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The Effectiveness of Learning Management Systems in Enhancing Student Learning Outcomes in Higher Education

Supriadi[1], Agus Pahrudin[2], Yuberti[3], Achi Rinaldi[4]*

[1,2,3,4]Universitas Islam Negeri Raden Intan Lampung, Indonesia

*Corresponding E-mail: supriadi040182@email.com

Abstract

The rapid digital transformation in education has brought significant challenges and opportunities, particularly in integrating technology to improve learning outcomes. This study aims to analyze the effectiveness of Learning Management Systems (LMS) in enhancing student learning outcomes, focusing on the Education Management course. Using a quasi-experimental design, the research involved 18 students who underwent pre-test and post-test assessments. The results showed a significant improvement in learning outcomes, with the average post-test score (80.67) significantly higher than the pre-test score (54.89), supported by statistical analysis (sig. 0.000). The findings align with Al-Fraihat et al. (2020) and Sun et al. (2008), emphasizing the importance of LMS usability, content quality, and integration with active learning strategies. However, challenges such as the digital divide and lack of face-to-face interaction need addressing through equitable access to technology and hybrid learning models. The study concludes that LMS is an effective tool for digital learning transformation, recommending continuous content development, training, and periodic evaluation to maximize its potential.

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Introduction

Higher education in the digital era faces significant challenges and opportunities. The development of information and communication technology has opened up new opportunities to improve the quality of learning by developing digital-based learning materials. However, this transformation also requires a more innovative and adaptive approach to the needs of students, as well as paying attention to security and privacy aspects (Adesina, 2023; Arbi & Amrullah, 2024). Based on the User Manual Generative Artificial Intelligence (Gen AI) (Ditbelmawa, 2024), On Learning in Higher Education, issued by Ditbelmawa Kemendikbudristek 2024, mentions that creating relevant and personalized material using GenAI is something that cannot be ignored anymore during disruption, especially for the development of learning in higher education today. The development of digital-based learning materials not only includes the use of technology to deliver content but also involves interactive learning design, personalization of learning experiences, and integration with learning management systems (Amoroso et al., 2024; Borenstein & Howard, 2021). In this context, universities need to consider various factors, such as the needs of students. (Sinaga, 2024), Technology availability (Wijiati et al., 2024) and data security aspects (Masrichah, 2023) to create practical and relevant learning materials (Widodo et al., 2024).

Learning Management System (LMS) is one of the leading platforms for supporting relevant and personalized learning in the digital era (Aldiab et al., 2019). Digital learning through Learning Management Systems (LMS) has become essential in higher education, especially in distance and blended learning (Firat, 2016; Imamuddin et al., 2024). LMS offers a platform to effectively plan, execute, and assess the learning process. LMS not only functions as a medium to deliver teaching materials but also as a tool that allows students to get a more adaptive learning experience according to their needs and abilities. With features such as data-driven learning analysis, automated task management, and flexibility in accessing materials anytime and anywhere, LMS provides an effective solution for educational institutions to develop more interactive and technology-based learning (Bere et al. 2018, 2018; Mahnegar, n.d.). In addition, integrating LMS with artificial intelligence (AI)-based technology further enriches the learning experience, automatically creates material recommendations, and supports more accurate learning evaluations. Therefore, using LMS in higher education is a strategic step to ensure

the learning process is efficient, more inclusive, and oriented to students' needs (Ditbelmawa, 2024; Wijiati et al., 2024).

Several previous studies have highlighted the role of the Learning Management System (LMS) in supporting digital learning. Sun, Tsai, Finger, Chen, and Yeh found that student satisfaction with the LMS was influenced by factors such as system design, instructional quality, and technical support (Sun et al., 2008). Other research by Al-Fraihat, Joy, Masa'deh, and Sinclair emphasizes that the effectiveness of an LMS is highly dependent on ease of use, accessibility, and integration with active learning strategies (Al-Fraihat et al., 2020). In Indonesia, Rahayu and Suryani showed that using LMS can improve student learning outcomes, especially in theory-based courses (Suryani et al., 2021). However, the studies still focus on technical aspects and user satisfaction without examining how LMS improves student learning outcomes from a pedagogical perspective and personalized learning experience. The research gap found is the lack of studies that empirically link the effectiveness of LMS with student academic achievement, especially in the context of digital learning transformation in higher education. In addition, there are still limitations in understanding how LMS can accommodate individual learning needs and increase student involvement in the learning process. Therefore, this study offers updates by exploring the effectiveness of LMS in improving student learning outcomes through a quantitative approach and a comprehensive analysis of factors that affect the successful implementation of LMS in higher education. This study aims to analyze the effectiveness of LMS in improving student learning outcomes and identify factors that contribute to the successful implementation of LMS in the digital learning process, as one of the recommendations for this research.

Theoretical review

Digital Learning Transformation

Digital learning transformation refers to a paradigm shift in the education system from traditional methods to a more technology-based approach (Nasihuddin, 2024; Sundari, 2024). The development of information and communication technology (ICT) has opened up new opportunities to improve the quality of learning, primarily through integrating digital platforms such as Learning Management Systems (LMS). According to Ningsih, digital transformation in education is not only

about the use of technology but also about changes in how learning is designed, delivered, and evaluated. This includes developing interactive learning materials, personalizing learning experiences, and increasing student accessibility (Ningsih, 2024).

In the digital era, learning transformation also requires a more innovative and adaptive approach. For example, using artificial intelligence (AI)- based technology and data analytics allows educational institutions to create more relevant and personalized materials according to students' needs (Ditbelmawa, 2024; Selwyn, 2021). However, challenges like the digital divide, infrastructure limitations, and resistance to change are still obstacles to implementing digital learning transformation (Nasihuddin, 2024; Sinaga, 2024; Wijiati et al., 2024). Therefore, universities need to consider holistic strategies, including lecturer training, technology-based curriculum development, and increasing awareness of the importance of digital literacy.

Digital learning transformation also has a significant impact on student learning outcomes. According to research by Means et al. (2014), technology-based learning can increase student engagement, facilitate independent learning, and expand access to learning resources. However, the success of this transformation largely depends on how technology is integrated into the learning process effectively and sustainably.

Digital learning refers to using digital technology to support the learning process, both online and in-person. According to Garrison (2011), digital learning includes three main components: digital content, online interaction, and technology-based evaluation. In the context of higher education, digital learning has become an effective solution to face challenges such as classroom limitations and the need for learning flexibility.

One of the advantages of digital learning is its ability to provide a personalized learning experience. For example, through an LMS, students can access learning materials tailored to their learning pace and style. In addition, digital learning also allows students to collaborate with their peers through online discussion forums and collaborative projects.

However, digital learning has challenges, such as the digital divide and lack of face-to-face interaction. According to Selwyn (2021), educational institutions must ensure all students have equal access to digital technology and learning resources. In addition, lecturers must be trained to use technology effectively and create meaningful student learning experiences.

Learning Management System (LMS)

The Learning Management System (LMS) has become one of the leading platforms in supporting digital learning, especially in higher education. LMS offers a variety of features that allow lecturers and students to interact, manage learning materials, and evaluate learning outcomes efficiently. According to Al-Fraihat et al. (2020), the effectiveness of LMS in improving student learning outcomes is greatly influenced by factors such as ease of use, content quality, and available technical support.

Several studies have shown that LMS can increase student engagement in the learning process. For example, Sun et al. (2008) found that student satisfaction with LMS is influenced by the intuitive system design and the quality of the instruction provided. In addition, LMS also allows for personalized learning through features such as AI-based material recommendations and learning analytics that help lecturers monitor student progress individually.

However, the effectiveness of an LMS depends not only on its technological features but also on how the system is integrated into a broader learning strategy. According to Rahayu and Suryani (2021), using LMS in theory-based courses has improved student learning outcomes, especially when accompanied by active learning approaches such as online discussions and collaborative assignments. Therefore, educational institutions need to ensure that LMS is used as a tool for delivering materials and as a platform to support student interaction and collaboration.

Several studies have shown that LMS can improve learning efficiency and effectiveness. For example, research by Al-Fraihat et al. (2020) found that a well-designed LMS can improve student satisfaction and learning outcomes. In addition,

the integration of LMS with AI-based technology also allows for the automatic generation of material recommendations, which helps students choose the content that is most relevant to their needs.

However, the success of LMS implementation is highly dependent on factors such as institutional support, lecturer training, and student engagement. According to Sun et al. (2008), educational institutions need to ensure that the LMS is used as a tool for delivering materials and as a platform to support student interaction and collaboration.

Student Learning Outcomes

Student learning outcomes are an essential indicator in evaluating the success of a learning method or strategy. In the context of digital learning, learning outcomes are not only measured through academic grades but also through improving students' cognitive, affective, and psychomotor skills. According to Bloom (1956), learning outcomes include three main domains, namely knowledge (mental), attitude (affective), and skill (psychomotor), all of which can be improved through a practical learning approach.

The use of LMS in digital learning has been proven to contribute to improving student learning outcomes. For example, the research of Means et al. (2014) shows that students who use LMS tend to have higher levels of information retention and better analytical skills. LMS allows students to access learning materials anytime and anywhere and provides quick feedback through the automatic evaluation feature.

However, improving learning outcomes is also influenced by other factors such as student motivation, the quality of learning materials, and support from lecturers. According to Zimmerman (2002), students who have intrinsic motivation tend to achieve better learning outcomes because they are more involved in the learning process. Therefore, it is essential for educational institutions to not only rely on technology but also create a learning environment that supports and motivates students.

Method

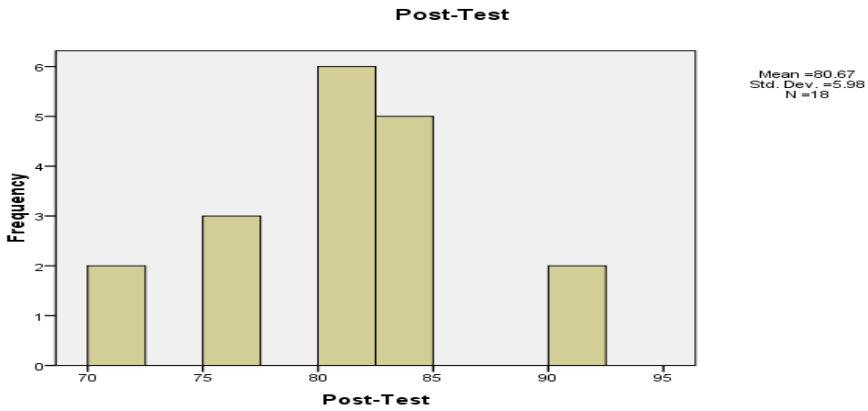
This study uses a quantitative research method to identify the effectiveness of digital-based learning assisted *by LMS (Learning Management System)* for student learning outcomes in *the Education Management* course. A quantitative approach is used so that all observed phenomena can be measured and converted into numbers so that statistical analysis can be carried out. This study uses a quasi-experimental method to prove that LMS-assisted digital learning is one of the effective methods to improve student learning outcomes in the ongoing and developing digital era. This research was conducted in one class without a comparison or control class (Suharsimi Arikunto, 2006). The research design is quasi-experimental, meaning that one group is used for pre- and post-testing to measure the difference between before and after treatment.

In the analysis of quantitative data obtained from the test results. The validity and reliability of the instrument are also tested. Then, statistical calculations were carried out using the Statistical Package for Social Science (SPSS) v.16 for Windows software to determine the effectiveness of this study.

Results

The findings of this study were taken from the results of pre-tests and post-tests carried out during November and December 2024. The pre-test is carried out before the student receives treatment to compare the ability and performance obtained from the post-test results. The pre-test was given to 18 students majoring in English Language (TBI) in *the Education Management* course in November 2024. The scores of students tested in the pre-test can be seen in Figure 1.

Figure 1. Student Score Results at the Pre-Test



From Figure 1, the researcher found four students scored 44, 6 students scored 52, 3 students scored 60, and 5 students scored 64. The data obtained helped researchers find the average pre-test, which was 54.89 with a standard deviation of 7.738, and N = 18, while the minimum score was 44, and the maximum score was 64. This is obtained for the score of *the Education Management* course before they get treatment.

At the end of December 2024, a post-test will be carried out to determine the score in the *Education Management* course given after *the treatment.*

Once the data are collected, the researcher will focus on a few assumptions before the data are analyzed using a paired sample t-test.

Table 1. Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pre-Test	54.89	18	7.738	1.824
	Post-Test	80.67	18	5.980	1.410

The average student's pre-test score was 54.89; on the post-test, it was 80.67. This shows that implementing digital-based learning assisted by LMS has resulted in improvements. The post-test results showed that the average score of students taught with the help of LMS was higher than before. A paired sample t-test must calculate the difference between the two samples. This test helps determine the

difference between the student's pretest and posttest scores. The following hypotheses are used: (H1) There are differences in student learning outcomes in *the Education Management* course before and after using digital-based learning assisted by LMS. (H0) There is no difference in student learning outcomes in the Education Management course before and after using digital-based learning assisted by LMS, which will be discussed in the following section, which will be discussed in the following sections.

Table 2. Paired Samples Test

		Paired Differences							
					95% Confidence Interval of the Difference				
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	Sig. (2-tailed)
Pair 1	Pre-Test - Post-Test	-25.778	5.652	1.332	-28.589	-22.967	-19.349	17	.000

The difference between the two averages was calculated by paired t-test analysis. A significance level of 0.05, or 95% confidence, is the criterion for rejecting or accepting the null hypothesis. A statistically significant difference exists between the post-test and pre-test conditions if the value of sig. Less than 0.05 ($p<0.05$). Based on the calculation results, there is a significant value of 0.000, which means that H0 is rejected and H1 is accepted. This shows that LMS-assisted digital-based learning significantly impacts student learning outcomes in *the Education Management* course. These results show that this *treatment* effectively differentiates between post-test and pre-test significantly.

Discussion

This study aims to analyze the effectiveness of the Learning Management System (LMS) in improving student learning outcomes, especially in *the* Education Management course. The study's findings showed that using LMS significantly enhanced student learning outcomes, with an average post-test score (80.67) higher than the pre-test (54.89). Statistical analysis using paired sample t-tests also showed significant differences (sig. 0.000), indicating that LMS positively impacted student learning outcomes.

These findings align with previous research conducted by Al-Fraihat et al., which stated that the effectiveness of LMS in improving learning outcomes is greatly influenced by ease of use, content quality, and technical support (Al-Fraihat et al., 2020). In this study, LMS provides interactive and personalized learning materials, allowing students to learn at their own pace and according to their learning style. This is also supported by the research of Sun et al., which found that student satisfaction with LMS was positively correlated with improved learning outcomes (Sun et al., 2008).

However, these findings suggest improved learning outcomes depend on the technology and how the LMS is integrated into broader learning strategies. For example, research by Rahayu and Suryani shows that using LMS in theory-based courses is more effective when accompanied by active learning approaches, such as online discussions and collaborative assignments. This is in line with the findings of this study, where students not only access materials through LMS but also engage in learning activities that encourage active participation.

Although the findings of this study show significant improvement, it is essential to evaluate other factors that may affect learning outcomes. For example, research by Means et al. highlights that student motivation and faculty support play a key role in the success of digital learning. In this context, LMS is a support tool, but learning success also depends on how lecturers utilize LMS features to create meaningful learning experiences.

In addition, the study also reveals that LMS can help reduce gaps in learning access, especially in the context of distance learning. These findings align with Garrison's research, which states that digital learning, including using LMS, can improve learning accessibility and flexibility for students (Garrison, 1997). However, challenges such as the digital divide and lack of face-to-face interaction still need to be addressed to ensure all students benefit equally from LMS-based learning. Regarding these problems, the LMS feature still includes links to online games that can be solved together, so that the material that has been covered can be evaluated for its achievements.

The findings of this study can be interpreted as evidence that LMS is an effective tool to support digital learning transformation, especially in improving student learning outcomes. However, this interpretation needs to be considered in a broader context. For example, research by Selwyn cautions that educational

technology, including LMS, should not be seen as a single solution to all educational challenges (Selwyn, 2021). Instead, LMS should be considered part of a more holistic learning strategy, including curriculum development, faculty training, and improving students' digital literacy.

The findings of this study can be compared with other studies conducted in a similar context. For example, research by Rahayu and Suryani also found that using LMS can improve student learning outcomes, especially in theory-based courses (Suryani et al., 2021). However, this research adds a new dimension by exploring how LMS can support the personalization of learning and improve student engagement.

On the other hand, research by Means et al. shows that technology-based learning, including LMS, can improve student engagement and learning outcomes (Means et al., 2009). However, the study also highlights that the success of digital learning is highly dependent on factors such as student motivation and lecturer support. These findings align with this study, where the improvement in learning outcomes is not only due to the use of LMS but also to how LMS is integrated into broader learning strategies.

In addition, Sun et al.'s research found that system design and instructional quality influence student satisfaction with LMS. These findings are relevant to this study, where the LMS is designed to provide interactive and easily accessible materials, which may contribute to improved learning outcomes.

Based on the findings and analysis above, this study has several important implications for educational practice. First, LMS can effectively improve student learning outcomes, mainly when used in a learning context that encourages active participation and personalization. Second, academic institutions need to ensure that the LMS is used as a tool for delivering materials and as a platform to support student interaction and collaboration.

In addition, this study also recommends that lecturers and educational institutions pay more attention to factors such as student motivation, technical support, and lecturer training in using LMS. Thus, LMS can be optimally used to support digital learning transformation and improve student learning outcomes.

Conclusion

Based on the discussion and analysis that has been carried out, it can be concluded that the Learning Management System (LMS) plays one of the key roles in the transformation of digital learning and significantly contributes to the improvement of student learning outcomes, with an average post-test score (80.67) that is higher than the pre-test (54.89) and a statistically significant difference (sig. 0.000). The success of an LMS implementation depends not only on the technology itself, but also on supporting factors such as ease of use, content quality, technical support, and integration with active learning strategies. However, challenges such as the digital divide and the lack of face-to-face interaction must be addressed by providing access to devices and the internet, digital literacy training, and implementing hybrid learning models that combine online and face-to-face. With a holistic approach, LMS can be a sustainable solution to improve the quality of learning in the digital era as long as educational institutions conduct periodic evaluations and develop relevant and interactive content to meet student needs.

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