



The Influence of Innovative Learning Management on the Numeration Skills of Primary School Students in Medan City

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ABSTRACT

This study was motivated by the low numeracy skills of students in Medan City, which reached only 50% in 2020 and increased to 62% in 2024. One contributing factor is the lack of variety in teaching methods and unengaging learning media, highlighting the need for innovative approaches to enhance students' numeracy skills. This study aims to analyze the impact of innovative teaching methods, such as environment-based gamification, digital educational games, and place value board media, on elementary school students' numeracy abilities. Using a quantitative method with a quasi-experimental design, this research involved 105 first and fifth-grade students from several elementary schools in Medan City. The findings indicate that innovative methods significantly improved students' numeracy skills. At UPT SD Negeri 064026 Medan Tuntungan, the application of place value board media increased the post-test scores of Class V-A from 44.17 to 78.5 and Class V-B from 42.97 to 87.4 (t -value 2.63 > t -table 1.68). At UPT SDN 060972 Simalingkar B, digital educational games raised the experimental class score from 32 to 89.09 (t -value 2.97 > t -table 2.021). Meanwhile, in Class I of UPT SD Negeri 064026, the environment-based gamification method increased Class 1A's score from 57 to 78.5 and Class 1B's score from 44 to 88.25 (t -value 2.09 > t -table 2.04). Thus, innovative teaching methods significantly impact the improvement of elementary students' numeracy skills in Medan City.

INTRODUCTION

The rapid progress of the times has brought various major challenges in the world of education. One of the main challenges is the low numeracy literacy ability of students in Indonesia. Based on the results of the 2018 Programme for International Student Assessment (PISA) research conducted by the Organisation for Economic Co-operation and Development (OECD), Indonesia only obtained a score of 379 out of an average international score of 500. This figure shows that the numeracy ability of Indonesian students is still relatively low, reflecting the quality of education that is not optimal and requires serious attention. In fact, numeracy skills have an important role in daily life, especially in solving various contextual problems that require reasoning, creativity, and logical thinking. Therefore, increasing numeracy literacy is one of the main priorities in developing the quality of education in Indonesia.

In the period 2020 to 2024, a report from the Ministry of Education and Culture shows a positive trend in the numeracy skills of elementary school students in Indonesia. In 2020, students' numeracy skills were at the level of 60% and increased to 67% by 2024. A similar trend was also seen in North Sumatra, where students' numeracy skills increased from 55% to 63%. Meanwhile, in the city of Medan, the percentage of students who have adequate numeracy skills increased from 50% to 62%. Despite the increase, data from direct observation at UPT SD Negeri 064026 Medan Tuntungan revealed that there are still significant problems, where as many as 25% of students in class I A and 50% of students in class I B have relatively low numeracy skills. This shows that there are still many students who have not reached the minimum competency standards in mathematics, so more effective learning strategies are needed to improve their numeracy skills.

One of the main factors that causes low numeracy skills of students is the use of inappropriate learning methods and minimal variation. The lack of use of innovative and interactive learning media leads to low student motivation to learn, which has an impact on their lack of understanding of mathematical concepts. Therefore, a more innovative, engaging, and technology-based learning approach is needed to increase student engagement in the learning process. This study aims to analyze the influence of innovative learning management on the numeracy ability of elementary school students by applying several approaches, such as the use of number place scoreboard media, Digital Educational Games, and environment-based gamification methods. By implementing more interactive and technology-based learning methods, it is hoped that students can be more motivated in learning and understand numeracy concepts better, thereby contributing to improving their learning outcomes.

LITERATURE REVIEW

Scoreboard media where numbers are used is one type of visual media used in mathematics learning. This media presents numbers and information in a structured form, making it easier for students to understand that the value of a number in a number depends on its position. With this media, students can more easily understand the concept of number place values, such as units, tens, and hundreds, so that they are not only able to memorize numbers but also be able to think logically. According to Arsyad, Azhar (2023:45), the scoreboard media where numbers function as visual aids that make it easier for students to understand the structure of numbers and the relationships between their positions. Thus, this media can improve students' understanding and numeracy skills from an early age.

Like other learning media, the scoreboard where numbers have advantages and disadvantages. Some of the advantages, according to Wati, Ega Rima (2018:40-41), include increasing the effectiveness of learning, making it easier for students to understand and remember the material, and helping them interact with the surrounding environment. In addition, this media also instills mathematical concepts concretely and attracts students' interest in learning. However, this media also has some limitations, such as a display that is sometimes less practical, not equipped with audio, and requires quite expensive production costs. Therefore, in its use, teachers need to consider strategies so that the effectiveness of this media remains maximum.

Sari (2021:67) defines Digital Educational Games as technology-based games designed to improve students' cognitive skills through interactive and fun activities. According to Sari, this game allows students to learn independently and in a more interesting way, thus speeding up the learning process. Meanwhile, Fauzan (2022:45) mentioned that Digital Educational Games are applications that combine game elements with learning objectives. In Fauzan's view, through Digital Educational Games, students can develop critical thinking and problem-solving skills while playing, thereby honing their understanding of the subject matter. Wijaya (2023:102) added that Digital Educational Games are computer-based learning media designed to support formal learning in a more fun way. From the opinions of some of these experts, it can be concluded that Digital Educational Games are interactive learning tools that utilize digital technology to combine game elements with educational purposes.

The characteristics of an effective educational game for learning, according to Pratama (2020:87), must have interactive elements that make it easier for students to understand mathematical concepts. This interactivity can increase student engagement and help them understand the application of numeracy in real-life situations. In addition, Utami (2021:77) emphasized that

good educational games must be oriented towards specific learning goals. This means that each part of the game must be designed to teach specific numeracy skills, such as addition, subtraction, or measurement. Furthermore, Wahyuni (2023:84) stated that effective Educational Games need to combine interesting visual and audio elements. This aims to invite students to understand the learning material, especially in numeracy lessons which are often considered difficult and boring. From these various opinions, it can be concluded that the characteristics of an effective Educational Game must be interactive, oriented to learning objectives, have a gradual level of difficulty, and use interesting visual and audio elements.

Digital Educational Games have various types, including Quizizz, Kahoot!, and Puzzle. Quizizz is a fun and competitive Educational Games platform that allows students to answer questions at their own pace. Teachers often use these platforms to test their students' knowledge with live feedback and a scoreboard that shows students' achievements compared to their peers. Kahoot! is a quiz-based Educational Game that is played live, where students can join through their devices and compete in answering questions displayed on the main screen. With dynamic visual and sound elements, Kahoot! creating an interactive and engaging learning atmosphere. Meanwhile, Puzzle Games challenge students to solve logical or numerical problems, which helps them develop critical thinking, problem-solving, and mathematical logic skills. These three types of games offer different approaches to learning, but they all aim to increase student engagement and enrich the numeracy learning experience.

Digital Education Games have advantages and disadvantages in their application in learning. Some of its advantages are increasing student motivation and engagement, providing learning that can be tailored to individual needs, as well as allowing students to learn repeatedly and get immediate feedback on their progress (Sari, 2022:67). However, there are also some drawbacks, such as limited social interaction because students interact more with technology than with peers, dependence on digital devices that may not be available to all students, and the risk of students becoming overstimulated and losing focus on the main educational goals (Hendriana, 2021:60). Therefore, a thoughtful and balanced integration between Digital Educational Games and traditional learning methods is essential to maximize its benefits.

METHODS

This research was carried out on October 29 - November 1, 2024 using quantitative methods and *quasi-experimental* designs, through a *pretest-posttest control group* design. The study involved three groups of students at the primary school level who were divided into experimental and control groups. The purpose of this study is to analyze the influence of various innovative learning methods on students' numeracy skills.

The research was conducted in two elementary schools in Medan City. At UPT SD Negeri 064026 Medan Tuntungan, the research was conducted on grade V students with a total of 51 students. A total of 27 students in the experimental class were taught using the media of the number place grade board, while 24 students in the control class did not use the media. Meanwhile, at UPT SDN 060972 Simalingkar B, the study involved 42 students in class V, with 22 students in the experimental class being taught using *Digital Educational Games*, while 20 students in the control class still used conventional methods. In addition, research was also conducted on grade I students at UPT SD Negeri 064026 Medan Tuntungan with a total of 32 students. In this group, 16 students in the experimental class (class 1B) learned using the environment-based gamification method, while 16 students in the control class (class 1A) did not get the treatment.

The research instrument is in the form of a numeracy test in the form of essay questions which are used to measure students' numeracy skills before and after the treatment. The data collection process is carried out through several stages, namely instrument preparation, pretest implementation, treatment, posttest implementation, and data analysis. Each stage is carried out systematically to ensure the validity and reliability of the research results.

The collected data is analyzed using various statistical techniques to obtain accurate conclusions. Data analysis begins with prerequisite tests, which include normality tests and homogeneity tests, to ensure that the data meet the necessary statistical assumptions. Furthermore, the average pretest *and* posttest scores were calculated for each group. To test the research hypothesis, an inferential statistical test was used to determine whether there was a significant difference between the experimental group and the control group in improving students' numeracy skills.

RESEARCH RESULTS

The results of the study show that the use of innovative learning media has a significant influence on improving students' numeracy skills at various levels of elementary school. In grade V students of UPT SD Negeri 064026 Medan Tuntungan, the results of *the pretest* showed an average score of 44.17 in class V-A and 42.97 in class V-B. After being treated with the media of the number place, the *posttest* score increased to 78.5 in class V-A and 87.4 in class V-B. The hypothesis test shows that t-count (2.63) is greater than t-table (1.68), so it can be concluded that the school board media where numbers are placed has a significant effect on the improvement of students' numeracy skills in the school.

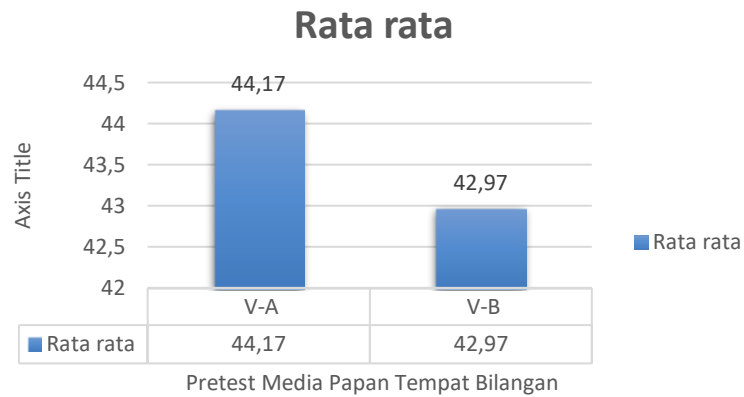


Figure 1. Pretest Learning with Number Place Media

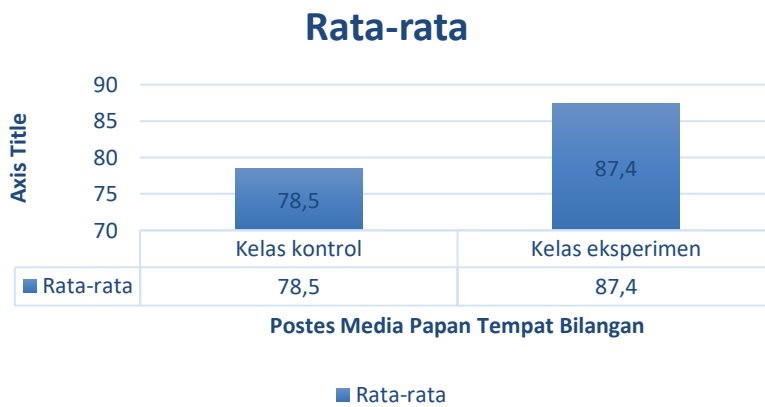


Figure 2. Posttest Learning with Number Place Media

Furthermore, the results of the Hypothesis Test, can be submitted as follows:

Table 1. Results of the Learning Hypothesis Test with Number Place Media

		Hyphotesis Test	
Innovative Learning Methods	Learning	t-count	t table
Place Scoreboard		2.63	1.68

Furthermore, at UPT SDN 060972 Simalingkar B, the results of the pretest of class V students showed an average score of 46 in the experimental class and 32 in the control class. After being given learning using Digital Educational

Games, the *posttest* score of the experimental class increased significantly to 89.09, much higher than the control class which only reached 60. Statistical tests show that t-count (2.97) is greater than t-table (2.021), which indicates that Digital Educational Games are proven to be effective in improving students' numeracy skills.

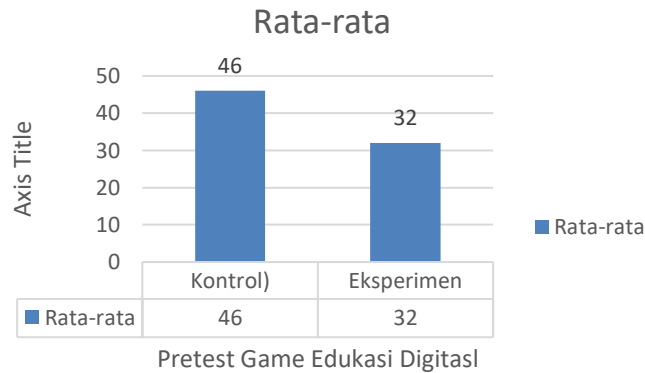


Figure 3. Pretest Learning with Digital Educational Game Method

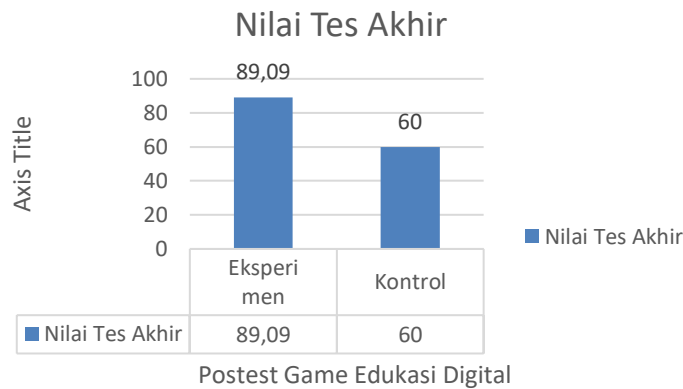


Figure 4. Posttest Learning with Digital Educational Game Method

Table 2. Results of the Digital Educational Game Learning Hypothesis Test

	Hypothesis Test	
	t-count	t-table
Innovative Learning Methos		
Digital Educational Games	2.97	2.02

Meanwhile, in grade I students of UPT SD Negeri 064026 Medan Tuntungan, the pretest results showed an average score of class 1A of 57 and

class 1B of 44. After being treated with the environment-based gamification method, the *posttest score* increased to 78.5 in class 1A and 88.25 in class 1B. The hypothesis test showed that the t-count (2.09) was greater than the t-table (2.04), which confirmed that this method had a significant influence on the improvement of students' numeracy skills at the grade I level.

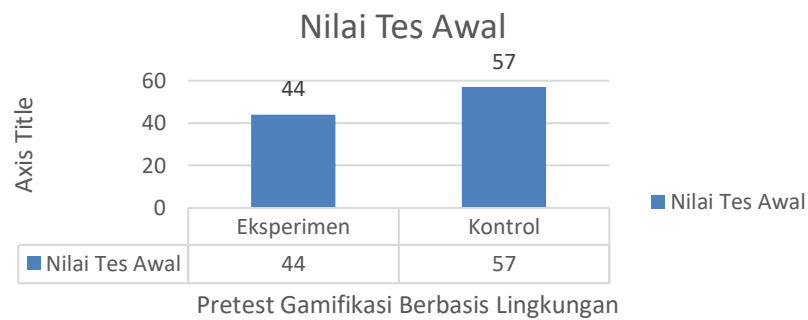


Figure 5. Pretest for Environment-Based Gamification Learning

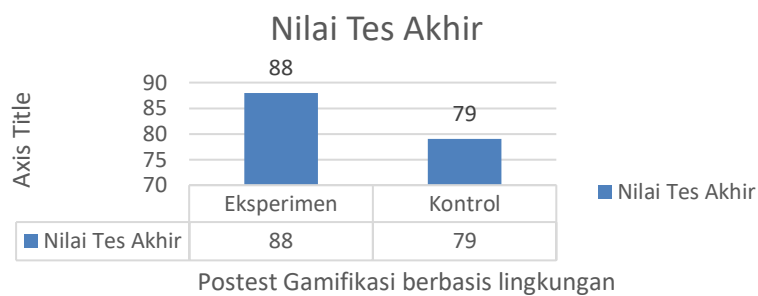


Figure 6. Posttest for Environment-Based Gamification Learning

Table 3. Results of Environment-Based Gamification Hypothesis Test

	Hypothesis Test	
	t-count	t table
Innovative Learning Methods		
Environment-based gamification	2.09	2.04

Thus, both the number place scoreboard media, *Digital Educational Games*, and environment-based gamification have proven to be effective in improving students' numeracy skills. The results of this study show that the application of more innovative and interactive learning methods can have a positive impact on students' numeracy understanding in elementary school. Therefore, it is

recommended that these methods be applied more widely in mathematics learning to improve the quality of numeracy education in Indonesia.

DISCUSSION

Numeracy is the ability to understand, use, and apply mathematical concepts in daily life (OECD, 2018). According to the National Research Council (2001), numeracy includes not only basic skills such as addition and subtraction, but also the ability to think logically and solve problems effectively.

Low numeracy skills in elementary school students can negatively impact their academic development at later levels of education (Rittle-Johnson & Siegler, 1998). Therefore, it is important to implement innovative learning strategies to improve students' numeracy skills from an early age.

The importance of Learning Media in Numerals, can be referred to from the opinion on the theory of constructivism by Piaget (1972), learning will be more effective if students are actively involved in the learning process by using tools that support their understanding. Bruner (1966) also stated that manipulative-based learning, such as the use of concrete media in numeracy, can improve students' understanding of mathematical concepts.

A study conducted by Van de Walle (2013) confirmed that the use of learning media such as a number board can help students understand the basic concept of numbers in a more concrete way. In the context of this study, the use of number place grade board media is proven to increase students' understanding of the concept of place value, as seen from the increase in posttest scores of grade V students at UPT SD Negeri 064026 Medan Tuntungan.

Furthermore, the effectiveness of Digital Educational Games in Numeracy Learning has been proven to increase student motivation and learning outcomes in mathematics (Ke, 2008). According to research conducted by Prensky (2001), educational games can create a fun learning environment, increase student engagement, and reinforce concept understanding. Another study by Clark, Tanner-Smith, and Killingsworth (2016) showed that the use of game-based technology in math education can improve student achievement by up to 12% compared to conventional methods. The results of the study at UPT SDN 060972 Simalingkar B support this finding, where students who learn using Digital Educational Games show a significant improvement in their numeracy skills compared to the control group.

Then Environment-Based Gamification can improve Numeracy, which has been commonly done in learning. Gamification in learning refers to the use of game elements in non-game contexts to increase student motivation and engagement (Deterding et al., 2011). According to Hamari, Koivisto, and Sarsa (2014), gamification applied in education can improve student interaction and provide a more immersive learning experience. A study conducted by Sailer et al. (2017) found that gamification strategies applied in numeracy learning can improve students' understanding through elements of competition, reward, and exploration of the surrounding environment. This is in line with the results of research on grade I students at UPT SD Negeri 064026 Medan Tuntungan, where

environment-based gamification methods have proven to be effective in significantly improving students' numeracy skills.

Research Implications on Numeracy Learning in Elementary Schools can be seen from several research results that have been conducted, such as the use of innovative learning media such as number place scoreboards, Digital Educational Games, and environment-based gamification have a positive impact on improving students' numeracy skills. This is in line with previous research that emphasizes the importance of more interactive and technology-based learning strategies in improving students' mathematics learning outcomes (Higgins, Xiao, & Katsipataki, 2012).

Thus, it is recommended for primary schools to adopt this approach in mathematics learning to improve students' numeracy skills more optimally. In addition, further research can be conducted to test the effectiveness of this method in a broader and diverse context.

CONCLUSION AND RECOMMENDATIONS

This study examines the effectiveness of various innovative learning methods on students' numeracy skills in several elementary schools. In grade V students of UPT SD Negeri 064026 Medan Tuntungan, the use of grade board media where numbers are proven to significantly improve students' numeracy skills. This was shown by the increase in the average score from 44.17 to 78.5 in class V-A and from 42.97 to 87.4 in class V-B after being given treatment. The hypothesis test shows that there is a significant influence of the use of this media on students' numeracy skills.

In addition, research at UPT SDN 060972 Simalingkar B showed that Digital Educational Games were effective in improving the numeracy skills of grade V students. Statistical tests showed significant differences between the two groups, indicating that Digital Educational Games proved to be effective in improving students' numeracy skills.

Finally, research on grade I students of UPT SD Negeri 064026 Medan Tuntungan showed that the environment-based gamification method was also effective in improving students' numeracy skills. The average score of class 1A increased from 57 to 78.5 and the average score of class 1B increased from 44 to 88.25 after being given the gamification method. The hypothesis test shows that there is a significant influence of this method on improving students' numeracy skills.

Overall, this study shows that the use of innovative learning media such as number place scoreboards, Digital Educational Games, and environment-based gamification has a positive impact on improving students' numeracy skills at various grade levels. These findings underscore the importance of using more interactive and technology-based learning methods in improving students' mathematics learning outcomes, especially in numeracy skills.

FURTHER RESEARCH

Future research is expected to further explore this material.

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