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Development of Interactive Learning Media Based on Digital Platforms to Improve Critical Thinking Skills in Primary School Science Education

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Abstract. The study aims to analyze how the use of interactive learning media based on digital platforms impacts students' critical thinking skills. By collecting quantitative and qualitative data, it is hoped that comprehensive information can be obtained regarding the extent to which interactive learning media influences the development of students' critical thinking skills. The methods used are qualitative analysis: Using ADDIE analysis to identify themes and patterns that emerge from interviews and observations and quantitative analysis: Using pre-tests and post-tests to measure students' critical thinking skills before and after the use of learning media and using questionnaires to collect data on students' attitudes towards science learning using interactive media based on digital platforms. In the pre-test, only 6 of 21 students (around 29%) achieved or exceeded the KKM (65). In the post-test, all 21 students (100%) achieved the KKM. This shows a significant increase in learning outcomes after treatment/intervention using interactive media based on digital platforms.

Keywords: learning, digital, interactive, platform, IPAS learning

1. Introduction

This study aims to develop interactive learning media based on a digital platform for IPAS learning at Labi-Labi State Elementary School. In addition, this study also aims to analyse how the use of interactive learning media based on a digital platform impacts students' critical thinking skills. Labi-Labi State Elementary School is one of many schools that have not been touched by increasingly advanced technological developments. Facilities in the form of learning media are also not yet fully available. The use of interactive learning media based on digital platforms is expected to create a more interesting and enjoyable learning experience for students and teachers at Labi-Labi State Elementary School. By actively involving students, this media can help them better understand the concepts being taught. The development of interactive learning media based on digital platforms is also expected to improve the critical thinking skills of students at Labi-Labi State Elementary School. The urgency of this research is how to develop interactive learning media based on a digital platform that is specifically designed for students at Labi Labi State Elementary School with a focus on IPAS learning. The media developed will not only present information but will also encourage students to think critically through various interactive activities. For example, students will be given tasks to analyse data, compare information, and draw conclusions from various sources.

The modern era of education requires critical thinking skills, which are among the most needed skills, especially at the primary education level. Ennis (1) argues that critical thinking is the ability to analyse, evaluate, and construct arguments logically. At the primary education level, the development of this skill greatly influences students' ability to face future challenges. A person's life will be considered meaningful if they have an education. Kolong (2). On the other hand, the teaching of Natural and Social Sciences (IPAS) at Labi-Labi State Primary School also faces various obstacles.

Many students find it difficult to understand the basic concepts of IPAS taught, resulting in low critical thinking skills. Interactive learning media based on digital platforms is one solution that can be used to increase student motivation and learning success. Hidayati (3) explained that the use of interactive media can make students more active in the learning process, thereby increasing their understanding of the material taught.

The application of interactive learning media is expected to solve the problems that exist at Labi-Labi State Elementary School, while motivating students to think critically in solving problems encountered in IPAS learning. The development of digital platform-based interactive learning media is also in line with Point 4 of Asta Cita regarding Human Resource Development, Science, Technology, Education, Health, Sports Achievement, Gender Equality, and the empowerment of Women, Youth, and People with Disabilities, as well as global trends in education. Hwang (4) states that a smart learning environment can support students in developing 21st-century skills, including critical thinking. In this context, this study aims to explore how interactive learning media can be implemented to improve students' critical thinking skills in IPAS learning at Labi-Labi State Elementary School.

Many studies have been conducted to explore the use of digital technology in improving the quality of learning, including: The development of interactive learning media specifically designed for primary school students with a focus on IPAS learning. The media developed will not only present information but will also encourage students to think critically through various interactive activities. This is in line with Piaget's constructivism theory (5) and Lestari's research (6). The integration of gamification elements in the interactive learning media to be developed. This is in line with the research by Deterding et al. (7). However, research on the integration of gamification in elementary school science learning to improve critical thinking skills is still limited. Based on these issues, this study aims to develop digital-based interactive media to improve critical thinking skills. This study is expected to provide a model that can be used by other schools in Indonesia to develop interactive learning media.

2. Methods

The research method used in this study was the research and development (R&D) method. This research approach followed the R&D model with ADDIE steps, namely Analysis, Design, Development, Implementation, and Evaluation.

The first analysis stage was conducted to determine the learning media needs that were appropriate for the characteristics of students at Labi-Labi State Elementary School. At this stage, surveys and interviews were conducted with teachers and students to identify the obstacles faced in existing IPAS learning. After the needs analysis, the next stage was the design of interactive learning media. In this stage, the media design will be created by considering interactive elements that can stimulate student engagement, such as the use of animations, videos, and interactive quizzes that can help students better understand IPAS concepts. This is in line with research conducted by Rahmawati (8), which shows that the use of interactive media can increase student motivation and engagement in learning.

In the development stage, the designed learning media will be tested to ensure its functionality and effectiveness. This test involves students in the class who will use the media. Research by Prasetyo (9) shows that product testing in the development of learning media is very important to ensure that the media meets the expected quality standards. The use of digital platforms is expected to increase student participation in science learning. Research by Setiawan (10) explains that students who learn using interactive media have higher participation rates compared to traditional methods.

Evaluation is the final step in the ADDIE model, where the effectiveness of interactive learning media will be measured. The evaluation method used can be in the form of pre-tests and post-tests to measure the improvement in students' critical thinking skills. The data obtained from this evaluation will be used to determine whether the interactive learning media created can have a positive impact on the critical thinking skills of students at Labi-Labi State Elementary School. This approach is expected to enable the development of digital platform-based interactive learning at Labi-Labi State Elementary School to run well, intelligently, and sustainably for elementary school students. Wang (11) states that the individual use of technological devices is not a priority for the Ministry. Technological tools are focused more on schools and teachers. The ADDIE steps are shown in Figure 1.

Figure 1. *ADDIE's Steps.*

3. Results and Discussion

The Pre-Test and Post-Test results are shown in Table 1.

Table 1. Data from the pre-test and post-test results of students at Labi-labi State Primary School

Number	Statistics	Statistics Value	
		Pre-test	Post-test
1	Minimum score	50	75
2	Maximum score	75	90
3	Sum (□)	1200	1720
4	Mean (x)	57.4	81.90
5	Minimum passing grade (65)	29%	100%

Calculation of learning completeness using equation 1.

$$P = \frac{W}{n} x100\% \quad (1)$$

where P is the percentage of students who have mastered the material, W is the number of students who have mastered the material, and n is the total number of students.

The number of students involved was 21. In the pre-test, only 6 of the 21 students (approximately 29%) achieved a score equal to or above the minimum passing grade (65). In the post-test, all 21 students (100%) achieved the minimum passing grade. This shows a significant improvement in learning outcomes after the treatment/intervention using interactive media based on a digital platform.

The Pre-Test and Post-Test results are shown in Figure 2.

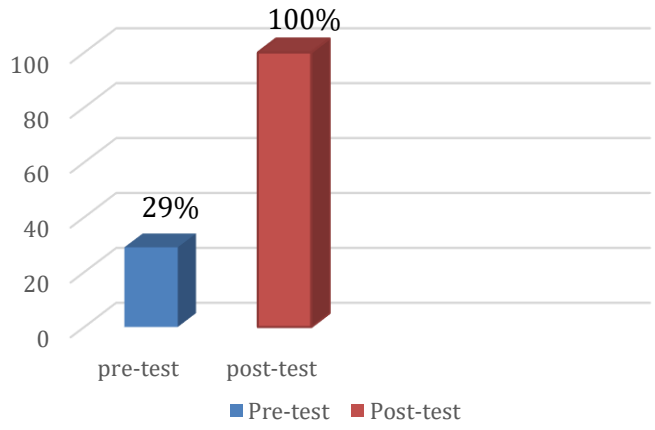

Figure 2. Diagram of Pre-Test and Post-Test results.

The explanation of Figure 2 is as follows. The X-axis (horizontal) of the diagram shows two types of tests, namely Pre-Test and Post-Test. The Y-axis (vertical) shows the percentage of learning completeness from 0% to 100%. The blue bars represent the Pre-test and the red bars represent the Post-test. The percentage above the bar for the Pre-Test is 29% and for the Post-Test is 100%. The Pre-Test diagram results show that only 29% of students achieved a score above or equal to the minimum passing grade (65) before the learning process. This means that only about 6 out of 21 students were considered to have completed their learning at the initial stage. Meanwhile, the Post-Test diagram results show that all students (100%) successfully achieved the minimum score (KKM) after learning. This means that there was an increase in mastery of 71%, from 29% to 100%. (12-15).

The analysis and interpretation are described as follows. A significant increase occurred after the learning intervention was carried out. The learning provided succeeded in improving students' overall understanding. The difference between the pre-test and post-test reflects that the learning media used was very effective. This diagram shows the success of the learning process that was implemented. Thus, the learning objectives were achieved and all students understood the material taught.

The teacher and student assessment questionnaire diagram is shown in Figure 3.

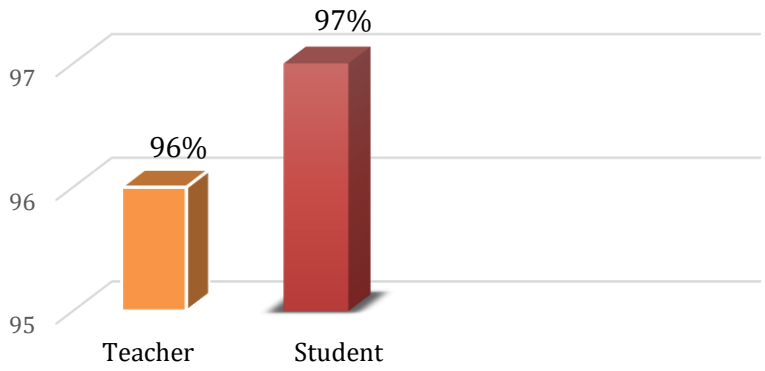

Figure 3. Diagram of the Teacher and Student Assessment Questionnaire.

Based on Figure 3, the student assessment questionnaire obtained an average student response value of X = 1020/21 = 48.57 and for teachers it was: Average teacher response value X = 580/12 = 48.33. The maximum overall score for the questionnaire is: 5x10 = 50. Five is the highest possible score (strongly agree). Thus, the percentage of the questionnaire assessment for students is Ps = 48.57/50 = 0.97 or 97%. And the questionnaire assessment percentage for teachers is Pg = 48.33/50 = 0.96 or 96%. Thus, the product, namely this interactive learning media, is considered valid and does not need to be revised (16-20).

The results of the study show that in the pre-test, only 6 out of 21 students (around 29%) achieved or exceeded the minimum passing grade (65). In the post-test, all 21 students (100%) achieved the minimum passing grade. This shows a significant increase in learning outcomes after treatment/intervention using digital platform-based interactive media. Based on the student assessment questionnaire, the average student response score was X = 1020/21 = 48.57, and for teachers, it was X = 580/12 = 48.33. The maximum overall questionnaire score was 5x10 = 50, with 5 being the highest possible score (strongly agree). Thus, the questionnaire assessment percentage for students is Ps = 48.57/50 = 0.97 or 97%. And for the questionnaire assessment percentage for teachers is Pg = 48.33/50 = 0.96 or 96%. Thus, the product, namely this interactive learning media, is valid and does not need to be revised.

4. Conclusion

The results of the above study show that the use of interactive media based on digital platforms can improve students' critical thinking skills. Pre-tests and post-tests using interactive media, namely quizzes using the Quizizz application, educational games, and educational videos, were conducted.

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