

## Analysis of the Need for Developing an Interactive E-Module in Phase D Science Learning to Improve Students' Critical Thinking Skills



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**ABSTRACT:** This study was conducted to develop an interactive e-module as a teaching material to enhance students' critical thinking skills. Therefore, a preliminary study consisting of a literature review and field study was necessary. The teaching material developed is an Interactive E-Module for science learning. The purpose of this study is to analyze the need for teaching materials in the form of an Interactive E-Module for Science Learning in Phase D to improve students' critical thinking skills. This research employs a qualitative descriptive approach. The data collection instruments include a teacher needs analysis interview questionnaire, a student needs analysis questionnaire, and the average critical thinking skills score. The results indicate that the average critical thinking skills score is relatively low, with an achievement percentage of 43.55%. While 95.6% of students have a textbook for learning, 53% of them stated that the textbook is insufficient as a learning resource. Additionally, 67.3% of students expressed the need for additional learning materials that can support learning activities and be easily understood independently. These findings highlight the necessity of developing an Interactive E-Module for science learning to enhance students' critical thinking skills.

**KEYWORDS:** Interactive E-Module, Science Learning, Students' Critical Thinking

### I. INTRODUCTION

Science learning in Phase D plays a crucial role in shaping students' scientific thinking patterns. According to the National Research Council (2012), science education should emphasize conceptual understanding and the development of critical thinking skills to enable students to analyze and solve problems logically. Critical thinking skills are one of the key competencies in the *Kurikulum Merdeka* implemented in Indonesia (Kemendikbud, 2022). According to Facione (2015), critical thinking encompasses the analysis, evaluation, and interpretation of information to make well-informed decisions.

Utilizing technology effectively, especially with the advancement of digital media, can enhance student engagement in science learning. Interactive e-modules offer a more engaging learning experience by incorporating multimedia features, simulations, and interactive quizzes that facilitate the exploration of scientific concepts (Munir, 2020). Research conducted by Prastowo (2019) also indicates that implementing e-modules in education can improve students' motivation and comprehension of the subject matter. The advantage of interactive e-modules in supporting critical thinking skills lies in their design, which allows students to actively engage in the learning process. According to Mayer (2021), multimedia-based learning can help students organize information, connect concepts, and enhance problem-solving abilities. Therefore, the development of interactive e-modules in science education is crucial to promote students' critical thinking skills. Critical thinking skills should be taught to students as they progress in age in the 21st century (Sagita et al., 2021).

However, in reality, science learning in Indonesia is still dominated by lecture-based methods that do not actively engage students in critical thinking activities (Susanti, 2021). Additionally, some studies have shown that students at the junior high school level still struggle to develop these skills due to the lack of cognitively challenging teaching approaches (Sari et al., 2023). A similar issue was found at SMP Negeri 3 Lubuk Sikaping. Based on observations, it was noted that learning at the school tends to be teacher-dominated, with teachers showing limited innovation in using learning media, and the available teaching materials are insufficient for each student. As a result, this has led to low critical thinking skills among students.

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The low critical thinking skills among students indicate that the current learning methods have not fully habituated students to think critically and solve problems (Herlina et al., 2020). Empowering critical thinking in students is essential so they can address various problems in daily life. Critical thinking in students can be observed not only through their ability to answer or solve problems, but also through the quality and types of questions they ask. Essentially, students possess critical thinking skills in learning, such as questioning, hypothesis formulation, classification, observation, and interpretation (Yustyan, 2015). Critical thinking skills should be empowered through school learning, especially in science education, as critical thinking is a vital 21st-century skill that students must possess (Saavedra & Opfer, 2012).

In 21st-century learning, its implementation has seen significant advancements in technology. Along with the development of time and technology, the form of learning modules can now be presented in different formats, such as digital formats, commonly known as e-modules. An e-module is a form of self-learning material that is systematically organized into learning units and presented electronically. E-modules are a practical and effective learning resource compared to printed modules, as they can be stored on computers or laptops. Additionally, a limitation of printed modules is that they cannot include videos in their presentation, whereas e-modules can incorporate videos into the content (Juianti et al., 2015).

This is in line with the explanation provided by Surjono (2013), who stated that electronic learning, or e-learning, plays an important role in education because it allows learning materials to be accessed anytime and anywhere. Based on this issue, a needs analysis was conducted for the development of an interactive e-module as an effort to enhance students' critical thinking skills. The aim of this study is to analyze the need for teaching materials in the form of an interactive e-module in Phase D Science learning to improve students' critical thinking skills.

## II. METHODS

This study uses a qualitative approach, where the researcher is not aware of how previous events are related to the variables being investigated. One of the main characteristics of qualitative research lies in its focus, which involves an intensive study of a particular situation, such as a case or phenomenon (Gall et al., 2003). The research was conducted at SMP Negeri 3 Lubuk Sikaping, with the subjects being 113 seventh-grade students from class VII and one science teacher. The data collection instruments included a teacher needs analysis interview sheet, a student needs analysis questionnaire, and test score results.

## III. RESULT AND DISCUSSION

### RESULT

According to the teacher needs analysis during the observation and interview, the following information was gathered.

#### Hasil Kebutuhan Guru

The analysis of the teacher's needs regarding learning resources and teaching media was conducted through an interview process using the following interview guide:

1. What learning resources are used in class VII at SMP Negeri 3 Lubuk Sikaping for science lessons?
2. What do you think are the strengths and weaknesses of the teaching materials currently used?
3. Have you ever developed teaching materials independently for science lessons?
4. What media do you use in science lessons?
5. Have you ever used electronic teaching materials such as interactive e-modules?
6. What is your opinion on interactive e-modules?
7. How do you assess student performance with the current teaching system that you have implemented?
8. Have you ever measured students' critical thinking skills?
9. How do you assess students' critical thinking abilities?
10. What is your opinion on students' current critical thinking skills?

Table 1. Teacher Needs Analysis During Observation

No	Analysis of the Questions
1	Teachers still rely on textbooks and student worksheets (LKS), and have not yet fully utilized interactive digital resources. There is a need for teaching materials based on technology, such as e-modules
2	There is a need for teaching materials that are more engaging and interactive
3	Teachers have shown initiative in developing teaching materials, but these are still in a simple form
4	Teachers have started using digital media, but it has not been fully optimized

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5	There is a need for introduction and training in the use of e-modules.
6	Teachers have a positive view of interactive e-modules
7	Learning needs to be more innovative and engaging so that all students are motivated to participate in the lessons
8	Teachers have attempted to assess critical thinking skills, but the methods used are still limited
9	Teachers have implemented good teaching methods
10	There is a need for teaching strategies that encourage students to think critically

### Results of Student Needs Analysis

Based on the results of the pre-research questionnaire distributed to 113 seventh-grade students, the following findings were obtained:

**Table 2. Results of Student Needs Analysis Questionnaire**

No	Questions	frequency		Percentage	
		Yes	No	Yes	No
1	Do you have a textbook for learning Science?	108	5	95,6	4,4
2	Do you think your textbook is sufficient as a learning resource for Science?	60	53	53	47
3	Do you look for additional materials besides school textbooks to learn Science, such as modules or online resources?	37	76	32,7	67.3
4	Do you like learning Science?	101	12	89,4	10,6
5	Are you interested in learning Science if the problems presented in the lessons are related to everyday life?	91	22	80,5	19,5
6	Do you have difficulty understanding the material through the learning resources and teaching methods used by the teacher?	61	52	54	46
7	<b>Has your Science teacher ever used an E-Module in teaching?</b>	12	101	10,6	89,4
8	Do you like learning with the use of media?	98	15	86,7	13,3
9	Would you like to try learning using an Electronic Module (E-Module)?	92	21	81,4	18,6
10	Do you need learning materials that can be used to study Science concepts in a more accessible and engaging way?	103	10	91,2	8,8

**Table 3. Analysis of Student Needs**

No	Analysis of the Questions
1	95.6% of students have a textbook, while only 4.4% do not have one.
2	53% feel that their textbooks are sufficient as a learning resource for Science, while 47% feel that they are inadequate.
3	32.7% of students seek additional learning resources, while 67.3% do not look for additional resources.
4	89.4% of students enjoy Science, while 10.6% do not like the subject.
5	80.5% are interested in learning Science if the problems presented in the lessons are related to real-life situations, while 19.5% are not interested in such lessons.
6	54% of students have difficulty understanding the material through the teaching materials and methods used by the teacher, while 46% do not have difficulty understanding them.
7	10.6% of teachers have used E-modules in teaching Science.
8	86.7% of students enjoy learning with the use of media, while 13.3% do not like learning with media.
9	81.4% of students are interested in trying to learn using E-modules, while 18.6% are not interested in trying them.
10	91.2% of students need learning materials that can be used to learn Science concepts more easily and engagingly, while 8.8% do not need such materials.

### Results of Critical Thinking Skills Scores

To determine the category of students in critical thinking skills, it can be presented in Table 4.

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Table 4. Average Score Percentage of Students' Critical Thinking Skills per Class

No	class	Average
1	VII.1	43,6
2	VII.2	43,5
Average		43,55

### DISCUSSION

#### Teacher Needs Analysis

Based on the interview results with the science teacher, several key findings were obtained. The teacher has never independently developed teaching materials and primarily relies on teacher's books, student books, and the internet as learning resources. Science learning at SMP Negeri 3 Lubuk Sikaping has not yet utilized modules as supplementary learning resources for students. The current teaching approach does not actively engage students, leading to passive learning. Additionally, science instruction has mainly focused on knowledge acquisition, which has resulted in underdeveloped critical thinking skills among students.

To address this issue, science learning should be structured using an engaging module that enhances students' thinking skills. Empowering critical thinking skills can be achieved by implementing student-centered learning. According to Emily (2011), critical thinking skills can be nurtured through content that is not solely focused on specific knowledge but rather on real-life problems that students encounter. Understanding the causes of events or phenomena in everyday life can be effectively addressed through problem-solving processes as a means of finding solutions to these phenomena.

#### Analysis of Students' Needs

The results of the student needs analysis survey indicate that while students have textbooks for learning science, these resources are not entirely sufficient as learning materials. Many students find the content in their textbooks difficult to understand and require additional learning resources that support independent study. One such resource that is systematically structured and facilitates self-directed learning is the e-module.

An e-module is a form of self-learning material systematically organized into small learning units to achieve specific learning objectives. It is presented in an electronic format, with each learning activity linked to navigational links, making students interactively engaged with the program. Additionally, e-modules incorporate videos, animations, and audio to enrich the learning experience (Gunadarma, 2011).

#### Analysis of Students' Critical Thinking Skills

The analysis of critical thinking skills among seventh-grade students at SMP Negeri 3 Lubuk Sikaping indicates that the average percentage of critical thinking skills in Class VII.1 is 43.6%, while in Class VII.2, it is 43.5%. Overall, the average critical thinking skill level across both classes is 43.55%, which suggests that students' critical thinking skills are still relatively low. Critical thinking is an essential competency in 21st-century learning. It encompasses the ability to analyze, evaluate, and synthesize information to solve problems rationally and logically. In science learning, critical thinking skills are crucial for students to understand concepts deeply and apply their knowledge in real-life situations. The low average critical thinking skill level indicates that current teaching methods do not fully support the development of students' critical thinking abilities. Several contributing factors include conventional teaching methods, minimal use of interactive media, and limited student engagement in activities that promote in-depth analysis. Interactive e-modules in science learning have the potential to be a solution for improving students' critical thinking skills. These e-modules can present more engaging content, provide simulations or animations to facilitate concept comprehension, and offer interactive exercises that enhance critical thinking skills. Additionally, interactive e-modules allow students to learn independently and receive immediate feedback on their responses, enabling them to evaluate and continuously improve their understanding.

### V. CONCLUSIONS

Based on the need's analysis, it can be concluded that students' critical thinking skills are still relatively low. Students require a learning resource that supports their learning activities and can be understood independently. Therefore, the most suitable teaching material to use is the Interactive E-Module, as it contains text, images, and videos, making it easier for students to understand the material. Additionally, the E-Module includes exercises designed to train students in critical thinking. Thus, with the presence of this Interactive E-Module, students' critical thinking skills can be improved.

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