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DEVELOPMENT OF AN E-MODULE LEARNING SYSTEM BASED ON A LEARNING MANAGEMENT SYSTEM (LMS) ORIENTED TOWARDS SELF-EFFICACY TO IMPROVE COGNITIVE ABILITIES IN REMEMBERING AND UNDERSTANDING AMONG JUNIOR HIGH SCHOOL STUDENTS

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Abstract

This research aims to develop and test the feasibility, practicality, and effectiveness of social studies learning e-modules based onLearning Management System (LMS) mooc.um.ac.id which is oriented towards self-efficacion the material on Mitigating Mountainous Eruptions and its relationship to Sustainable Development Goals (SDGs). The research uses a multidisciplinary approach Research and Development(R&D) with the ADDIE development model (Analysis, Design, Development, Implementation, Evaluation The product was developed in flipbook format using Heyzine with visual design through Figma, then integrated into the LMS to organize the learning flow, activities, and evaluation. The e-module's feasibility was assessed through expert validation and obtained a very feasible category with an average of 99% (mean3.96). Student responses showed a very good level of acceptance with an average of 3.44 (86%). Learning effectiveness was analyzed using N-Gain with an average result of 0.858 (high category), indicating a significant increase in cognitive aspects C1 (remembering) and C2 (understanding). In addition, self-efficacy Students were in the high category (mean 3.09), indicating good confidence in learning through LMS. Thus, the LMS-based e-module developed was declared highly feasible and effective in supporting disaster mitigation-based social studies learning.

Keywords: *E-module; LMS; Self-Efficacy; Eruption Mitigation; ADDIE.*

INTRODUCTION

The rapid advancement of digital technology has significantly transformed educational practices through the integration of information and communication technologies in learning processes. One of the major innovations emerging from this transformation is the Learning Management System (LMS), which functions as a central infrastructure for delivering, managing, and facilitating interaction within digital learning environments. The implementation of LMS has become increasingly relevant in response to the demands of 21st-century learning, the post-COVID-19 transition toward online and blended learning, and the global commitment to Sustainable Development Goal (SDG) 4, which emphasizes inclusive and high-quality education.

Globally, the adoption of LMS has increased substantially (UNESCO, 2022). In Indonesia, LMS platforms such as Google Classroom and Moodle have been widely implemented in schools. In this context, LMS is expected not only to support accessibility to learning but also to improve the quality and effectiveness of educational processes. However, despite its widespread implementation, the pedagogical utilization of LMS remains limited. Previous studies indicate that LMS usage is often confined to administrative purposes, such as distributing materials and collecting assignments, without fully utilizing interactive features including discussions, quizzes, and collaborative activities (Kusumaningsih et al., 2026; Ananta et al., 2024).

This gap between the technological potential of LMS and its actual implementation is also evident at Junior High School at Laboratory UM, where LMS usage remains procedural and focused on basic learning activities. As a result, student engagement in the learning process tends to be limited, leading to suboptimal learning experiences. These limitations directly affect students' cognitive development, particularly at the foundational levels of remembering (C1) and understanding (C2), which according to Bloom's Taxonomy (1956) serve as essential prerequisites for higher-order thinking skills.

In addition to cognitive aspects, learning effectiveness in digital environments is strongly influenced by psychological factors, particularly self-efficacy. Self-efficacy refers to an individual's belief in their capability to complete tasks and achieve learning goals (Bandura, 1997). Students with higher self-efficacy tend to demonstrate greater confidence, motivation, persistence, and active participation in learning activities, including those conducted through LMS-based environments. Conversely, insufficient integration of self-efficacy principles into LMS-based learning design may hinder students' motivation and engagement, reducing the effectiveness of digital learning implementation.

If these issues are not addressed, LMS risks remaining merely an administrative tool rather than evolving into a transformative learning medium capable of supporting meaningful learning experiences. Therefore, there is a critical need for instructional innovation that integrates both cognitive and psychological dimensions in digital learning environments. One possible solution is the development of an interactive and systematic LMS-based e-module oriented toward self-efficacy, designed to improve student engagement and learning achievement.

Based on these considerations, this study aims to develop and evaluate the feasibility, practicality, and effectiveness of an LMS-based e-module oriented toward

self-efficacy. The study specifically focuses on improving students' cognitive abilities, particularly remembering and understanding, while simultaneously strengthening their self-efficacy, engagement, and confidence in digital learning contexts.

METHODS

This study employed a Research and Development (R&D) approach using the ADDIE model (analysis, design, development, implementation, and evaluation) to develop an LMS-based e-module oriented toward students' self-efficacy. The study used a one-group pretest-posttest design to examine the effectiveness of developed product.

The sample consisted of 27 eighth-grade students at Junior High Schools at Laboratorium UM, selected through purposive sampling based on their participation in LMS-based learning. Data were collected using expert validation sheets to assess content and media feasibility, student response questionnaires to measure practicality, a self-efficacy scale (four-point Likert) to evaluate students' confidence and cognitive tests (pretest and posttest) focusing on remembering (C1) and understanding (C2).

Data analysis was conducted using descriptive statistics to determine the feasibility and practicality of the e-module. The effectiveness of the intervention was analyzed using normalized gain (N-Gain) to measure students' learning improvement between pretest and posttest scores. This combination of methods ensured a systematic and measureable evaluation of the product in terms of validity usability, and instructional effectiveness.

RESULTS

E-Module Developtment and Feasibility

The developed LMS-based e-module was designed as an interactive flipbook integrated within the learning management system to support structured and self-directed learning. The module combines learning materials, activities, and evaluation features in a single environment. The interface and content organization are presented in figure 1, illustrating the integration between visual design and LMS functionality.

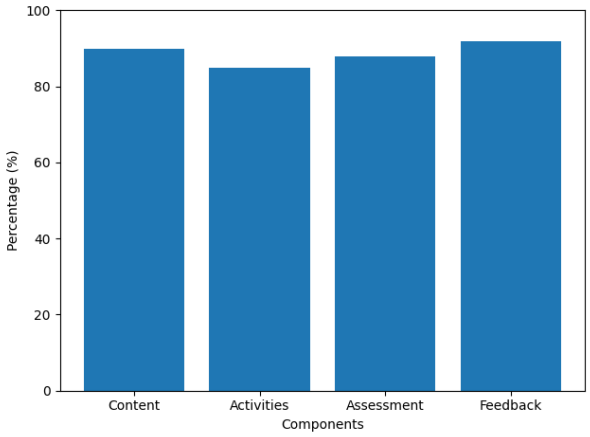

Figure 1. E-Module Visualization

The feasibility of the product was assessed through expert validation covering content, media, and instructional aspect. The results indicate that the e-module achieved a very high feasibility level, with an average score of 99% (mean = 3.96). This finding confirms that the developed product meets the standards for effective digital learning materials.

Practicality and Student Responses

The practicality of the e-module was evaluated through student response questionnaires. The result show a very positive level of acceptance, with an average score of 3.44 (86%). Students reported that the e-module was easy to use, visually engaging, and helpful in understanding the learning material. These findings indicate that the developed product is practical for classroom implementation.

Learning Effectiveness

The effectiveness of the e-module was measured using a pretest-posttest design. The comparison of students' scores before and after the implementation is visualized in Figure 2 showing a clear improvement in learning outcomes after using the e-module.

Further analysis using normalized gain (N-Gain) shows an average score of 0.858, which is categorized as high. The descriptive statistic indicate a mean score of 858 with a standard deviation of 10.9, reflecting consistent improvement among students. A summary of the N-Gain analysis is presented in table 1.

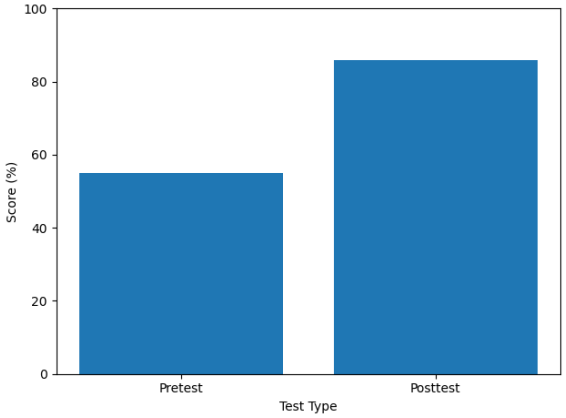

Figure 2. Pretest vs Posttest scores

Table 1. Summary of N-Gain Analysis

Metric	Value
Mean Score	85.8
Standard Deviation	10.9
N-Gain	0.858

Students' Self-Efficacy

Students' self-efficacy was measured using a four-point Likert scale. The result show an average score of 3.09 (77%), which falls into the high category. This indicates that students have strong confidence in engaging with LMS-based learning, including accessing materials, completing tasks, and practicipating in learning activities.

Overall, the findings demonstrate that the developed LMS-based e-module is feasible, practical and effective in improving students cognitive abilities-practicularly remembering (C1) and understanding (C2)- as well as enhancing their self-efficacy in digital learning environments.

DISCUSSION

Interpretation of Findings

The findings of this study indicate that the developed LMS-based e-module demonstrates strong potential as an effective digital learning resource. The high level of feasibility reflects that the integration of instructional design, content organization, and media elements has been successfully aligned with established standards of digital learning materials. This is consistent with previous studies emphasizing that well-designed digital modules can enhance learning structure and accessibility, particularly in LMS environments (Hodges et al., 2020; Al-Fraihat et al., 2020).

The positive student responses toward the practicality of the e-module further highlight the importance of usability and interface design in digital learning. Ease of navigation, clarity of instructions, and interactive elements contribute significantly to user acceptance and engagement. Similar findings have been reported by Martin et al. (2019), who argue that student satisfaction in online learning environments is strongly influenced by system usability and instructional clarity. In this study, the integration of structured activities within the LMS appears to support more active student participation.

In terms of learning effectiveness, the observed improvement in students' cognitive abilities suggests that the e-module successfully supports foundational learning processes. The enhancement of remembering and understanding aligns with Bloom's taxonomy, which positions these levels as essential for the development of higher-order thinking skills (Anderson & Krathwohl, 2001). This finding is in line with research by Mayer (2021), which highlights that well-structured multimedia learning environments can improve knowledge retention and conceptual understanding.

The effectiveness of the e-module can also be attributed to the integration of interactive components such as guided tasks and formative assessments. These elements encourage active engagement and continuous feedback, which are critical factors in improving learning outcomes. Previous studies have shown that interactive LMS-based learning environments significantly enhance student performance compared to passive content delivery (Sun & Chen, 2016; Broadbent & Poon, 2015).

Implications and Contributions

Beyond cognitive outcomes, the findings also demonstrate the important role of self-efficacy in digital learning environments. The high level of students' confidence suggests that the e-module design successfully supports learners' belief in their ability to complete learning tasks. This aligns with Bandura's (1997) theory, which posits that self-efficacy influences motivation, persistence, and learning achievement. Students who feel confident in navigating LMS platforms are more likely to engage actively and complete learning activities effectively.

The integration of self-efficacy elements—such as scaffolding, gradual task progression, and feedback—appears to play a crucial role in shaping students' learning experiences. This is supported by Schunk & DiBenedetto (2020), who emphasize that instructional strategies that enhance self-efficacy can significantly improve learning engagement and outcomes. In this context, the e-module not only functions as a content delivery tool but also as a psychological support mechanism that fosters learner autonomy.

From a broader perspective, the findings confirm that LMS-based learning can be more effective when supported by well-designed instructional materials rather than relying solely on platform functionality. This supports the argument by Moore & Kearsley (2012) that the effectiveness of online learning depends not only on technology but also on instructional design quality. Without such integration, LMS risks being reduced to a mere administrative tool.

The practical implications of this study suggest that educators should prioritize the development of structured and interactive e-modules when implementing LMS-based learning. Integrating cognitive and psychological aspects, particularly self-efficacy, can enhance both student engagement and learning outcomes, especially in secondary education contexts.

Theoretically, this study contributes to the literature on digital learning by demonstrating the combined impact of instructional design and self-efficacy in LMS-based environments. It reinforces the importance of integrating cognitive processes with learner-centered design principles. Overall, the developed e-module provides a meaningful contribution to improving the quality of digital learning and supports more effective and sustainable educational practices.

CONCLUSION

This study concludes that the developed LMS-based e-module oriented toward self-efficacy is feasible, practical, and effective for supporting learning in digital environments. The integration of structured content, interactive activities, and self-efficacy elements contributes to improved student engagement and enhances foundational cognitive abilities, particularly in remembering and understanding. These findings indicate that combining instructional design quality with psychological support elements can optimize the effectiveness of LMS-based learning and strengthen students' confidence in engaging with digital platforms.

However, this study is limited by its implementation in a single class with a relatively small sample size, which may affect the generalizability of the findings. Future research is recommended to involve larger and more diverse samples, as well as to explore the impact of LMS-based e-modules on higher-order thinking skills and other psychological factors. Further studies may also examine long-term learning outcomes and the integration of more advanced interactive features to enhance digital learning effectiveness.

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