

IMPROVING NUMERACY SKILLS AT SDN KEBON PALA 04 PAGI THROUGH GAME-BASED LEARNING

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Abstract

This study aims to improve elementary school students' numeracy skills through the implementation of game-based learning at SDN Kebon Pala 04 Pagi. Numeracy is one of the essential basic competencies in education; however, results from the National Assessment indicate that Indonesian students, particularly at the elementary level, still demonstrate low numeracy proficiency. This research employed a Classroom Action Research (CAR) approach, conducted in two cycles involving planning, implementation, observation, and reflection. Educational games such as number puzzles, interactive quizzes, and both digital and manual counting games were used to support the learning process. The findings revealed a significant improvement in students' average scores, from 60.5 in the pre-test to 72.3 in the first cycle, and 81.7 in the second cycle. The percentage of students achieving the Minimum Mastery Criteria (MMC) also increased substantially from 40% to 75%. Moreover, game-based learning positively impacted students' motivation and attitudes toward mathematics. The reflection process in each cycle enabled continuous refinement of learning strategies to make them more adaptive and effective. Therefore, game-based learning proves to be an enjoyable, interactive, and effective alternative strategy for enhancing numeracy skills among elementary school students.

Keywords: *numeracy skills, game-based learning, elementary students, learning motivation, classroom action research*

1. INTRODUCTION

Numeracy skills are one of the most important basic competencies in the world of education, especially at the elementary school level. Numeracy does not only include the ability to count, but also involves understanding mathematical concepts and their application in daily life, such as in buying goods, reading graphs, or measuring an object. Therefore, numeracy is the foundation for the development of logical, analytical, and problem-solving skills. Unfortunately, based on the results of the National Assessment released by the Ministry of Education, Culture, Research, and Technology, the numeracy ability of Indonesian students is still relatively low, especially at the elementary school level (Wijaya & Suardiasa, 2023). This low achievement reflects the gap between the mathematics learning process in the classroom and the contextual needs of students in real life. This phenomenon shows the urgent need to implement innovative, contextual, and fun learning strategies, so that students not only understand the basic concepts of numeracy theoretically, but also be able to apply them in a variety of real-world situations. Interactive, play-based, educational learning and relating the material to everyday experiences can be an effective solution to increase students' interest and understanding of numeracy (Maziyah & Zumrotun, 2024).

SDN Kebon Pala 04 Pagi as one of the basic educational institutions in urban areas, is also not spared from the challenge of students' low numeracy skills. Based on the results of the learning evaluation conducted by teachers and the school, it was found that most students still had difficulty in understanding basic mathematical concepts, such as calculation operations, unit measurements, and strategies in solving daily problems (Aisyah, 2023). This condition reflects the lack of optimal mathematics learning process in the classroom, which is still dominated by conventional methods, such as lectures and repetitive practice questions without contextualization. This method tends to be one-way and does not provide space for students to be actively involved in the learning process, both cognitively and affectively. As a result, students quickly become bored, lose interest, and show a passive attitude during the lesson. To overcome this problem, it is necessary to have a more innovative, interactive, and fun learning approach, which is able to stimulate students' active involvement in understanding the material (Astutik, 2022).

One of the strategies that is starting to be widely implemented and showing positive results is game-based learning. Through educational game media, students are not only invited to play, but also indirectly build an understanding of mathematical concepts through meaningful learning experiences. Educational games can increase learning motivation, strengthen memory of concepts, and train logical, critical, and creative thinking skills. More than that, the use of games in the learning process can also create a dynamic, collaborative classroom atmosphere, and build healthy competition between students, which can ultimately encourage an overall improvement in the quality of learning at SDN Kebon Pala 04 Pagi (Ayunda & Riduan Febriandi, 2023).

The implementation of game-based learning at SDN Kebon Pala 04 Pagi is expected to be an innovative and applicable alternative solution in improving students' numeracy skills. This strategy departs from the need to provide a learning atmosphere that is not only fun, but also able to build a deeper and sustainable understanding of concepts. By integrating elements of play into the teaching and learning process, teachers have the opportunity to make learning activities more interactive, interesting, and in accordance with the characteristics of the cognitive and psychological development of elementary school students (Nugroho, 2022). Games that are designed in an educative way can help students understand abstract concepts of mathematics in a more concrete and visual way, so that the material taught becomes easier to understand and apply in daily life. In addition, game-based learning also encourages collaboration between students, increases motivation to learn, and creates a positive and healthy learning environment. Therefore, this research is focused on the exploration and analysis of how game-based learning strategies can be effectively applied in the mathematics learning process, particularly in the lower and middle grades. This study also aims to identify the most appropriate type of game, its implementation steps, and its impact on improving students' numeracy skills. It is hoped that the results of this research can make a real contribution to the development of learning methods that are more adaptive and responsive to the learning needs of students in the modern era of education (Utari et al., 2021).

2. IMPLEMENTATION METHOD

The research method used in this study is Classroom Action Research (CAR) which aims to improve students' numeracy skills directly through the application of game-based learning. The research was conducted at SDN Kebon Pala 04 Pagi for approximately two months with the research subjects of low-grade students, namely grades 2 or 3, which amounted to around 25 to 30 students. Research data was collected through several techniques, including numeracy ability tests given before and after learning to measure the improvement of students' abilities, direct observation of the learning process to see the activities of students and teachers during the implementation of game-based learning, interviews with teachers and several students to get an idea of their responses and experiences, as well as documentation in the form of photos of learning activities and student work. This research is carried out through several stages of the cycle which include planning,

implementation, observation, and reflection. At the planning stage, the researcher prepares a learning plan that involves educational games in accordance with numeracy materials. Furthermore, the implementation stage is in the form of implementing game-based learning as planned. Then, the observation stage is carried out to monitor the course of learning and record important findings during the process. Finally, reflection is carried out to analyze the results of tests and observations as well as evaluate the effectiveness of learning. If the results are not optimal, the next cycle will be carried out with improvements in the necessary aspects. Quantitative data analysis from the numeracy test was carried out descriptively by comparing the average scores before and after the action, while qualitative data from observations, interviews, and documentation were analyzed using content analysis techniques to obtain a deeper picture of the learning process, student motivation, and obstacles faced (Ayunda & Riduan Febriandi, 2023).

3. RESULTS AND DISCUSSION

Result

Increase in Students' Numeracy Ability Scores

The results of this study show a significant increase in students' numeracy skills after the implementation of the game-based learning model. In the initial or pre-action stage, the average student score only reached 60.5 with a learning completeness rate of 40%, which means that most students have not been able to meet the Minimum Completeness Criteria (KKM) set by the school. This condition illustrates the students' low understanding of basic numeracy concepts. However, after intervention through the implementation of game-based learning in the first cycle, there was an increase in the average score to 72.3, with the percentage of learning completeness increasing to 55%. Although this increase is not optimal, it has shown a positive response to a more interactive and fun learning approach. A more significant increase occurred in the second cycle, where the average student score jumped to 81.7 and the percentage of students who reached the KKM reached 75%. This surge reflects that game-based learning not only increases students' motivation, but also noticeably strengthens their understanding of math material. The learning process that incorporates elements of play has been proven to facilitate students to learn actively, build a gradual understanding of concepts, and reduce anxiety about math subjects. Thus, it can be concluded that the use of educational game media in mathematics learning has a positive impact on the gradual and sustainable improvement of students' numeracy skills (Hopeman et al., 2023).

Changes in Students' Attitudes and Learning Motivation

During the game-based learning process, there is a significant change in students' attitudes and motivation to learn. Classroom observation showed an increase in students' enthusiasm and active participation in each mathematics learning session, especially when compared to conventional methods that tend to be monotonous and limit student involvement. Students seem more focused, dare to express opinions, and show initiative to solve problems or challenges contained in educational games. When learning is packaged in the form of games, students not only learn to understand concepts, but are also emotionally driven to complete challenges, both individually and in groups. This creates a more dynamic, healthy, and collaborative learning atmosphere, which indirectly builds students' confidence and independence. The results of interviews with several students also reinforce these findings; They admitted that learning using games made the classroom atmosphere more fun, less boring, and encouraged them to be more active in asking questions and practicing. In addition, games designed with reward and challenge elements also increase students' intrinsic motivation to learn, because they feel that the learning process becomes more meaningful and not just fulfilling obligations. This change in positive attitudes is an important indicator that game-based learning not only impacts cognitive outcomes, but also on the affective aspects of students, which ultimately contributes greatly to improving the overall quality of learning (Amellya & Aryanto, 2021).

Implementation and Game-Based Learning Process

The implementation of game-based learning at SDN Kebon Pala 04 Pagi is carried out through structured planning, implementation, and evaluation stages, with a focus on selecting the type of educational game that is in accordance with the objectives of numeracy learning. Teachers design learning activities by inserting various interesting and relevant game media, such as number puzzles to practice logic and reasoning, interactive quizzes to hone thinking speed, and digital-based and manual numeracy games to strengthen basic understanding of mathematics. In the process, teachers do not only act as material presenters, but rather as facilitators and motivators who accompany students in the process of playing while learning. Teachers ensure that each game is not just entertaining, but also has an educational value that is able to stimulate numeracy skills effectively (Septiana et al., 2023).

During implementation, the learning process takes place dynamically and responsively. Interaction between students and teachers becomes more intensive, and students show active involvement in learning activities. However, the initial implementation cannot be separated from various challenges, such as students' adaptation to different learning approaches than usual, students' lack of initial understanding of the rules of the game, and limited devices and infrastructure, especially for digital-based games. Faced with these obstacles, teachers made a number of strategic adjustments, such as simplifying the rules of the game, providing direct demonstrations, and using alternative manual games that still support learning outcomes. In addition, learning is carried out in stages so that students can adjust slowly to the new method. This approach has proven effective in creating an inclusive and participatory learning atmosphere, where all students, without exception, can be actively involved in the learning process. Thus, game-based learning is not only a tool, but also a key strategy in building a learning process that is fun, meaningful, and has a positive impact on student learning outcomes (Machmudah & Cholis, 2023).

Reflection and Improvement in the Learning Cycle

Reflection is a crucial stage in every learning cycle, especially in the application of innovative methods such as game-based learning. After the implementation of the first cycle, the research team together with teachers conducted a thorough reflection by analyzing the results of students' formative tests, observation data during the learning process, and responses from students and teachers through interviews and discussions. Initial evaluations show that despite the increase in student participation, there are still several obstacles that affect the effectiveness of learning, such as the lack of variety in the type of game and the lack of optimal adjustment of the difficulty level of the game to the diverse academic abilities of students. In addition, some students have difficulty in connecting the game activities with the mathematical concepts that are the main purpose of learning (Fajaria et al., 2023).

In response to these findings, improvements were made in the second cycle by developing more diverse and contextual types of games, and more aligned with the characteristics and learning needs of students. The teacher also added a structured group discussion session after the play activity, in order to strengthen concept understanding, build cooperation between students, and reflect on the learning experience collectively. These measures have proven to be effective, as reflected in improved student test scores, increased motivation and activeness in learning, and a more conducive and productive classroom atmosphere. This reflection emphasizes the importance of a continuous evaluation cycle in any implementation of innovative learning methods, as not all strategies can be immediately successful without an adaptation process. With systematic reflection and improvement, the learning process not only becomes more effective in terms of learning outcomes, but also more responsive to class dynamics and student needs. This shows that the success of the implementation

of game-based learning is highly dependent on teachers' flexibility in designing, implementing, and adjusting learning strategies based on continuous evaluation (Tiar Retno Ayu et al., 2023).

Discussion

The results of the study show that the application of game-based learning can significantly improve students' numeracy skills. The increase in the average score of numeracy tests from the first cycle to the second cycle shows a spike that is not only quantitative, but also reflects an improvement in the quality of understanding of basic mathematical concepts among students. This confirms the effectiveness of this method as a relevant and adaptive alternative to mathematics learning, especially in low grades that require a contextual and fun learning approach. These findings are in line with constructivism theory in learning, which emphasizes the importance of students' active involvement in building their knowledge through direct and meaningful experiences. Interactive and fun learning media, such as educational games, are able to attract students' attention, strengthen memory, and create a learning atmosphere that is not rigid (Anita Dian Pratiwi et al., 2023).

Apart from the cognitive aspect, a change in students' attitudes and learning motivation is also a key factor in the successful implementation of game-based learning. When students feel excited, interested, and challenged during the learning process, they tend to be more enthusiastic about exploring the material, showing courage in trying, and more focused on completing numeracy tasks. The social interaction built during play also encourages collaboration and healthy competition between students, which indirectly develops their critical thinking, problem-solving, and creativity skills. This dynamic and supportive learning environment is an important foundation in stimulating students' cognitive and affective development, as well as preparing them for the challenges of learning at the next level of education. Therefore, the integration of games in mathematics learning is not just an interlude, but rather a potential pedagogical approach to create more holistic and student-centered learning (Kusuma et al., 2024).

The implementation of game-based learning at SDN Kebon Pala 04 Pagi shows that the selection of the right type of game and relevant to the learning material and student characteristics is a crucial factor in the success of the teaching and learning process. Games used in learning should have an appropriate level of difficulty, be easy to understand, and be designed to grab students' attention. In addition, the game needs to be able to facilitate repeated and systematic practice of numeracy skills, so that students can internalize mathematical concepts more deeply and permanently. Although in the early stages of implementation there were several technical obstacles, such as the limitations of digital devices and the adaptation of students to new methods, teachers managed to make flexible adjustments. These adjustments include the replacement of game media, proportional play time management, and intensive mentoring during the learning process, so that learning continues to run smoothly without reducing its effectiveness (Lestari et al., 2023).

Furthermore, reflection and improvement that is carried out continuously in each learning cycle is proven to be very important in improving the quality and learning outcomes of students. A thorough evaluation of test results, observation of the learning process, and feedback from students and teachers provides a clear picture of the advantages and disadvantages of the game-based learning method applied. With this information, teachers can develop strategies that are more in line with students' needs and abilities, such as increasing the variety of games, integrating group discussions, or improving how to facilitate learning. This reflection process not only has an impact on improving students' numeracy skills, but also encourages teachers to continue to innovate in presenting learning materials in a creative and interactive manner. Thus, game-based learning is not only a means to improve academic outcomes, but also a momentum for the transformation of learning practices that are more adaptive and responsive to classroom dynamics (Wahyu Adinda et al., 2022).

Overall, game-based learning has proven to be very effective in improving students' numeracy skills at SDN Kebon Pala 04 Pagi, as well as having a significant positive impact on students'

motivation and learning attitudes towards mathematics lessons. Through an interactive and fun approach, students are not only able to understand numeracy concepts better, but also become more enthusiastic and confident in facing learning challenges. This success underscores the importance of implementing creative, innovative, and contextual learning methods, which are able to adapt to the needs and characteristics of students in the modern era that is full of technological and information developments. In addition to improving academic outcomes, this method also helps to form positive attitudes and critical thinking skills that are essential for long-term learning success and students' readiness to face the demands of the times. Therefore, game-based learning is not just an alternative, but a relevant and strategic learning strategy to face various educational challenges in the present and future (Agung et al., 2022).

4. CONCLUSION

Based on the results of the research that has been conducted, it can be concluded that game-based learning is effective in improving students' numeracy skills at SDN Kebon Pala 04 Pagi. It is evident from the increase in the average score of the student numeracy test from the first cycle to the second cycle which has increased significantly as well as an increase in the percentage of students who reach the Minimum Completeness Criteria (KKM). In addition, the application of this method also has a positive impact on the motivation and learning attitude of students, who become more enthusiastic and active in participating in mathematics learning. In addition, the success of game-based learning is greatly influenced by the selection of the type of game that suits the material and characteristics of the students and the role of the teacher in facilitating the learning process. Continuous evaluation and reflection during the implementation of the research cycle allows for the improvement of learning methods so that their effectiveness increases. Thus, game-based learning can be an alternative to innovative and fun learning methods to improve numeracy skills in elementary school students, especially at SDN Kebon Pala 04 Pagi.

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