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THE INFLUENCE OF ASSEMBLR EDU BASED LEARNING MEDIA ON STUDENTS MATHEMATICAL THINKING ABILITY

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ABSTRACT

Based on the results of the initial test of mathematical thinking skills at SD Negeri 1 Jatimulyo, it shows that students' mathematical thinking skills are still relatively low. The purpose of this study was to determine the effect of assemblr edu-based learning media on students' mathematical thinking skills in elementary schools. This type of research is a quasi-experimental study with a non-equivalent control group design. The population in this study were all 57 students in grade V and the sample determination used a purposive sampling technique with 30 students from class V A for the experimental class and 27 students from class V B for the control class. Data collection techniques used tests, observations and documentation. Data were analyzed using linear regression tests. Judging from the results of the data analysis, the average pretest score was 49.20 while the average posttest score was 69.73. After the hypothesis test was carried out with a linear regression test, a value of 0.000 <0.05 was obtained, so Ho was rejected and Ha was accepted. It can be concluded that there is an influence of assembly edu-based learning media on students' mathematical thinking skills.

Keywords*: *assemblr edu, mathematical thinking ability, learning media.

A. INTRODUCTION

One of the fundamental areas of study that requires comprehensive mastery within educational institutions, particularly at the primary and secondary levels, is undoubtedly mathematics. In accordance with the perspectives articulated by Cahyaning and Asikin, it is explicitly stated that mathematics education should be imparted to all students commencing from elementary school, a critical juncture that serves to equip them with an array of essential cognitive skills including, but not limited to, logical reasoning, analytical thought processes, systematic approaches, critical evaluation, and creative problem-solving abilities, in addition to fostering collaborative skills among peers. (Hermawan et al., 2021). Within the realm of mathematics education, it becomes evident that problem-solving constitutes the principal objective and focal point of the entire learning endeavor. This assertion aligns harmoniously with the five overarching goals of mathematics education as delineated by the National Council of Teachers of Mathematics (NCTM), which encompass the abilities to communicate effectively, engage in logical reasoning, solve complex problems, draw connections between ideas, and cultivate a positive and constructive attitude towards the subject of mathematics itself. (NCTM, 2000).

It is irrefutable that when students engage in the process of developing solutions to mathematical problems, they become intricately intertwined with the cognitive processes of thinking. Thinking, in this context, is defined as a mental action that individuals engage in to make informed decisions, comprehend and define problems, articulate them clearly, and ultimately devise effective solutions. (Wardhani et al., 2016). Mathematical thinking emerges as a critical component during the learning process of mathematics, wherein

students are confronted with a variety of contextual problems that are intricately linked to real-life situations, thereby enhancing their capacity to solve problems in a more effective manner. The significance of mathematical thinking cannot be overstated, as it is imperative for students to master these skills in order to navigate everyday life successfully. Proficiency in mathematical thinking skills is of paramount importance because it empowers individuals to make sound decisions and address problems with confidence and competence. (Putri et al., 2022).

Despite the undeniable importance of mathematical thinking in addressing and resolving mathematical problems, the current state of mathematics education in elementary schools reveals a concerning trend wherein students predominantly concentrate on mathematical products, such as formulas and algorithms, rather than engaging deeply with the underlying properties and principles that govern mathematics. If students limit their focus solely to mathematical products, neglecting to appreciate the foundational properties and principles of mathematics, it becomes exceedingly challenging for educators to cultivate and enhance their students' mathematical thinking skills effectively. (Nugraha & Suryadi, 2016). Consequently, the development of robust mathematical thinking skills emerges as a crucial competency that students must acquire in order to become adept at problem-solving in the field of mathematics.

Drawing upon the findings of an initial research study conducted at SD Negeri 1 Jatimulyo, which involved conducting interviews with educators from the fifth grade and observing the prevailing learning processes, it becomes apparent that a significant number of students struggle to formulate coherent solutions to the problems posed by their educators. The inadequate mathematical thinking abilities of these students are further corroborated by the preliminary research findings, which reveal that a considerable portion—exceeding 50%—of the total student population in classes V A and V B, consisting of a total of 57 students, has yet to master the requisite mathematical thinking skills essential for their academic progress. This deficiency can largely be attributed to the instructional methods that have been utilized, which are not yet fully centered on the students' needs and learning processes. The lack of engagement and motivation among students is exacerbated by monotonous instructional practices, while the challenges presented by educators fall short of stimulating their intellectual curiosity. As a result, students find themselves unable to delve into their prior knowledge and ideas, leading to a learning experience that lacks significance and relevance in their educational journey.

In light of the previously discussed challenges regarding the enhancement of mathematical thinking skills among students, the dedicated efforts undertaken by the researcher aim to devise a comprehensive solution that is directly related to the observed deficiencies in mathematical reasoning. This is accomplished through the implementation of mathematics instruction that employs innovative teaching media specifically designed to elevate the mathematical thinking capabilities of students during their mathematics classes. This approach is in accordance with Mayer's assertion that the careful selection of suitable media is a crucial determinant in fostering the development of students' critical thinking skills, as noted by Hendi et al. (2020). The rationale behind this method stems from the prevailing situation in which current mathematics instruction is predominantly teacher-

centered, thereby highlighting the fact that educators have yet to fully embrace and integrate innovative and interactive learning media into their teaching practices. Assemblr edu emerges as a modern platform that enables the design of creative and innovative learning experiences, as articulated by Hayati (2022). Moreover, the learning resources available on the Assemblr edu platform present educational materials in a dynamic 3D format, while also offering the capability to showcase content through audio-visual means. Within the context of the Assemblr edu media, students will have access to a diverse array of learning materials along with various mathematical exercises that are structured to promote critical thinking, ultimately aimed at significantly enhancing the mathematical thinking abilities of students.

At present, there exists a pressing need for individuals who are equipped with the capacity to think creatively, adeptly identify problems, and formulate effective solutions to tackle the challenges that arise in conjunction with the rapid progress in technology and scientific advancements, as highlighted by Arisoy and Aybek (2021). Furthermore, there is an alternative perspective that underscores the clear evidence of the role that digital media plays as a medium within the teaching and learning process, as articulated by Putri et al. (2022). Given the notable contributions of digital media in contemporary education, it is becoming increasingly apparent that students can effectively leverage these media resources to facilitate and enhance their own learning experiences. As educators, it is imperative that we exercise caution and discernment when incorporating learning media into our pedagogical practices, as technological advancements invariably entail both advantageous and disadvantageous consequences for the educational landscape. In addition, it is essential that educators strive to provide learning media that captivates students' attention and mitigates any potential feelings of boredom. The involvement of creative educators who are willing to harness technology effectively for educational purposes is of utmost importance in fostering meaningful and impactful learning experiences that resonate with students and promote their overall academic success.

B. RESEARCH METHOD

The research methodology employed in the present study can be classified as quantitative research, specifically utilizing a quasi-experimental design that enables the examination of causal relationships without full experimental control. This quasi-experimental framework incorporates two distinct groups for comparative analysis, which consist of the experimental group and the control group, thereby facilitating a structured approach to evaluating the impact of various interventions. Within this context, the experimental group is represented by the class designated as the control class, which participates in the learning process utilizing the Assemblr Edu learning media, an innovative educational tool designed to enhance learning outcomes, while the control group, in contrast, engages with traditional concrete media for instructional purposes.

The population targeted for this research consists of fifth-grade students enrolled at State Elementary School 1 Jatimulyo during the academic year spanning 2023 to 2024, ensuring that the study is relevant and applicable to contemporary educational settings. Sampling procedures were meticulously executed using a non-probability sampling

technique, with a specific emphasis on purposive sampling to strategically select participants who meet the study's criteria. The initial phase of this research involved assessing the mathematical thinking abilities of the students, which revealed that class V A, comprising 30 students, exhibited lower test scores and was thus designated as the experimental class for the purpose of this study. Conversely, class V B, which demonstrated higher test scores and included 27 students, was assigned to serve as the control class, highlighting the distinct differences in academic performance between the two groups.

In terms of data collection methodologies, this research employed a combination of testing and observation techniques to gather comprehensive insights into the participants' learning experiences and outcomes. The assessment utilized in this study is a descriptive test, which has been specifically crafted to evaluate the mathematical thinking skills of the students, encompassing a total of 10 carefully designed questions that are intended to gauge various aspects of their cognitive abilities. Prior to the administration of this examination, a thorough evaluation was conducted to establish the validity and reliability of the test instruments used, ensuring that the data collected would be both credible and applicable. The validity of the test was assessed utilizing the product moment correlation formula, which serves as a statistical measure to determine the degree to which the test accurately reflects the content it purports to measure, while the reliability was established through the application of the Cronbach's Alpha formula, a widely recognized method for determining the internal consistency of the test items.

Following the completion of the testing phase, the results obtained were systematically analyzed to ascertain the effects of the differing instructional media on students' mathematical thinking skills, thereby enabling the researchers to draw well-founded conclusions regarding the study's hypotheses. The prerequisite tests conducted for the analysis included a normality test and a homogeneity test, both of which were executed using the SPSS 25 statistical software package, providing a robust framework for data analysis. Finally, the hypothesis testing technique employed in this investigation is simple linear regression, a statistical method that allows for the exploration of relationships between variables and the assessment of the predictive power of the independent variable on the dependent variable within the educational context.

C. RESULTS AND DISCUSSION

In the context of this scholarly investigation, the researcher meticulously collected and analyzed data that emerged from the findings of a comprehensive study which was grounded in observational data pertaining to the innovative learning media developed through the use of Assemblr Edu, alongside an evaluation of the mathematical thinking skills exhibited by fifth-grade students enrolled at Jatimulyo State Elementary School 1, thereby providing a robust framework for understanding the interplay between educational technology and cognitive skill development in a primary educational setting.

Table 1. Results of Observations on Assemblr Edu Media Activities

No.	Success Rate	Success Rate	Success Rate	%
1	≥ 80	Very Active	7	23
2	70 – 79	Active	16	53
3	60 – 69	Fairly Active	5	17
4	50 – 59	Less Active	2	7

Amount	30	100

According to the information presented in Table 1, it can be inferred that the engagement levels of students utilizing the Assemblr Edu media platform are, in fact, quite commendable and reflective of a positive trend. This observation is substantiated by the data indicating the average percentage of student activity, whereby it is noteworthy that within the less active category, there are a total of 2 students demonstrating a relatively low engagement level with a percentage of 7%, while in the moderately active category, there are 5 students whose participation rate is slightly better, reflecting a percentage of 17%; furthermore, in the active category, an impressive 16 students are recorded, showcasing a significant involvement with a percentage of 53%, and finally, in the very active category, there are 7 students exhibiting an exceptional level of engagement, represented by a percentage of 23%.

Table 2. Results of Pretest and Posttest on Mathematical Thinking Ability

Calculation	Eksperimen		Kontrol	
	Pretest	***Posttest***	***Pretest***	***Posttest***
Highest Value	76	92	82	84
Lowest Value	34	50	38	40
Average Value	49,20	69,73	52,67	57,19

In Table 2, data from the pretest and posttest results of mathematical thinking abilities for the experimental and control classes are presented. In the experimental class, the highest pretest score was 76 and the lowest was 34, with an average score of 49.20. Meanwhile, the highest posttest score was 92 and the lowest was 50, with an average score of 69.73. In the control class, the highest pretest score was 82 and the lowest was 38, with an average score of 52.67. The highest posttest score was 84 and the lowest posttest score was 40, with an average score of 57.19.

Based on the results of the post-test, there was a significant improvement in the mathematical thinking skills of the students in the experimental class after being given treatment with the assemblr edu-based learning media. This improvement can be seen in the following table.

Table 3. Percentage of Mathematical Thinking Ability Scores

No.	Indicator of Mathematical Thinking Ability	Eksperimen		Kontrol	
		Pretest	***Posttest***	***Pretest***	***Posttest***
1	Identifying the problem	59%	86%	61%	75%
2	Formulating a resolution strategy	47%	64%	50%	54%
3	Establishing the formula to be used to solve the problem	49%	72%	53%	58%
4	Carrying out the problem-solving	45%	63%	47%	49%
5	Drawing conclusions from the results obtained	44%	63%	45%	49%
Average		48,80%	69,50%	51,20%	57,00%
Category		Rendah	Sedang	Rendah	Rendah

Based on Table 3, it shows that the average percentage of students' mathematical thinking ability scores on the pretest and posttest differs. In the pretest, the average score for mathematical thinking ability in the experimental class was 48.80%, categorized as low, while in the posttest, the average score for mathematical thinking ability was 69.50%, categorized as moderate.

Meanwhile, the average percentage of students' mathematical thinking ability scores on the pretest and posttest also shows a difference. In the pretest, the average score for mathematical thinking ability was 51.20%, categorized as low, while in the posttest, the average score for mathematical thinking ability was 57.00%, also categorized as low.

Before conducting the hypothesis test, normality and homogeneity tests were first performed. The results of the normality test for the pretest in the experimental class showed a significance of 0.20, and the normality test for the pretest in the control class also showed a significance of 0.20. Since 0.20 > 0.05, the data is normally distributed. The results of the normality test for the posttest in the experimental class showed a significance of 0.20, and the normality test for the posttest in the control class also showed a significance of 0.20. Therefore, 0.20 > 0.05 indicates that the data is normally distributed.

Next, a homogeneity test was conducted using SPSS 25 with the testing criteria that if the significance value > 0.05, then it is homogeneous, while if the significance < 0.05, then it is not homogeneous. The results of the homogeneity test for the pretest in the experimental and control classes showed a significance value of 0.237, so 0.237 > 0.05, indicating that all obtained data is homogeneous. Meanwhile, the results of the homogeneity test for the posttest in the experimental and control classes showed a significance of 0.580, thus 0.580 > 0.05, indicating that all obtained data is homogeneous.

The next step involved hypothesis testing using simple linear regression. The simple regression test was conducted to examine whether there is an effect of the assemblr edu-based learning media on the mathematical thinking skills of elementary school students. The results of the simple linear regression test showed a significance level of 0.00 < 0.05, thus Ho is rejected and Ha is accepted, confirming that there is indeed an effect of the assemblr edu-based learning media on the mathematical thinking skills of elementary school students.
Based on the research that has been conducted, data from the study was obtained and then analyzed to draw conclusions from the research findings. From the analysis results, it is known that there is a significant difference between the average mathematical thinking ability of students who use assemblr edu media and those who only use concrete media. The average mathematical thinking ability of students who apply assemblr edu learning media is higher than that of students who only use concrete media.

Learning with the assemblr edu media provides students with an enjoyable and engaging learning experience that is far from boring. This was evident during the learning activities when many students were very enthusiastic and actively participated in using the Assemblr Edu media. The Assemblr Edu media can assist students in understanding material presented in the form of 3D images, allowing them to visualize spatial objects in a more realistic way. Assemblr Edu makes the learning activities less monotonous, enhances student engagement, boosts their enthusiasm for learning, and improves their understanding of spatial concepts. This is also supported by previous researchers who found that using the Assemblr Edu application helps students easily grasp the material, increases their activity in class, and enhances their critical thinking skills after being taught with the application during lessons. (Hayati, 2022). According to Rochmad, mathematical thinking ability is the capability of students to solve mathematical problems by gathering various pieces of information they know and then drawing evaluative conclusions from that information (Nurul et al., 2022). The mathematical thinking

ability of students can be measured through indicators of mathematical thinking skills. In this study, the indicators used are 1) identifying problems, 2) formulating solution strategies, 3) determining the formulas to be used to solve the problems, 4) solving the problems, and 5) drawing conclusions from the results obtained.

Learning media based on assemblr edu is one of the learning tools that can help students become more active and train them to enhance their thinking skills to solve problems and illustrate concepts in a tangible way. The problem-based learning model is a learning approach that presents students with real-life problems to be solved collaboratively in groups. (Aristia, 2019). This is in line with the constructivist learning theory according to Shymansky, which states that constructivism is an active activity, where learners build their own knowledge, seek meaning from what they learn, and it is a process of resolving concepts and new ideas within the framework of thinking they already possess. (Suparlan, 2019). Thus, students need to be accustomed to solving problems, discovering something beneficial for themselves, and developing existing ideas.

D. CONCLUSION

Based on the results of the research, data analysis, and hypothesis testing conducted regarding the assemblr edu-based learning media on the mathematical thinking skills of elementary school students, there has been an improvement in the mathematical thinking skills of the students, as evidenced by the posttest scores being higher than the pretest scores. This is indicated by an average pretest score of 49.20, while the average posttest score is 69.73. After conducting a hypothesis test using linear regression, a value of 0.000<0.05 was obtained, thus Ho is rejected and Ha is accepted. It can be concluded that there is an influence of assemblr edu-based learning media on students' mathematical thinking skills.

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