Exploration of Concrete Media in Improving Mathematics Learning Outcomes of Elemantary School Strudents in the Independent Curriculum

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Abstract

This study aims to observe and analyze how the use of concrete media has an impact on the understanding of students' mathematics learning outcomes. The type of research uses a descriptive method with a qualitative approach and data collection techniques through direct field observation, interviews, and documentation. This research was carried out at Wonokerto State Elementary School 4, with the implementation of the research carried out twice in phase C, namely in grade 5 (32 students) and grade 6 (20 students). And with one teacher, in grade 5 the teacher uses a wall clock as a concrete medium to learn angle material, while in grade 6 the teacher uses a puzzle mat arranged with various forms of nets to learn the material to build a cube room. The results of the study show that concrete media increases student interest and participation and shows that the use of concrete media can increase student understanding by 90% and more effective and efficient learning. Communicative teachers also play an important role in supporting students who are experiencing difficulties. These findings show that concrete media is an effective tool to improve student learning outcomes in mathematics.

1. Introduction

Mathematics learning is often considered one of the subjects that students find difficult to understand. According to data from the Ministry of Education and Culture (Kemendikbud) in 2021, around 60% of students in Indonesia have difficulty understanding basic mathematical concepts, which is reflected in the results of the National Exam which shows that the average mathematics score is still below standard. Low student learning outcomes in mathematics can be caused by a lack of understanding of abstract concepts. In an effort to improve student understanding, the use of appropriate learning media is essential. One way that can be used is to use concrete media, which allows students to interact directly with physical objects that demonstrate mathematical concepts.

This study aims to observe and analyze how the use of concrete media has an impact on students' understanding of mathematics learning outcomes. Using an observational approach, this study will investigate how the use of concrete media can affect students' understanding of learning outcomes by helping students understand complex mathematical concepts and increasing their motivation and involvement in the learning process.

Educators have an important role in changing learning patterns in the classroom, so that they can increase the benefits of students in learning, so that students are comfortable and easy to get data. (Argaruri et al., 2023: 190). According to Mulyasa (2013: 42), learning must involve students as much as possible, in order to be able to explore to form competencies by exploring various potentials and truths scientifically. Good student learning outcomes are one of the indicators of the quality of education in a school (Khoiriyah, A. E., Lestari, S., & Ramadhani, R., 2024). Therefore, it is important to understand how the use of concrete media can help students understand complex mathematical concepts and improve their learning outcomes. Teachers as role holders in learning make an important contribution to the understanding that will be built by students.

Thus, this research is expected to provide insight into how the use of concrete media can help students understand complex mathematical concepts and improve their learning outcomes. According to Azizah., Mustapa, K., Reski, S (2020) Educators/teachers are required to be more creative in finding methods and media in learning in order to achieve better learning outcomes, both for students and educators themselves. The selection of a learning model that matches the characteristics of the learning material needs to be considered so that learning is more effective and attracts students' interest.

LITERATURE REVIEW

The use of concrete media in mathematics learning is one of the main concerns in order to improve students' understanding and learning achievement. According to Argaruri et al. (2023), concrete media serves as an effective tool to help students understand abstract mathematical concepts. The results of their research revealed that student engagement in learning can be increased through direct interaction with physical objects, making understanding the material easier. These findings are also supported by evidence that the use of concrete media makes students more active and motivated in learning, which ultimately has a positive impact on improving their learning outcomes.

Next, research by Khoiriyah, Lestari, and Ramadhani (2024) emphasizes the importance of choosing media that is in accordance with the characteristics of the material and the needs of students. They found that the use of concrete media not only improves students' understanding, but also helps in building students' confidence in dealing with difficult material. In mathematics learning, concrete media such as teaching aids and manipulatives provide opportunities for students to directly explore mathematical concepts, so that they are able to connect theory with practice. This research strengthens the opinion that concrete media is an effective solution in overcoming the difficulties of learning mathematics that students often experience.

Research conducted by Adi and his colleagues (2023) revealed that the use of concrete media in mathematics learning is able to increase students' motivation and interest in learning. They noted a significant increase in the learning outcomes of students who participated in learning using concrete media. These findings show that concrete media not only plays a role as a tool, but also as a driver of student motivation in the learning process. Therefore, the use of concrete media is expected to create a more interactive and fun learning atmosphere, so that it can ultimately improve student learning achievement.

Overall, this literature review confirms that the use of concrete media in mathematics learning has a significant positive impact on students' understanding and learning outcomes. Concrete media not only helps students in understanding abstract concepts, but also increases their motivation and engagement during the learning process. As such, it is important for educators to consider the use of concrete media as part of their teaching strategy, especially in the context of the Independent Curriculum that emphasizes more interactive and experiential learning.

2. Method

In this study, this type of research uses a descriptive method using a qualitative approach with data collection techniques through direct field observation, interviews, and documentation. The research was carried out at Wonokerto 4 State Elementary School, Wonokerto Village, Bantur District, Malang Regency. The research observation was carried out 2 times, the first was carried out on February 26, 2024 in grade 5 and the second time was carried out on April 16, 2025, which is phase c. Phase c for mathematics subjects is taught by one teacher, namely Surya Aziz Yedianto S.Pd. who is also the 5th grade homeroom teacher. Grade 5 with a total of 32 students and grade 6 with a total of 20 students. The selection of phase C is based on the consideration that in this phase, students are at the stage of capturing more complex and critical material.

Interviews with teachers and students were conducted to get more information about the learning process and student understanding. Interviews were conducted to gain diverse perspectives and enrich data analysis. As well as verifying the real reality and understanding the perspectives of teachers and students regarding the learning process.

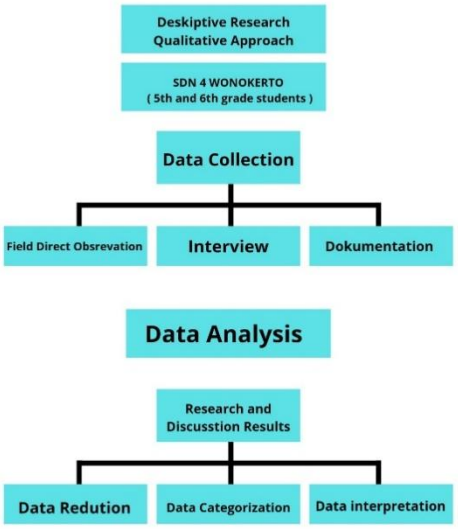

Figure 1. Schematic Chart of Research Methodology

During the study, the documentation of class activities was carried out in a structured manner. Documentation is carried out in every activity carried out, including teachers explaining the material, teachers introducing and using concrete media, student responses, and student interaction with the media. In addition, the documentation includes observation notes, interview transcripts, and the learning materials used.

Table 1. Data Analysis Techniques

No.	Data Analysis Techniques	Information
1.	**Data Reduction**	Identify and select relevant information from observations, interviews, and documentation. Irrelevant data will be ignored to focus the analysis on information that supports the research objectives.
2.	**Categorization**	Groups data into appropriate categories based on themes or topics that emerge from the data collection results. This category will help in organizing the data for further analysis.
3.	**Interpretasi**	Analyze the data that has been grouped to draw conclusions and understand the phenomenon being studied. This process involves interpreting the meaning of the data obtained and relating it to relevant theories or literature.

3. Results and Discussion

3.1. Results

In the first research in grade 5, when learning angle material, the teacher used a wall clock as a concrete medium. Students look very interested and pay close attention as the teacher explains. Teachers also open up interactions by providing feedback, and about 90% of students actively respond and answer questions asked correctly. The teacher gives students the opportunity to use a wall clock so that they can understand firsthand how the clock hand shows the angle in degrees.

In grade 6, when learning the material to build a cube room, the teacher uses a puzzle mat arranged in the shape of a cube with various forms of nets. The teacher explained the general characteristics of the cube which has 6 sides and introduced the shape of the nets (base and lid). Previously, teachers had explained the material using visual media with a projector, but many students had difficulty and had not understood the concept. After using concrete media, about 80% of students can follow and understand the concept of cube nets. The teacher then divides the students into groups to use the puzzle media and make cubes according to the given provisions. There are 3 groups in class 2 groups can follow quickly, while 1 group still has difficulty understanding concepts. However, after the teacher gives the exercises repeatedly, all the students can finally understand and follow the concept of cube nets.

Table 2. Student Engagement Observation Results

Class	Learning Materials	Media Use	Student Engagement Percentage (%)	Information
5	Corner	Clock	90%	Students actively respond and answer questions
6	Build a Cube Space	Alas Puzzle	80%	Students understand the concept of cube nets

The results of interviews with teachers show that the selection of concrete media in mathematics learning is very important because it can help teachers bring learning in the classroom effectively and efficiently. Some criteria that teachers consider in choosing concrete media such as, first, the media must be in accordance with the material to be taught. Both the number of students should be considered, as this relates to the number and size of the media. If the medium is used for explanation in front of the class, then a larger medium is needed. However, if the media is given to students, it must be safe to use. The three media chosen must not be easily damaged and have good rehabilitation.

Table 3. Interview Results with Resource Persons

No.	Question	Resource Person's Answer
1.	How do you choose the right concrete media for learning mathematics?	Adjusted to the chapters/material to be studied Adjusted to the number of students Where this will be related to the amount of media or the size of the media, If it is only used to explain in front of the class, it requires a larger media, however, if the media is given to students, it must be safe to use for students. Media is not easily damaged, Can be used many times, Effective and efficient.
2.	How to deal with students when is difficult to follow learning using these concrete media?	The main step when providing media begins with socialization of how to use the media. Teachers also show how to use concrete media. Then children are given the opportunity to use concrete media directly. If there are still children who cannot follow the teacher, make sure to go around the students' desks to accompany and help students.

3.	How do you improve your abilit to adjust the use of concrete media in the learning materials that are being presented?	As a teacher, you must hone and develop yourself, both independently and collectively. Outside of school, teachers can also develop their skills by looking for learning material references from various sources. In addition, brackets develop themselves through technical guidance or technology guidance, technology guidance is mandatory training for teachers that covers the teacher's self-development. From existing teaching materials such as LKS, modules and other teaching materials, teaching materials are also developed by modifying them.
4.	What is the difference when usir concrete media with other media Towards student learning outcomes?	Of course, it is more efficient and effective when using concrete media. When using other media, students have not mastered the concepts given, so concrete media is one of the solutions to provide a deeper understanding to students.

Students who have difficulty understanding and following learning using concrete media during the learning process, the first step that the teacher takes is that the teacher will socialize the way to use concrete media and the rules for its use. If there are students who are still having difficulties, the teacher will provide help and assistance.

In addition, to improve and develop one's potential to adjust the use of concrete media in the learning materials that will be presented. Teachers also conveyed the importance of honing and developing themselves through independent and collective training. Outside of school, teachers can also develop their skills by and find references to learning materials from various sources. Teachers are obliged to take part in BIMTEK training every semester in order to improve teachers' abilities.

The teacher said that the use of concrete media is more effective than other media, because it can help students understand concepts directly and more deeply. When using other media, students have not mastered the concepts given, concrete media is one of the solutions to provide a deeper understanding to students.

The results of interviews with students show that students often use various media in learning, such as LKS (Student Worksheets), concrete media, and videos. Students stated that teachers more often use concrete media to help them understand the concepts of the material being taught. About 90% of students stated that they prefer the use of concrete media because with this medium, they can learn together simultaneously. In addition, concrete media also allows them to engage in group discussions, which helps improve their understanding through interaction. Students argue that concrete media is very helpful for them in understanding material concepts and makes them faster in solving problems when experiencing difficulties in learning. Students also stated that teachers were very open and communicative. When there are students who do not understand the material, teachers are always ready to accompany and help them directly.

3.2. Discussion

The results of the study show that the use of concrete media in mathematics learning has a positive impact on student understanding. In observations in grades 5 and 6, it can be seen that students are more interested and active when using concrete media, such as wall clocks and puzzle mats. This medium helps students understand difficult concepts in a more real and interactive way. For example, when learning about angles, students can instantly see how the hands show the angle in degrees. Likewise, when learning about building a cube space, the use of concrete media puzzles makes it easier for students to understand cube nets.

Interviews with teachers and students also revealed that concrete media is very effective and efficient in improving and building student understanding. The teacher explained that the selection of media must be in accordance with the material and the number of students, and must be safe and not easily damaged. In addition, teachers also play an active role in accompanying students who experience

difficulties, so that all students can understand the material well. Students enjoy learning with concrete media because they can learn together and discuss, which makes the learning process more enjoyable.

Research conducted at SDN Wonokerto 4 shows that the use of concrete media in mathematics learning is very effective in improving students' understanding and learning outcomes. Concrete media such as wall clocks for corner materials and puzzles for building materials for cube space materials have succeeded in increasing student engagement and helping them understand abstract concepts in a more real and interactive way. Communicative teachers also play an important role in accompanying students who experience difficulties so that learning outcomes increase significantly.

Comparison with Other Studies : The results of this study are in line with the research of Shoimah (2020), which showed a significant increase in learning interest from 60% (medium criteria) to 95% (very high criteria) after the use of concrete media. This shows that concrete media not only improves understanding, but also makes learning more interesting and not monotonous. Research at SDN Baluase (2024) also found an increase in learning outcomes from 40% completeness in the pre-cycle to 97% in the second cycle, which shows that concrete media helps students understand abstract concepts more easily and increases their confidence.

Research at SD Nurul Fathimiyah (2021/2022) compared the learning outcomes of mathematics multiplication materials between classes that use concrete media and conventional learning. The learning outcomes with concrete media were higher (average score of 85) compared to conventional learning (average score of 75), showing the positive influence of concrete media on mathematics learning outcomes. This corroborates the conclusion that concrete media improves the quality of mathematics learning.

Concrete Learning Theory : The concrete learning theory put forward by Jerome Bruner and Jean Piaget supports this finding. Bruner argues that effective learning involves hands-on experience with real objects, allowing students to understand concepts in more depth. He stated that students learn better when they can interact with the learning materials directly. Meanwhile, Piaget emphasizes the importance of the cognitive developmental stage, where students need to experience and interact with their environment in order to build more complex understanding.

Based on the research that has been conducted, it is recommended for teachers to choose concrete media according to the material and the needs of students. In addition, the concrete media used must be safe, can be used many times, is not easily damaged, and is adjusted to the size and number of students. If the concrete media is small, it is expected that all students will be able to analyze directly. Teachers must also play an active role in accompanying students who experience obstacles, so that all students can understand the material well. One of the educational successes is shown by the increasing learning outcomes of students, including the media used in learning (Musdar et al., 2020).

Thus, the role of concrete media is very important to help students understand abstract mathematical concepts in a more real and interactive way. Concrete media is used to facilitate discussion and cooperation between students, so that they can learn together and understand math material better. According to Azizah, Mustapa, K., and Reski, S. (2020), through concrete media, students will experience direct experience with real objects and can also help students understand something abstract.

3.3. Conclusion

Fundamental Finding : From the results of this study, it can be concluded that the use of concrete media in mathematics learning is very useful for improving student understanding. Concrete media helps students understand abstract concepts in a more real and interactive way. In addition, communicative and supportive teachers also play an important role in helping students who are experiencing difficulties. Educators have a crucial role in changing learning patterns in the classroom (Anggraini, M., Mahmudah, I, 2023). These findings show that concrete media is not only effective in increasing students' interest and understanding, but also in improving their learning outcomes. **Implication** : The practical implication of this study is that the use of concrete media can be an effective solution to improve student learning outcomes in mathematics subjects at the elementary school level. Therefore, it is recommended that teachers choose concrete media that suits the material and needs of students, and plays an active role in assisting students who are experiencing difficulties. **Limitation** : In addition, the use of other media is also important to support learning and as a variation of learning models so that the teaching and learning process becomes more interesting and can increase student learning motivation. Future **Research** : Suggestions for follow-up research are to explore the use of concrete media in other learning contexts, as well as conduct a more in-depth study of the long-term impact of concrete media use on student learning outcomes. Further research can also consider other factors that affect the effectiveness of concrete media, such as student characteristics and learning

environment. Thus, this research makes an important contribution to the development of more effective and innovative learning methods in mathematics education.

Author Contributions

Cindy Claudya : Developing Ideas, condructing research, write data, processing data, editing articles and compiling articles. Candra Utama : supervisor, revision and research companion.

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