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FROM CONVENTIONAL READING TO MOODLE-BASED LEARNING: AN EXPERIMENTAL STUDY ON UNDERGRADUATE STUDENTS' READING COMPREHENSION

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Abstrak

Perkembangan teknologi digital mendorong pemanfaatan Learning Management Systems (LMS) dalam pembelajaran di pendidikan tinggi, termasuk pada pengajaran membaca. Meskipun Moodle banyak diadopsi, bukti empiris yang menguji efektivitasnya melalui pendekatan eksperimental dalam meningkatkan pemahaman membaca mahasiswa masih terbatas, khususnya jika dibandingkan secara langsung dengan pembelajaran membaca konvensional. Penelitian ini bertujuan untuk menguji pengaruh pembelajaran membaca berbasis Moodle terhadap kemampuan pemahaman membaca mahasiswa serta membandingkan hasil belajar mahasiswa yang mengikuti pembelajaran melalui Moodle dengan mahasiswa yang mengikuti pembelajaran membaca konvensional. Penelitian menggunakan desain kuasi-eksperimental dengan rancangan pretest–posttest kelompok kontrol. Sebanyak 46 mahasiswa sarjana dilibatkan dan ditempatkan pada dua kelas utuh: kelompok eksperimen (n = 23) dan kelompok kontrol (n = 23). Kelompok eksperimen memperoleh pembelajaran membaca melalui Moodle yang mengintegrasikan materi terstruktur, aktivitas interaktif, dan penilaian formatif, sedangkan kelompok kontrol menerima pembelajaran membaca tatap muka menggunakan materi cetak dan diskusi yang dipandu dosen. Instrumen utama berupa tes pemahaman membaca yang diberikan sebelum dan sesudah intervensi. Data dianalisis menggunakan statistik deskriptif, uji t sampel berpasangan untuk menguji peningkatan dalam masing-masing kelompok, uji t sampel independen untuk membandingkan skor posttest antar-kelompok, serta perhitungan ukuran efek untuk menilai signifikansi praktis. Hasil analisis menunjukkan bahwa kedua kelompok mengalami peningkatan pemahaman membaca dari pretest ke posttest, namun peningkatan pada kelompok eksperimen secara signifikan lebih besar dibandingkan kelompok kontrol. Perbandingan skor posttest antar-kelompok juga menunjukkan perbedaan yang signifikan dengan ukuran efek yang besar, menandakan dampak yang kuat dan bermakna secara edukatif. Dengan demikian, pembelajaran membaca berbasis Moodle terbukti efektif dan berpotensi meningkatkan kualitas pembelajaran membaca di pendidikan tinggi, terutama melalui lingkungan belajar yang lebih interaktif dan fleksibel..

***Kata kunci**: Moodle, membaca, pendidikan, pembelajaran*

Abstract

The rapid advancement of digital technology has encouraged the integration of Learning Management Systems (LMS) in higher education, including in reading instruction. Although Moodle is widely adopted, empirical evidence based on experimental approaches that directly examine its effectiveness in enhancing undergraduate students' reading comprehension remains limited, particularly in comparison with conventional reading instruction. This study aimed to investigate the effect of Moodle-based reading instruction on students' reading comprehension and to compare learning outcomes between students taught through Moodle and those taught through traditional instructional methods. A quasi-experimental research design employing a pretest–posttest control group was applied. The participants

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consisted of 46 undergraduate students divided into two intact classes: an experimental group (n = 23) and a control group (n = 23). The experimental group received reading instruction through Moodle, integrating structured learning materials, interactive activities, and formative assessments, while the control group was taught using conventional face-to-face reading instruction with printed materials and teacher-led discussions. A reading comprehension test was administered as both a pretest and a posttest. Data were analyzed using descriptive statistics, paired-samples t-tests to examine within-group improvement, independent-samples t-tests to compare posttest performance between groups, and effect size analysis to assess practical significance. The results revealed that both groups demonstrated significant improvement in reading comprehension from pretest to posttest; however, the experimental group showed significantly greater gains than the control group. Furthermore, the posttest comparison indicated a statistically significant difference with a large effect size, suggesting that Moodle-based instruction had a substantial and educationally meaningful impact on students' reading comprehension. Overall, the findings indicate that Moodle-based reading instruction is an effective approach for enhancing undergraduate students' reading comprehension and offers considerable pedagogical benefits for reading instruction in higher education contexts..

Keywords: Moodle, reading, education, learning

1. INTRODUCTION

Reading comprehension continues to be a fundamental competency in higher education because it enables students to interpret subject-specific texts, integrate ideas from multiple sources, and participate effectively in critical scholarly discussions. At the undergraduate level, strong reading competence is closely associated with academic achievement, self-directed learning, and successful knowledge construction across subject areas (Jeong, 2022; Li et al., 2023). Despite its importance, recent studies continue to report that many university students experience difficulties in comprehending academic texts, particularly when reading instruction relies heavily on conventional, teacher-centered approaches with limited learner interaction (Eriksson, 2023; Kamaşak et al., 2021).

Over the past few years, the growing use of digital learning platforms has significantly influenced how teaching is carried out in universities, including approaches to developing students' reading abilities. One widely used tool is the Learning Management System (LMS), which helps facilitate learning that is more adaptable, engaging, and oriented toward student participation (Marzuki et al., 2024a; Wahid et. al., 2024). Research suggests that technology-supported reading instruction can enhance comprehension by offering multimodal texts, immediate feedback, and opportunities for collaborative meaning-making (Kim et al., 2023; Moon et al., 2021). Among various LMS platforms, Moodle has emerged as one of the most extensively used systems in universities worldwide. Its capacity to integrate structured reading materials with interactive activities, quizzes, and discussion forums positions Moodle as a potentially effective medium for supporting reading comprehension development in higher education contexts (Marzuki et al., 2026).

Despite the rising number of studies on technology-enhanced reading instruction, the evidence base remains uneven. Many LMS-related studies in reading contexts are descriptive or correlational, prioritizing indicators such as perception, engagement, and satisfaction, while giving limited attention to outcome-based evaluation using experimental control (Ma & Zhao, 2025; McBreen & Savage, 2021). As a result, empirical evidence demonstrating the causal impact of LMS-based instruction on reading comprehension development remains limited, particularly in higher education contexts. Second, studies that have investigated Moodle-supported learning often treat the platform as a general instructional tool, without explicitly contrasting Moodle-based reading instruction with conventional, face-to-face reading practices. This situation makes it difficult to determine whether gains in reading comprehension stem

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from Moodle's pedagogical features or from other instructional factors (Al-Qora'n et al., 2025; Marzuki et al., 2024b). Moreover, existing research tends to emphasize blended or emergency remote learning settings, especially during the COVID-19 pandemic, which may not accurately reflect post-pandemic instructional realities (Goyal et al., 2023; Oliveira et al., 2021).

Finally, there is still limited experimental evidence from undergraduate settings in developing or non-urban contexts, where digital access and instructional conditions often diverge from those in well-funded institutions. Responding to these gaps will help establish stronger empirical support for the effectiveness of Moodle-based reading instruction while also informing instructional practices in a wide range of higher education environments.

To fill the gaps in existing studies, the current research tests the effectiveness of Moodle-based reading instruction for improving undergraduate students' reading comprehension through a controlled experiment. The direct comparison between Moodle-supported instruction and conventional reading activities is intended to produce more reliable evidence of Moodle's contribution to comprehension gains. Employing a pretest–posttest control group design strengthens the analysis of causal relationships between instructional delivery and students' reading outcomes.

By comparing the outcomes of Moodle-supported and traditional reading instruction, this study advances the literature in three main respects. First, it strengthens the evidence base on the effectiveness of Learning Management Systems (LMS) by employing an experimental design. Second, it elucidates the instructional contribution of Moodle to reading pedagogy in undergraduate classrooms. Third, it provides context-specific insights that can guide instructional design as well as institutional policy for higher education providers aiming to adopt digital platforms to support language and literacy development. In line with these objectives, this study proposes the following research questions: (1) Do undergraduate students who receive Moodle-based reading instruction demonstrate significantly different reading comprehension performance than those who receive conventional instruction? (2) To what extent does Moodle-based reading instruction influence undergraduate students' reading comprehension relative to conventional instruction?

2. METHOD

To examine the effect of Moodle-assisted reading instruction on undergraduate reading comprehension, the study applied a quasi-experimental research design. Using a pretest–posttest control group arrangement, the research compared performance gains between students participating in Moodle-based instruction and those following traditional reading instruction. Given institutional constraints that prevented random allocation of individual students, the study relied on two intact classes as the experimental and control groups.

Students in the experimental group received reading instruction via Moodle, which included organized reading resources, interactive learning tasks, and formative evaluation activities. In contrast, the control group participated in conventional face-to-face instruction using printed texts and teacher-facilitated discussions. The same reading comprehension test was administered to both groups before and after the intervention to capture changes in reading performance across time. This approach allowed a systematic comparison of instructional impacts while preserving ecological validity in authentic classroom conditions, making it suitable for higher-education educational research (Creswell & Plano Clark, 2023)

This study involved 46 undergraduate students enrolled in a reading-related course at a higher education institution. They were organized into two existing classes, with 23 students

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forming the experimental group and 23 students forming the control group. The use of intact groups was required due to institutional policies and timetable constraints, which aligns with common practice in quasi-experimental research in educational contexts. Overall, participants were at a comparable academic stage and shared similar prior learning experiences in reading before the intervention. To establish baseline equivalence, both groups completed a reading comprehension pretest prior to the treatment. The pretest results showed no statistically significant difference in initial reading ability between the two groups, indicating that they were sufficiently comparable for subsequent analyses. Participation was voluntary, and informed consent was obtained from all students before data collection commenced.

Table 1. Demographic Characteristics of the Participants

Demographic Variable	Experimental Group (n = 23)	Control Group (n = 23)	Total (N = 46)
Gender			
– Male	10	9	19
– Female	13	14	27
Age (years)			
– Mean	19.8	20.0	19.9
– Range	18–22	18–22	18–22
Academic Level			
– First-year students	23	23	46
Prior Moodle Experience			
– Yes	15	14	29
– No	8	9	17

The study employed a reading comprehension test as the principal measurement tool. Using a pretest–posttest format for both groups, the instrument consisted of multiple-choice items covering major components of comprehension, including main idea recognition, explicit/implicit understanding, inferential reasoning, and contextual vocabulary interpretation. Texts were drawn from academic-level materials appropriate for undergraduate students. Content validity was supported through blueprinting to course objectives and evaluation by two specialists in language education. Reliability was checked through pilot testing and yielded an acceptable coefficient. The pretest and posttest used the same items, with only the item order altered at posttest to mitigate familiarity-related bias.

The procedures followed a staged sequence. Both groups first completed a reading comprehension pretest to determine baseline ability and ensure equivalence. The experimental group then received Moodle-based instruction, while the control group underwent conventional instruction over six sessions. Moodle activities included structured tasks, quizzes, discussion forums, and assignment uploads, with students engaging individually and collaboratively. The control group used printed versions of the same materials and took part in teacher-led discussions and in-class exercises without Moodle. After the intervention, an identical posttest was administered under conditions similar to the pretest.

The analysis began with descriptive statistics to summarize reading comprehension scores from the pretest and posttest. For both the experimental and control groups, measures of central tendency and dispersion—including the mean, standard deviation, minimum, and maximum—were computed to provide an initial profile of students' performance before and after

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the intervention. Prior to conducting inferential tests, assumption checking was performed to confirm the appropriateness of parametric procedures. Score normality was evaluated using the Shapiro–Wilk test, and the equality of variances between groups was examined through Levene's test. The findings indicated that the dataset satisfied the assumptions for t-test analyses.

To assess improvement within each group, paired-samples t-tests were used to compare pretest and posttest scores. To evaluate the impact of instructional mode, an independent-samples t-test was applied to compare the posttest results of the experimental and control groups. In addition, Cohen's d was calculated to estimate the magnitude of the observed differences. All statistical analyses were conducted using statistical software, with the significance threshold set at $p < .05$.

3. RESULTS AND DISCUSSION

This section reports the results of the study examining the effect of Moodle-based instruction on undergraduate students' reading comprehension. The findings include descriptive statistics of pre-test and post-test scores, analyses of within-group improvements, and comparisons between the experimental and control groups. Paired-sample and independent-sample t-tests were conducted to identify significant differences in reading performance. The magnitude of the instructional effect is further explained through effect size analysis.

Descriptive Statistics of Students' Reading Comprehension

This section presents the descriptive statistics of students' reading comprehension scores obtained from the pre-test and post-test in both the experimental and control groups. Descriptive measures, including mean scores and standard deviations, were calculated to provide an initial overview of students' reading performance before and after the instructional intervention.

As shown in Table 2, both groups demonstrated comparable mean scores on the pre-test, indicating relatively similar initial reading comprehension levels prior to the treatment. Following the instructional intervention, the experimental group exhibited a noticeable increase in mean post-test scores, whereas the control group showed a more modest improvement. The reduction in score variability in the experimental group also suggests a more consistent improvement in reading comprehension among students exposed to Moodle-based instruction.

Table 2. Descriptive Statistics of Students' Reading Romprehension Scores

Group	Test	N	Mean	SD
Experimental Group	Pre-test	23	65.21	6.48
	Post-test	23	78.34	5.92
Control Group	Pre-test	23	64.87	6.61
	Post-test	23	70.26	6.35

Within-Group Differences (Pre-test vs Post-test)

To assess within-group changes in reading comprehension, paired-samples t-tests were performed to compare the pretest and posttest scores of the experimental and control groups. This procedure was intended to determine whether each instructional condition produced statistically significant gains over the intervention period. As shown in Table 3, the experimental group experienced a significant increase in reading comprehension from pretest to posttest, with the posttest mean clearly exceeding the pretest mean, suggesting meaningful improvement following Moodle-based instruction. The control group also recorded a significant gain; nevertheless, the extent of improvement was relatively smaller compared with that of the experimental group

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Table 3. Paired-Sample t-Test Results for Reading Comprehension Scores

Group	Test Comparison	Mean Difference	t	df	p
Experimental Group	Pre-test vs Post-test	13.13	8.47	22	< .001
Control Group	Pre-test vs Post-test	5.39	4.12	22	< .001

Between-Group Differences (Independent-Sample t-Test)

To examine whether post-intervention reading comprehension differed significantly between students receiving Moodle-based instruction and those receiving conventional instruction, an independent-samples t-test was performed using the posttest scores of the experimental and control groups. This analysis addressed the first research question by directly comparing outcomes across the two instructional conditions after the treatment. As reported in Table 4, the results revealed a statistically significant difference in posttest reading comprehension between the groups. The experimental group obtained a higher mean score than the control group, indicating that students exposed to Moodle-supported reading instruction performed better than those taught through conventional methods. This mean difference provides empirical support for Moodle's potential value as an instructional medium for improving undergraduate students' reading comprehension.

Table 4. Independent-Sample t-Test Results

Group	N	Mean	SD
Experimental Group	23	78.34	5.92
Control Group	23	70.26	6.35
t	df	p	
4.59	44	< .001	

While the t-test results indicate a significant difference between groups, statistical significance alone does not fully capture the practical importance of the instructional effect. Therefore, the following section reports the effect size of Moodle-based instruction to assess the magnitude of its impact on students' reading comprehension.

Effect Size of Moodle-Based Instruction (Cohen's d)

To gauge the magnitude of Moodle-based reading instruction on students' reading comprehension, the effect size was computed using Cohen's d. Unlike statistical significance testing, effect size quantifies the practical or educational importance of an intervention. In the present study, Cohen's d was derived by taking the difference between the experimental and control groups' posttest means and dividing it by the pooled standard deviation. The resulting value (d = 1.32) represents a large effect based on commonly used benchmarks. This finding indicates that Moodle-supported instruction exerted a substantial influence on undergraduate students' reading comprehension relative to conventional instruction, suggesting that the observed group difference was not only statistically reliable but also meaningful in educational terms.

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Table 5. Effect Size of Moodle-Based Instruction on Reading Comprehension

Comparison	Mean Difference	Pooled SD	Cohen's d	Effect Magnitude
Experimental vs Control (Post-test)	8.08	6.13	1.32	Large

In summary, the findings offer clear responses to the study's research questions. First, the results indicate a statistically significant difference in reading comprehension between undergraduates who received Moodle-based instruction and those who experienced conventional instruction, with the experimental group attaining higher posttest scores. Second, the large effect size suggests that the observed difference is substantial, indicating that Moodle-supported instruction exerted a strong influence on students' reading comprehension. Overall, these outcomes imply that integrating Moodle into reading instruction not only improves performance in statistical terms but also produces educationally meaningful advantages over traditional approaches

DISCUSSION

The present study aimed to investigate the impact of Moodle-supported reading instruction on undergraduate students' reading comprehension using a quasi-experimental approach. By contrasting a group receiving Moodle-mediated instruction with a group experiencing conventional reading instruction, the study sought to generate empirical evidence on Moodle's instructional contribution in higher-education reading contexts. The results yield three central findings. First, both the experimental and control groups improved from pretest to posttest, suggesting that structured reading instruction can foster students' comprehension development. Second, the experimental group exhibited significantly larger gains than the control group, indicating that Moodle-based instruction may provide added pedagogical benefits beyond traditional approaches. Third, the large effect size obtained in this study implies that the group difference was not only statistically reliable but also meaningful from an educational standpoint. Taken together, these results suggest that integrating Moodle into reading instruction can substantially strengthen undergraduates' reading comprehension and lead to more effective learning outcomes in higher education.

The analysis further showed significant pretest-to-posttest improvement in both groups, highlighting the importance of systematic reading instruction irrespective of delivery mode. Structured exposure to academic texts, guided practice, and regular assessment can support comprehension by enhancing students' ability to process disciplinary readings and apply appropriate strategies more effectively (Alharbi, 2023; Yapp et al., 2023). Nevertheless, the greater gain observed in the experimental group is plausibly linked to the instructional affordances associated with Moodle. Moodle facilitates repeated access to learning materials, supports self-paced engagement, and provides timely feedback through quizzes and online tasks—features that can promote deeper cognitive involvement with texts (Englmeier, 2025; Marzuki et al., 2026). Moreover, interactive tools such as discussion forums may encourage learners to express interpretations, negotiate meaning, and co-construct understanding with peers, thereby reinforcing comprehension development (Herrera-Pavo, 2021; Peramunugamage et al., 2024). Overall, while conventional instruction appears capable of improving reading outcomes, technology-enhanced environments such as Moodle may create learning conditions that amplify students' gains.

The statistically significant difference in posttest reading comprehension between the experimental and control groups underscores the additional pedagogical contribution of Moodle-based instruction. Students in the Moodle

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condition achieved higher outcomes than those in the conventional classroom, indicating that the learning environment itself likely influenced reading achievement. This result is consistent with prior studies suggesting that digital learning platforms can strengthen comprehension by promoting learner engagement and facilitating more active interaction with texts (Das & Malaviya, 2025; Gameil & Al-Abdullatif, 2023). Moodle components—such as automated quizzes, sequenced lessons, and asynchronous discussion forums—may encourage deeper processing by prompting learners to check their understanding and reflect on textual meaning. Such mechanisms are closely connected to self-regulated learning, in which students plan, monitor, and evaluate their learning activities (Bransen et al., 2022; D. H. Chang et al., 2023; Nguyen et al., 2024). By comparison, conventional reading instruction often depends heavily on limited classroom time and teacher-centered explanations, which can reduce opportunities for individualized practice. Accordingly, the observed group differences suggest that Moodle-supported instruction provides more conducive conditions for sustained and meaningful development of reading comprehension.

Beyond statistical significance, the large effect size found in this study indicates that Moodle-based instruction produced a substantial and educationally relevant improvement in reading comprehension. Under widely used benchmarks, a large effect reflects a strong instructional influence that is likely to be evident in authentic classroom settings rather than merely a statistical artifact. In other words, Moodle integration appears to have generated more than minor gains; it corresponded to meaningful advances in students' ability to comprehend academic texts. From an instructional standpoint, this magnitude highlights the value of learning environments that cultivate ongoing engagement and active learning. Digital platforms like Moodle enable learners to revisit texts, obtain timely feedback, and engage in reflective learning practices—factors that have been associated with improved comprehension and retention (Chang & Lan, 2021; Goyal et al., 2023). Therefore, the size of the effect observed here further supports the view that Moodle-based instruction can be an effective approach for enhancing reading comprehension in higher education.

These findings carry practical implications for university-level reading instruction, particularly in contexts where traditional approaches remain predominant. The demonstrated benefits of Moodle-based instruction suggest that incorporating an LMS into reading courses can strengthen instructional quality and improve learning outcomes. Importantly, Moodle should not be used merely as a storage space for materials; lecturers may achieve greater impact by designing interactive activities such as quizzes with immediate feedback, guided reading tasks, and forum discussions that promote critical engagement with texts. At the institutional level, the results point to the need for targeted professional development to help lecturers develop the pedagogical expertise required to design effective Moodle-supported learning experiences. This recommendation is especially pertinent for non-metropolitan or resource-limited universities, where digital platforms can offer flexible and scalable options to enhance reading instruction. Strategic Moodle integration may thus support the development of more autonomous, engaged readers who are better aligned with contemporary academic demands.

Several limitations should also be noted. Because the study used a quasi-experimental design with intact classes, the strength of causal conclusions is constrained. In addition, the relatively small sample and short intervention duration may limit broader generalization. The study also examined overall reading comprehension without exploring specific

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subskills in detail. Future research could address these issues by employing randomized designs with larger participant pools, implementing longitudinal interventions, and integrating qualitative evidence to capture learners' cognitive and affective experiences during Moodle-based reading instruction.

4. CONCLUSION

This study examined the effect of Moodle-based reading instruction on undergraduate students' reading comprehension using a quasi-experimental research design. By comparing students who received instruction through Moodle with those who experienced conventional reading instruction, the study aimed to provide empirical evidence on the pedagogical value of Learning Management Systems in higher education reading contexts. The findings demonstrated that while both instructional approaches contributed to improvements in students' reading comprehension, Moodle-based instruction resulted in significantly greater gains. The large effect size further indicated that the observed differences were not only statistically significant but also educationally meaningful. Overall, these results highlight Moodle's potential to strengthen reading instruction by offering a flexible, interactive learning environment that supports sustained engagement with academic texts through structured modules, formative assessments, and self-paced learning opportunities.

Beyond its practical implications, this study contributes to the technology-enhanced language learning literature by providing experimental evidence from an undergraduate setting and by clarifying how Moodle's pedagogical affordances can translate into measurable comprehension gains. It also offers context-sensitive insights for lecturers and institutions, particularly in non-metropolitan or resource-constrained environments on designing Moodle-based reading activities that move beyond using the platform as a mere content repository. However, several limitations should be noted: the use of intact classes limits the strength of causal inference, the sample size and relatively short intervention duration may constrain generalizability, and the study focused on overall reading comprehension rather than specific sub-skills. Future research is therefore encouraged to employ larger and more diverse samples, adopt longitudinal or randomized designs, and examine specific comprehension subcomponents while integrating qualitative data to better capture learners' cognitive and affective experiences. Despite these limitations, the study provides a useful foundation for understanding the instructional effectiveness of Moodle-based reading instruction and supports its promise as an approach for fostering meaningful reading comprehension development in higher education.

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