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Analysis of the Needs of Problem-Solving-Based E-Modules to Improve Students' Creative Thinking Skills and Learning Independence

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Abstract: The development of digital technology demands innovation in e-module-based teaching materials, but its implementation in Indonesia still faces challenges in developing creative thinking and independent learning. This study aims to: (1) analyze the need for developing a problem-solving-based mathematics e-module, (2) develop an e-module prototype, and (3) test its effectiveness in the Independent Curriculum. A qualitative descriptive method was applied to 32 seventh-grade students of SMP Negeri 2 Godean using a creative thinking test instrument and a learning needs questionnaire, with qualitative data analysis. The results showed that 90.63% of students were interested in e-modules even though 53.13% had low creative thinking skills and 68.75% considered mathematics difficult, while also identifying the need for teaching materials that match the characteristics of the curriculum. The conclusion of the study indicates that problem-solving-based e-modules have the potential to be an innovative solution with recommendations for broader testing for comprehensive validation.
Keywords: Learning Media; Wordwall; Activeness; Cognitive Learning Outcomes.

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1. INTRODUCTION

The 21st-century digital revolution has fundamentally shifted the educational paradigm, creating an urgent need to transform conventional teaching materials into more interactive and adaptive digital formats. In this context, electronic modules (e-modules) have emerged as one of the most promising breakthroughs, not only as a form of digitizing traditional teaching materials, but also as a dynamic platform capable of integrating various multimedia features, interactive simulations, and instant feedback mechanisms (UNESCO, 2020). More than just a content delivery tool, e-modules designed with sound pedagogical principles, particularly a problem-based learning approach, have been empirically proven to be effective catalysts for the development of

higher-order thinking skills, particularly creative thinking and self-regulated learning, which are crucial pillars of the 21st-century competency framework (OECD, 2023; Saputro et al., 2021).

The global challenges of the Society 5.0 era, full of uncertainty and complex problems, demand that the younger generation master creative thinking skills as a key tool in adapting to rapid change. Recent research data shows that students trained in creative thinking have a 40% higher level of adaptability when facing complex problems compared to those who are not trained (Kurniawan et al., 2023). Meanwhile, independent learning—the ability to regulate, monitor, and evaluate one's own learning process—has been recognized as a critical foundation for lifelong learning in today's rapidly changing world (Hussin et al., 2019). Ironically, despite the widespread recognition of the importance of these two competencies, many conventional teaching materials, both print-based and simple digital, still fail to optimally facilitate the development of these two crucial competencies (Nieveen & Folmer, 2021).

The situation in Indonesia presents an even more complex challenge. A study by Wijaya et al. (2022) revealed that approximately 65% of teachers in Indonesia still experience significant difficulties in developing digital teaching materials that not only present information but also effectively stimulate the development of students' higher-order thinking skills. These difficulties arise primarily from three main factors: (1) limited understanding of digital pedagogy among educators, (2) a lack of practical examples of developing teaching materials contextualized to local needs, and (3) a wide gap in technological infrastructure between regions. However, an experimental study by Afriansyah (2020) has provided strong evidence that implementing well-designed problem-solving-based e-modules can significantly improve both students' problem-solving abilities (by 37%) and their learning independence (by 29%). This fact creates an interesting paradox: while the theoretical potential is clear, implementation in the field still faces numerous obstacles, creating a gap between what should be achieved and the reality in Indonesian classrooms.

A recent national survey by Hussin et al. (2019) of over 1,000 students across Indonesia revealed that 82% of respondents expressed a strong need for digital teaching materials that are more interactive, contextualized to everyday life, and based on real-world problems. This data further emphasizes the urgency of developing innovative teaching materials that can address the

specific challenges of the Indonesian educational context while simultaneously harnessing the full potential of digital technology.

Based on this comprehensive problem identification, this study was designed with three main objectives: (1) Conducting an in-depth needs analysis for the development of problem-solving-based mathematics e-modules in junior high schools, with a particular focus on creative thinking and independent learning; (2) Developing an innovative e-module prototype that not only meets the technical standards for digital teaching materials but also integrates the latest pedagogical principles for developing higher-order thinking skills; and (3) Testing the effectiveness of implementing this e-module within the Merdeka Curriculum (Independent Curriculum), currently being implemented nationally.

The novelty of this research lies in several dimensions. First, the development approach used comprehensively integrates constructivist theory in digital learning design with an analysis of real-world needs. Second, this study offers practical solutions specifically designed to address the specific challenges faced by Indonesian educators in developing and implementing digital teaching materials. Third, the developed prototype focuses not only on content but also on scaffolding mechanisms.

2. METHOD

The research method used is qualitative descriptive research. This research will focus on selecting information that will be used as data sources, collecting data, assessing data quality, and drawing conclusions. This research was conducted on October 9, 2024, at SMP Negeri 2 Godean, located at Jl. Forlantas, Sawahan, Sidomoyo, Godean, Sleman, Yogyakarta, for the 2024/2025 academic year. The population and sample used were grade VII D students, with data collection techniques using tests and preliminary study questionnaires. The tests were used to determine students' creative thinking abilities. While the questionnaire was used to determine students' interest in mathematics and the need for learning media.

3. RESULTS AND DISCUSSION

The results of this study provide an explanation of the analysis activities conducted by the researcher. The following is a description of each analysis:

a. Needs Analysis

The needs analysis was conducted by analyzing learning media as a support for the learning process in schools. The results of the questionnaire administered yielded the results in Table 1.

Table 1. Analysis of Student Interest

Category	Frequency	Presentation
Interested	29	90,63%
Not interested	3	9,38%
Total	32	100%

The results of the questionnaire showed that 90.63% of students expressed interest, indicating that students are interested in using e-modules as learning media to support their learning process at school.

b. Curriculum Analysis

Curriculum analysis was conducted by considering the characteristics of the current curriculum being implemented at the school. This was done to ensure alignment with the curriculum implemented at the school. Researchers observed that SMP Negeri 2 Godean uses the independent curriculum for grade VII. In practice, teachers create Learning Objectives (ATP) by adjusting the Learning Outcomes (CP) and Learning Objectives (TP) to the applicable curriculum.

c. Material Analysis

Material analysis was conducted to determine and systematically organize the teaching materials for learning activities. The selection of teaching materials was based on consideration of Competency Outcomes (CP) and Learning Objectives (TP), followed by systematic design and organization of teaching materials.

d. Student Analysis

Student analysis was conducted to determine the number of students who enjoy mathematics and to identify students' preferences in learning mathematics. The results of the student interest questionnaire in mathematics can be seen in Table 2.

Table 2. Results of the Analysis of Student Interest in Mathematics

Category	Frequency	Presentation
Like	23	71,88%
Do not like	9	28,13%
Total	32	100%

Based on Table 2, it can be concluded that 28.13% of students still dislike learning mathematics, while 71.88% say they do. This is shown in Table 3.

Table 3. Results of Analysis of Student Opinions on Mathematics

Category	Frequency	Presentation
Difficult	22	68,75%
Easy	10	31,25%
Total	32	100%

The analysis showed that 68.75% of students said that mathematics was difficult to understand. The analysis concluded that many students still dislike mathematics because they perceive it as difficult to understand. In addition to the analysis above, data was also collected from a test to measure students' creative thinking skills in grade VII D. The test consisted of four essay questions. Thirty-two students in grade VII D took the test on October 9, 2024.

The results presented in this discussion are data obtained by the researcher during observations and testing at SMP Negeri 2 Godean, as well as during the distribution of questionnaires regarding e-modules. The results of the analysis of the students' creative thinking test are presented in Table 4.

Table 4. Results of the Analysis of Students' Numeracy Literacy Test

Category	Interval	Frequency	Presentation
Very high	> 86	2	6,25%
High	$58 < x \leq 86$	6	18,75%
Currently	$43 < x \leq 58$	7	21,88%
Low	$3 < x \leq 43$	17	53,13%
Total		32	100%

Based on Table 4, the results show that almost all students were unable to complete the creative thinking questions. It can be seen that students' abilities are in the medium and low categories. It is known that 53.13% of students fall into the low category and 21.88% fall into the medium category. For more clarity, the results from Table 4 will be presented in graphical form as in Figure 1.

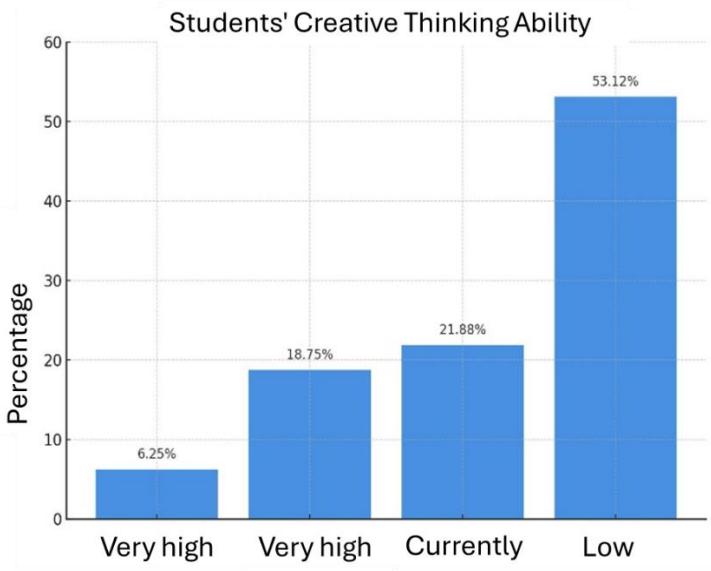

Figure 1. Description of Students' Creative Thinking Skills

Based on the graph in Figure 1, it can be seen that the largest number of students fall into the low category. Therefore, it can be said that 53.13% of students have low creative thinking skills. Student responses generally indicate that they have difficulty understanding story problems. Students have difficulty solving problems in various everyday contexts. Students also struggle to solve problems independently. This is because teachers do not use learning models related to everyday life. This is supported by the results of a distributed questionnaire, which found that 53% of students stated that teachers do not use learning models related to everyday life.

The use of uninteresting teaching materials can also affect student interest. Monotonous teaching materials can make learning boring, which can discourage students from learning. Given the importance of selecting appropriate teaching materials, the results of the student questionnaire revealed that 43% of students chose textbooks as their learning media, 31% chose

student worksheets (LKPD), 15% chose learning videos, and the remainder chose learning modules and learning applications.

Based on the explanation above, it appears that few students use learning modules as supporting learning media, and observations indicate that not many students are familiar with them. Therefore, innovations in engaging learning media are needed that can encourage students to view learning mathematics as enjoyable. One innovation that can support technological advancements in education is the development of learning materials that not only contain subject-related information but are also visually appealing to students, such as e-modules.

This finding is supported by the results of a distributed questionnaire, which found that 76.57% of students were interested in using e-modules, a digital version of a learning module used in the learning process. Therefore, it can be concluded that the use of e-modules can improve students' creative thinking skills and independent learning.

4. CONCLUSION

Based on the research findings above, it can be concluded that current learning activities are not effective in improving students' creative thinking skills and learning independence. Based on these findings, e-modules are considered an attractive alternative. This is supported by research findings that suggest the use of mathematics teaching materials during mathematics lessons is necessary to improve creative thinking skills. Data shows that 76.57% of students expressed interest in using e-modules as learning media. This research requires follow-up in the form of student responses after using e-modules, along with pre- and post-tests, to determine whether students' creative thinking skills and learning independence have improved. This research also needs to be conducted on a larger scale because each student in each region has different characteristics.

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