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Use of Counting Media to Improve Understanding of Elementary School Students

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ABSTRACT

Counting media in elementary school mathematics learning has proven effective in enhancing students' understanding of fundamental mathematical concepts. This study aimed to explore the impact of counting media on students' conceptual understanding, learning motivation, and the challenges associated with its implementation. Utilizing a qualitative descriptive approach, data were collected through classroom observations, teacher interviews, focus group discussions, and document analysis. The findings reveal that counting media, such as counting blocks, coins, and number boards, significantly improved students' ability to visualize and comprehend abstract mathematical concepts, resulting in a 20% increase in average test scores. Counting media fostered active student participation and boosted motivation, making learning more engaging and enjoyable. Teachers also reported that these tools facilitated more varied and effective instructional strategies. Despite its benefits, the implementation of counting media faced challenges, including limited access to resources in rural areas and insufficient teacher training. Addressing these challenges requires more substantial support from schools and governments, including resource provision and professional development programs. Overall, this study underscores the potential of counting media to enhance cognitive outcomes and foster positive learning attitudes and collaboration among students. The results suggest that integrating innovative media into mathematics education can significantly improve the quality of learning, providing valuable insights for broader educational reforms.

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1. INTRODUCTION

Learning in elementary school is an essential foundation in shaping students' basic knowledge, including mathematics learning [1]. Mathematics is not just the science of arithmetic but also includes logical thinking patterns and analytical skills that are important

for students' cognitive development. However, in the field, many students still have difficulty understanding basic mathematical concepts [2]. These difficulties are often caused by learning methods that are less engaging and less actively involving students. Therefore, learning methods and media innovations are needed to bridge students' interest in mathematics and make it easier for them to understand basic concepts [3], [4], [5].

One widely used innovation is using counting media in mathematics learning in elementary schools [6]. Counting media is a tool teachers use to make it easier for students to understand mathematical concepts through a more interactive and contextual approach. This media is designed to suit the cognitive development needs of students at elementary school age so that it can help them understand the material more effectively [7]. The use of this counting media not only serves as a visual aid but also helps students develop critical and creative thinking skills.

In several studies, counting media has been proven effective in improving students' understanding of mathematical concepts. Counting media provides an accurate picture that helps students visualize problems, ultimately making it easier to solve math problems. This will make learning more fun, motivating students to learn mathematics. This motivational factor is crucial in creating a positive learning atmosphere where students feel happy and challenged to solve math problems [8].

In Indonesia, mathematics learning in elementary schools still faces various challenges, including low student understanding of the material taught. Based on the results of the National Examination (UN) and international surveys such as PISA (Program for International Student Assessment), Indonesian students' mathematics ability is still relatively low. One of the reasons is that learning methods tend to be monotonous and do not provide a meaningful learning experience for students [9]. Therefore, using counting media can effectively improve the quality of mathematics learning in elementary schools.

In addition to improving students' understanding, using counting media in mathematics learning can also develop other essential skills, such as problem-solving, logical thinking, and working together in groups [10]. Through the media of arithmetic, students can learn directly by manipulating learning objects. For example, in addition to subtraction learning, students can use media such as blocks or coins to count physically to make the concepts taught more concrete and easy to understand.

On the other hand, teachers also play an essential role in facilitating the use of this counting media [11]. Teachers must be able to choose media that suits the material and needs of students and utilize these media optimally in the learning process. Therefore, it is necessary to improve teachers' competence in using numeracy-based learning media through structured and continuous training. In addition, support from schools in providing counting media facilities is also vital so that the learning process can run well.

Mathematics learning using counting media focuses on students' final results or academic achievements and the learning processes [12]. With this media, students are invited to do active and independent learning, explore mathematical concepts, and apply them in real situations. This aligns with the contextual learning approach, emphasizing the importance of relating subject matter to students' daily lives [13]. Through this approach, it is hoped that

students will not only understand mathematical concepts in the abstract but also be able to apply them in various situations and life problems.

In today's digital era of education, innovative learning media, such as counting media, is very relevant. Counting media can also be combined with digital technology to increase learning effectiveness further. For example, computer-based numeracy applications or interactive learning software that uses numeracy simulations can be integrated into mathematics learning in the classroom [14], [15], [16], [17]. Thus, students can learn more engagingly and interactively, improving their understanding and math skills.

However, the use of computational media also has its challenges. One is the limited resources in some schools, especially in rural or remote areas [18]. Not all schools have access to adequate counting media, so teachers must be creative by utilizing the materials around them to make simple counting media. Another difficulty is the lack of training for teachers in using this counting-based learning media. Therefore, more attention is needed from the government and related parties to ensure that all schools have equal access to quality learning media.

Learning mathematics using counting media in elementary school can improve students' understanding of basic mathematical concepts [19]. Counting media helps students learn more concretely and interactively, making learning more fun and meaningful. Thus, it is hoped that the use of counting media can be one of the solutions to improve the quality of mathematics learning in elementary schools, ultimately contributing to improving student learning achievement in mathematics.

2. METHOD

This study uses a qualitative approach with a descriptive method [20] to explore and analyze the use of counting media in mathematics learning in elementary schools. The qualitative approach was chosen because it allows researchers to deeply understand the experiences and perceptions of teachers and students related to the implementation of counting media in the teaching and learning process. Here, observation and interviews are used. Observation is done directly in the classroom, while the interview is done with a mathematics teacher. Furthermore, focus group discussions with students. Observations were made to see how counting media was used during learning and its impact on classroom interaction, while interviews aimed to understand teachers' experiences in designing and implementing the media. Then, a group discussion with students was conducted to explore their understanding of the effectiveness of computational media in helping them understand mathematical concepts. The researcher also analyzed documents like learning implementation plans (RPP) and student learning outcomes to complete observation and interview data. All data obtained were analyzed using thematic analysis techniques, in which researchers identified key themes that emerged from field data. This analysis process involves steps such as interview transcription, data coding, and theme grouping to comprehensively understand the contribution of computational media in improving students' mathematical comprehension. The validity of the data is maintained through triangulation of data sources and techniques, namely by comparing the results of observations, interviews, and documents to ensure consistency of findings. With this

approach, the research is expected to provide a comprehensive overview of the practice of mathematics learning based on counting media in elementary schools and its implications for improving student understanding.

3. RESULTS AND DISCUSSION

This study examines the effectiveness of using computational media to increase elementary school students' understanding. The observations, interviews, and document analysis showed that using computational media positively impacted students' understanding of basic mathematical concepts. In this discussion, the results of the study will be described in three main subheadings:

3.1. The Effectiveness of Counting Media in Improving Concept Understanding

The study results show that counting media significantly improves students' understanding of basic mathematical concepts [21]. The counting media in this study uses visual aids such as counting blocks, coins, and number boards to explain materials such as addition, subtraction, multiplication, and division. Based on observations in the classroom, students who engaged in learning with counting media showed better results in applying mathematical concepts than students who only received conventional lecture-based learning.

Using counting media makes it easier for students to visualize mathematical problems, ultimately increasing their understanding of the material taught [22]. For example, in learning about addition and subtraction, the medium of counting blocks describes the change in the number of objects in real life. Students will see in real terms how addition and subtraction operations occur, which reduces the abstraction of those concepts. In addition, counting media can also make it easier for students to understand abstract mathematical symbols by providing physical representations of mathematical operations.

Interviews with teachers showed that counting media helped students understand the material and provided more opportunities for teachers to convey concepts. Teachers feel helped by this tool because they can explain complex material more simply and interestingly [23]. For example, when teaching the concept of fractions, teachers use paper cut into parts to demonstrate the concept of division into smaller parts, which proves to be very effective in helping students understand fractions.

Student learning outcome data also showed a significant increase after using counting media. Based on the analysis of test results before and after the intervention, it was found that the average score of students increased by 20% after they participated in learning using counting media. This increase shows that counting media is effective in helping students understand the material more deeply and be able to apply that knowledge in formal tests.

3.2. The Effect of Counting Media on Student Learning Motivation

In addition to increasing understanding of concepts, counting media positively impacts student learning motivation [24]. Based on the results of focused group

discussions with students, many stated that learning mathematics becomes more fun and exciting when using counting media. Most students feel more involved in the learning process because they can interact directly with the tools used to explain mathematical concepts.

Students' motivation to learn increases because counting media provides variation in learning methods, breaking conventional lecture methods' boredom[25]. This media provides opportunities for students to actively participate in learning, for example, by manipulating physical objects so that they are more interested in participating in lessons. This method differs from conventional learning methods, often making students passive and only listening to the teacher's explanations without much interaction.

Some students also stated that the counting media helped them feel more confident solving math problems. They find it easier to understand problems that are usually difficult when using visual aids. This confidence encourages them to be more enthusiastic about learning mathematics and no longer afraid to face complex problems. This increased motivation to learn is reflected in students' increased class participation and willingness to take assignments more seriously.

Teachers also observed positive changes in students' attitudes toward math lessons after using counting media. Students who are usually less active or even reluctant to learn mathematics begin to show interest and desire to engage in learning. Teachers also note that the classroom atmosphere becomes more dynamic and interactive when counting media is used, as students ask more questions and participate in class discussions.

3.3. Challenges and Solutions for Computational Media Implementation

Although this study shows positive results, several challenges are faced in implementing counting media in elementary schools [26]. The first challenge is the limited resources and facilities in schools. Not all schools can access quality computational media, especially in rural or remote areas. Due to school budget constraints, some teachers said they had to get creative by making their counting media from simple materials, such as cardboard or folding paper.

The second challenge is the lack of training for teachers in using counting media effectively. Teachers not used to learning aids may find integrating counting media into their lesson plans challenging. Some teachers also feel that using counting media requires additional time for preparation, which can be an additional burden for those with a busy teaching schedule. This is an obstacle, especially for teachers unfamiliar with interactive learning methods.

To overcome this challenge, one of the proposed solutions is to increase support from the government and schools in providing learning media. The government and schools must ensure that each classroom has adequate counting media to optimise learning. In addition, training and workshops for teachers on the use of counting media are also essential to improve their competence in utilizing these tools effectively.

In addition, local innovation can also be a solution to the limitations of counting media. Teachers can be invited to be more creative in creating counting media from materials around the school environment. For example, teachers can use everyday objects

such as grains, paper, or wooden blocks as simple counting mediums. This creativity saves costs and brings students closer to the everyday realities they encounter in their neighbourhood.

Despite these challenges, this computational media research can significantly improve the quality of mathematics learning. With solid support in terms of facilities and teacher training, counting media can be an effective tool to help students understand mathematical concepts better. Cooperation between schools, teachers, and the government can overcome the existing challenges.

4. CONCLUSION

Based on the research results on using computational media for mathematics learning, it can be concluded that it is an effective learning tool to improve students' understanding of basic mathematical concepts. Various research efforts have proven that counting media significantly improves student learning outcomes, especially their cognitive ability to understand and apply mathematical concepts. Counting media helps reduce the abstraction of mathematical concepts and make them more concrete and easy for students to understand, especially at the stage of primary education where understanding concepts is essential for their academic development.

Counting media is proven to increase student involvement in the learning process. Students not only passively receive the material but also actively participate by manipulating the visual aids used. This makes learning more interactive and exciting, increasing students' motivation. Students actively involved in the learning process tend to show increased understanding and ability to solve math problems. They also showed increased confidence in facing material previously considered difficult, so their motivation to learn increased.

In addition, this study also reveals that the media of counting contributes to improving student achievement. Based on the test results data before and after using computational media, there was a significant increase in the average score. This shows that students not only understand the material better but are also able to apply it in formal evaluation situations. These results reinforce the argument that counting media is helpful as a visual aid and a learning tool that can improve students' overall academic outcomes.

However, although this study shows many benefits, the use of counting media in mathematics learning also faces some challenges. The main challenge is in some schools. Not all schools have adequate access to numeracy media, especially in remote areas. School budget limitations are often an obstacle to providing adequate learning aids. In addition, some teachers have also not received sufficient training in using counting media effectively in learning. This results in less optimal use of counting media in the classroom.

More substantial support from the government and schools is needed to overcome this challenge. The provision of adequate learning aids and training for teachers on how to integrate counting media in mathematics learning must be a priority. Teachers need to be given adequate training to use the counting media effectively and optimize the potential of these tools in improving mathematics learning. In addition, local innovation can also be a solution to overcoming the limitations of assistive devices. Teachers can be creative by

counting media from materials available in the surrounding environment, such as everyday objects that can be used as visual aids.

In addition to cognitive benefits, counting media positively impacts students' affective and social aspects. The use of visual aids in mathematics learning can make the classroom atmosphere more fun and dynamic, which ultimately increases students' comfort and interest in mathematics lessons. The interactive classroom atmosphere also facilitates student cooperation, as many activities involve group work or discussions focusing on solving problems. It helps develop students' social skills, such as communicating, working together, and sharing ideas.

Overall, this study confirms that counting media is an effective tool in improving the quality of mathematics learning in elementary schools. This medium helps students understand math concepts better and increases their motivation, engagement, and academic achievement. With proper support from schools, the government, and teacher training, counting media can be implemented more widely and effectively in elementary schools in urban and remote areas. In addition, teachers' innovation and creativity in creating counting media from local materials can also expand students' access to these learning aids so that more students in various regions can feel the impact.

In the future, further research needs to be carried out to explore more deeply the different types of counting media that can be used for mathematics learning following technological developments and the digital era. For example, the development of technology-based arithmetic applications or software can be a solution to overcome the limitations of physical aids in some schools. By utilizing technology, computing media can be accessed anywhere and anytime. This also aligns with education's development, which is increasingly moving towards digital and online learning.

This study also recommends that counting media be used in mathematics learning in elementary schools and applied to higher levels of education with adjustments to materials and difficulty levels. More complex mathematical concepts, such as algebra and geometry, can also be taught using computational media tailored to the needs of students at a higher level of education. This is expected to continue increasing students' interest and understanding of mathematics throughout their education.

Finally, although this study focuses on the context of mathematics learning in elementary schools, the findings obtained are also relevant for learning in other subjects. The use of visual media and interactive aids can be applied to a variety of other fields of study, such as science and language, to improve students' understanding of the material being taught. Therefore, it is essential to explore various innovative learning strategies and media so that the teaching and learning process can run more effectively and enjoyable for students in all subjects.

Thus, this research will contribute to a much more interactive and student-centered learning method, especially in mathematics learning. This conclusion is expected to be the basis for efforts to improve the quality of education in Indonesia.

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