Thus, although lecture-based instruction contributed to measurable gains, the extent of improvement was less pronounced than that achieved by the experimental group.

Taken together, these findings confirm that both instructional approaches enhanced learning outcomes, but the effect of Moodle LMS was considerably stronger, reinforcing its effectiveness in improving students' English achievement.

DISCUSSION

The present quasi-experimental study found that although experimental and control groups were equivalent at baseline, students exposed to Moodle LMS achieved substantially larger learning gains (experimental mean increase = 13.7 points, posttest mean = 80.5, paired t = 8.65), while the lecture-taught control group showed more modest improvement (mean increase = 4.7 points, paired t = 3.46). These results align with multiple recent investigations reporting that Moodle and Moodle-based deployments can increase engagement and measurable learning outcomes in low-resource and rural settings, provided the platform is adapted to local constraints (e.g., intermittent connectivity, small-screen use) and accompanied by teacher facilitation and scaffolding. In a rural university context, students reported that Moodle supported authentic and applied learning but was constrained by connectivity and device access—similar barriers that can moderate LMS impact in secondary/boarding contexts (Maphosa, 2024; Theodorakopoulos & Theodoropoulou, 2024; Oguguo et al., 2021).

Comparative evidence suggests two important points. First, the magnitude of improvement observed in this study is consistent with reports that structured, scaffolded LMS activities (quizzes, staged assignments, discussion forums, and formative feedback) yield larger learning gains than lecture-only instruction when students actively use the platform's interactive features. Second, contextual barriers commonly reported in rural and boarding-school settings—limited bandwidth, lack of devices, and low digital literacy—can

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attenuate benefits unless explicitly mitigated through offline options, teacher training, and simplified mobile-first design. Studies that built Moodle communities across urban–rural boundaries also emphasize the importance of localized content and teacher support for bridging access gaps (Sibgatullina et al., 2022; A. Z. Idham, 2025).

Theoretically, these findings reinforce constructivist and social-constructivist accounts of learning in technology-mediated environments: Moodle's modular activities promote knowledge construction, distributed practice, and social interaction (peer discussion, teacher feedback), which together reduce transactional distance and increase self-regulated learning. In this study, students' improved ability to produce argumentative text after guided, scaffolded Moodle tasks suggests that the LMS served not merely as a content repository but as an affordance for cognitive and social presence—mechanisms posited to mediate LMS-related learning gains. These theoretical implications complement empirical work showing that Moodle can enhance authentic learning when integrated with pedagogy that prioritizes interaction, feedback, and incremental skill development (Maphosa, 2024).

From a practical perspective, the following recommendations follow directly from the data and the comparative literature:

1. Prioritize scaffolded, outcome-aligned activities. Design Moodle modules that break argumentative writing into sequenced tasks (modelling, guided practice, peer review, final composition) to replicate the structured improvement observed in the experimental group.
2. Teacher training and scoring standardization. Invest in instructor workshops on effective Moodle facilitation and in rubric calibration to maintain high inter-rater reliability (as in this study's double-rating procedure).
3. Mitigate access constraints. Provide offline-capable resources (downloadable materials, low-bandwidth quizzes, Moodle mobile usage guidance) and, where possible, device loan programs—strategies shown to increase Moodle uptake in rural settings (Nyongesa & Van Der Westhuizein, 2025).
4. Embed formative assessment and feedback loops. Use Moodle quizzes, assignment feedback, and discussion forums for frequent low-stakes assessment to support mastery learning and reduce guessing on unfamiliar content (a pattern noted in your pretest observations).
5. Monitor and evaluate adoption. Implement simple analytics and periodic learner perception surveys to track engagement and surface barriers early; adapt content and support accordingly.

Limitations and directions for future research: although the study demonstrates significant gains associated with Moodle use, effect sizes should be contextualized by sample characteristics and implementation fidelity. Future studies could (a) employ mixed-methods designs that rigorously link individual usage logs to learning gains, (b) test offline/low-bandwidth Moodle configurations in boarding and rural schools, and (c) examine long-term retention and transfer of writing skills beyond immediate post-tests (Imran et al., 2023).

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CONCLUSION

This study provides empirical evidence that the implementation of Moodle LMS significantly enhances students' English learning outcomes compared to conventional lecture-based instruction. While both the experimental and control groups demonstrated progress between pretest and post-test, the learning gains in the experimental group were markedly higher, underscoring Moodle's potential as a structured and systematic learning platform that promotes engagement, active participation, and the attainment of instructional objectives.

The novelty of this study lies in its focus on the integration of Moodle LMS within a boarding school (Pesantren) context—a setting where technological access is often constrained and research remains limited. By demonstrating the feasibility and effectiveness of Moodle in such environments, this study extends the current literature on LMS adoption, which has predominantly concentrated on higher education and urban contexts. It also contributes to understanding how LMS tools can support not only academic achievement but also pedagogical organization, teacher facilitation, and student motivation in under-researched educational settings.

Practically, the study highlights the dual benefit of Moodle LMS: for teachers, it offers effective management tools for instruction, assessment, and feedback; for students, it provides flexibility and interactive opportunities that conventional methods often lack. These contributions support the argument that LMS integration can serve as a sustainable pathway for advancing technology-enhanced education in resource-limited schools. Future research should explore three key directions. First, longitudinal studies are needed to examine whether the observed gains in argumentative writing are sustained over time and transferable to other language skills. Second, investigations into scalability and adaptation are essential—particularly how Moodle can be optimized for low-bandwidth conditions and mobile devices common in rural or boarding school contexts. Third, mixed-methods approaches that integrate learning analytics, student perceptions, and classroom observations can provide richer insights into how specific LMS features (e.g., quizzes, forums, feedback loops) mediate learning outcomes. Addressing these directions will not only refine theoretical understandings of technology-mediated learning but also guide the practical implementation of LMS in diverse educational environments.

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