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The Use of Multiplication Cards in Improving Students' Math Multiplication Learning Outcomes

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Abstract

Media innovation in math learning is essential to improving student understanding. This study aims to assess the improvement in students' math learning outcomes using multiplication card media. This research follows a classroom action research design consisting of three cycles. The research subjects were 13 fifth-grade students from SD Negeri Wironanggan 02. Three types of questions were used to measure student learning outcomes. The results indicated an improvement in student learning outcomes. In Cycle I, the average learning outcome was 58.462, increasing to 76.538 in Cycle II and 93.077 in Cycle III. The gain score between Cycle I and Cycle II was 0.435 (43.5%), which further increased to 0.705 (70.5%) between Cycle II and Cycle III. Based on these results, it can be concluded that the use of multiplication card media in learning enhances the learning outcomes of fifth-grade students at SD Negeri Wironanggan 02.

Keywords: *learning outcomes; mathematics; multiplication cards*

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INTRODUCTION

Mathematics is one of the basic subjects that plays an important role in students' cognitive development. A strong understanding of basic math concepts such as multiplication is essential for academic success and its application in everyday life. Math is also a subject that deals with concepts. According to Novitasari (2016) understanding concepts in mathematics is very important because the concepts of mathematical material are interrelated with one another. Mathematics plays an important role in the national curriculum and must be studied by students at all levels of education with the aim of learning mathematics at school, which is not only to improve students' understanding of mathematical material, but also to improve their skills in various fields which include mathematical understanding and communication, reasoning, representation, connection, and mathematical problem solving (Dhanesti et al., 2024).

Students should be taught to understand mathematical concepts since elementary school, because this is the golden period in physical and mental growth (Radiusman, 2020). Students' understanding of mathematical concepts can be measured by their ability to apply

principles in various situations, how they solve problems using appropriate strategies and can explain the reasons for the steps or strategies they take. During learning, students often have difficulty solving problems that are not in line with their expectations, so a solution is needed (Hidajat et al., 2020). In learning, each student also has various interests. Each of these students also sees every learning obstacle as a challenge that must be resolved. Children who like math are generally very interested in learning, this makes students moved to create strategies on how to solve the problems or problems they get.

A child's high interest in learning will ultimately achieve satisfactory learning outcomes. Students who have a high interest in learning tend to be diligent, resilient, and enthusiastic in learning and trying to strategize to solve it (Prastika, 2020). This interest in learning will affect their learning outcomes. A learning model that can attract students' interest is cooperative learning. Cooperative learning is a broader concept encompassing all types of group work including formats that are more teacher-led or teacher-managed, cooperative learning is generally considered teacher-focused, where the teacher sets the problems and questions and provides materials and information that can help in the learning process (Agustina et al., 2020). In the learning process, teachers need to be creative in determining the right learning model so that they can create conducive teaching and learning conditions so that the learning process runs according to the expected goals (Lokat et al., 2022).

To support the successful application of mathematical concepts, in addition to the learning model, teachers also need to develop various media that are in accordance with student needs and can motivate student learning. In this case more specifically, learning media are objects, tools, or environments that contain information to be used as learning, both for students and teachers (Anjarani et al., 2020). According to Shomad & Rahayu (2022), learning media is one of the instruments that can help stimulate students for the learning process to occur. The existence of learning media can help learning to be more lively, not monotonous, not boring and can arouse students' curiosity and stimulate physical and emotional reactions (Junaidi, 2019).

According to Wulandari et al. (2023), the benefits of media in organizing the learning and learning process, namely 1) clarify the delivery of information in learning 2) increase motivation, student interest in their ability to learn independently 3) have no sensory, space and time limitations 4) enable direct learning experiences in their own environment. One way to make learning fun is to combine learning with games, because conventional learning methods or lectures are widely used by teachers so that students are quickly bored and lazy when learning takes place (Agustino et al., 2024).

Multiplication is one of the topics in mathematics that is frequently applied in everyday life. Based on observations, researchers found that some students still struggled to understand multiplication. In line with the statement by Mahmudah et al. (2021), in general, mathematics is considered difficult by students because students are required to memorize formulas, so teaching staff are expected to be able to present mathematics material in the form of games with the hope that students do not think it is difficult but it becomes a fun lesson for students. The difficulties of learning math for students include: 1) difficulty in understanding concepts, 2) students' difficulty in memorizing multiplication, 3) difficulty in distinguishing the symbols of arithmetic operations (Amalia et al., 2022)

Therefore, media is needed that can help students understand and solve problems related to multiplication material. One of the media that can be used is card-shaped learning media. Card media is one of the media that can be used in learning in elementary schools. One of the learning media that is considered suitable is domino cards. According to Yuli & Ruswandy (2019), domino card games are media that can provide direct experience for

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students, in this case students can be directly involved in activities to recognize numbers on modified domino cards.

In this study, card learning media called multiplication cards were used. The researchers directly observed SD Negeri Wironanggan 02. From these observations, they found that the low learning outcomes of Class V students were due to difficulties in math, especially multiplication. Therefore, researchers use multiplication card media as a fun and interesting media for students in memorizing and understanding the concept of multiplication to improve student learning outcomes. The same research was Miftahuddin & Arofah (2020) on students of Class IV MI NU Imaduddin Hadiwarno is the use of counting card games as a medium for learning multiplication. The novelty of this research lies in the subject studied and the game method, which differentiate it from previous studies.

Based on the description above, this study aims to determine the effectiveness of using multiplication card media to improve the learning outcomes of fifth-grade students at Wironanggan 02 State Elementary School. Multiplication card media serve as an interactive and engaging learning tool. It is expected that using multiplication card media as a teaching aid will help students understand multiplication concepts, ultimately having a positive impact on their math learning outcomes.

RESEARCH METHODOLOGY

The method used in the research is class action research (CAR). This method is designed to determine the effectiveness of using learning media to improve learning outcomes. According to Prihantoro & Hidayat (2019), Classroom Action Research (CAR) can also bridge the gap between educational theory and practice because these activities are carried out by themselves, in their own classrooms by involving their own students, through an action that is planned, implemented, evaluated, and reflected, thus systematic feedback is obtained about what has been done in teaching and learning activities to be applied properly in the class they are engaged in for a more effective, optimal, and functional learning process and or product. Therefore, CAR an reflect and analyze during the learning process to find shortcomings and improve performance by changing learning strategies and creating learning that improves the quality of learning.

The research was conducted at SD Negeri Wironanggan 02 located on Jl. Raya Klewer-Gawok, Dusun II, Wironanggan, Gatak Subdistrict, Sukoharjo Regency, Central Java in the 2023/2024 academic year. The subjects of this study were fifth grade students of Wironanggan 02 State Elementary School totaling 13 students. Classroom action research with the model used is Kemmis and McTaggart. The stages carried out in Kemmis and Taggart each action includes planning, implementation, observation, and reflection.

During the planning stage, various steps were taken, including observing classroom conditions, identifying problems, discussing with the class teacher, formulating an action plan, designing learning scenarios, preparing learning materials and media, and creating pre-test and post-test questions. The implementation stage followed the planned design and was conducted in three cycles: Cycle I, Cycle II, and Cycle III. Cycle I was carried out before introducing multiplication cards, during which students were asked to complete worksheets consisting of 10 questions from the teacher's textbook within 45 minutes. In Cycles II and III, learning was conducted using multiplication card media to assess student learning outcomes.

In the multiplication card activity, students played the game in groups of 5-7, with each student receiving five cards. The game involved sorting and matching answer pairs to form a tower. After constructing the tower, students observed and solved operations by writing their answers on a piece of paper. Observations were conducted throughout the

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activity, with researchers monitoring how students approached problem-solving and evaluating the accuracy of their answers.

The data collection techniques used in this study included observation and student worksheets administered during and after the activity. Data collection instruments consisted of tests, including pre-tests and post-tests given by the researchers. The data analysis in this study involved both quantitative and qualitative approaches. Quantitative analysis was conducted by comparing learning outcomes before and after using multiplication cards, based on the average N-gain score across Cycle I, Cycle II, and Cycle III. Qualitative analysis focused on evaluating the process of implementing multiplication card media in supporting math learning.

RESULTS AND DISCUSSION

Based on observations at SD Negeri Wironanggan 02, researchers conducted a study in three cycles. In Cycle I, we planned and prepared student worksheets, after which students were asked to answer and solve the problems. In Cycles II and Cycle III, researchers designed lessons by preparing student worksheets with problem-solving tasks and incorporating multiplication card media. This approach allowed researchers to observe students' learning progress through pre-test and post-test assessments.

The study revealed an improvement in learning outcomes, with an increase observed from Cycle I to Cycle II, followed by further progress from Cycle II to Cycle III. This development is evident in the comparison of student learning outcomes presented below.

Student Learning Outcomes Cycle I

In Cycle I, the planning involved creating 10 questions on basic multiplication concepts. Students were then given 45 minutes to complete the questions. After finishing, they submitted their answer sheets, which were then reviewed and scored by the researcher. Figure 1 shows student activity in problem-solving during Cycle I learning.

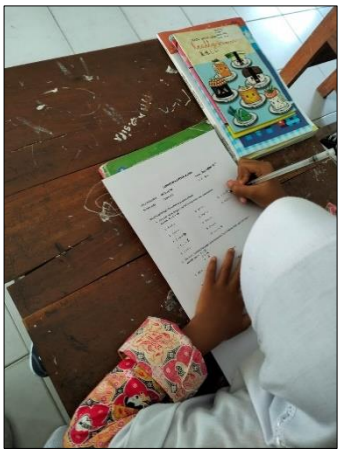

Figure 1. Student Problem Solving in Cycle I

The learning outcomes of fifth-grade students at Wironanggan 02 State Elementary School in Cycle I are presented in Table 1. From Table 1 on student learning outcomes, it

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can be seen that the average score of fifth-grade students at Wironanggan 02 State Elementary School is 58.462, with a total of 13 students. This result is due to the fact that teaching media had not yet been implemented in this cycle. Based on these findings, it can be concluded that some students still struggled with the multiplication material. Therefore, the researcher planned for Cycle II to incorporate teaching media in the form of multiplication cards.

Table 1. Student Learning Outcomes in Cycle I

No	Students	Score
1.	Student 1	70
2.	Student 2	50
3.	Student 3	70
4.	Student 4	50
5.	Student 5	80
6.	Student 6	60
7.	Student 7	30
8.	Student 8	50
9.	Student 9	60
10.	Student 10	70
11.	Student 11	60
12.	Student 12	50
13.	Student 13	60
	Average	58.462

In Table 2, it is shown that one student received a *very low* qualification, eight students received *low* qualifications, three students received *sufficient* qualifications, and one student received a *good* qualification. In this cycle, students had not yet used the multiplication card media.

Table 2. Classification of Student Learning Outcomes in Cycle I

Value	Qualification	Many	Percentage
85-100	Very Good	0	0
75-84	Good	1	7.692
65-74	Sufficient	3	23.077
40-64	Low	8	61.539
<40	Very Low	1	7.692
	Total	13	100

Student Learning Outcomes Cycle II

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The results of Cycle II were obtained from research incorporating multiplication card media. In this phase, students were asked to complete the provided student worksheet, which included five questions from the textbook and five statements derived from the multiplication card game. Figure 2 shows a sample of the multiplication card media.

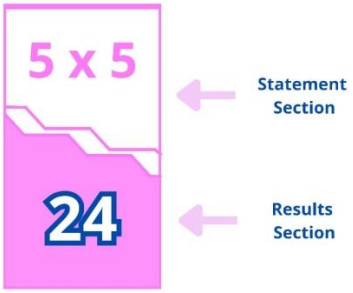

Figure 2. Multiplication Card Teaching Media

Before playing the multiplication card game, structured game steps are established to encourage student interaction and create an engaging learning environment. The game is played in groups of 5-7 students, with a total of 70 multiplication cards. Each student receives 5 cards randomly. Students work together to build up to 7 towers, each consisting of 10 cards, or until no more cards can be placed. The multiplication cards are divided into two parts: *the result section*, which contains a single number, and *the statement section*, which includes two numbers and a multiplication operation. The cards are arranged similarly to dominoes, where the result section of one card must match the statement section of another.

The game begins with one player placing a *prefix card* in the center of the table. The next player continues by placing a card that matches the number at the end of the existing sequence. The game progresses clockwise. Once a tower reaches 10 cards, a new arrangement begins with the next player placing a new prefix card. The game continues until a maximum of 7 towers is completed. The winner is the player who finishes their multiplication cards the fastest. To reinforce multiplication learning, each student selects one of the completed towers and observes the multiplication results within it. They then write down the results from the multiplication card tower as questions on a worksheet for further problem-solving. Figure 3 illustrates students' engagement in problem-solving and the application of multiplication cards during Cycle II.

Figure 1. Student Problem Solving and Application of Multiplication Cards in Cycle II

In this cycle, students record five results from their observations, which correspond to five similar problems from the textbook. By combining problem-solving with the

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multiplication card game, the learning outcomes of fifth-grade students at SD Negeri Wironanggan 02 are recorded in Table 3. The student learning outcomes in Cycle II show an average score of 76.538.

Table 3. Student Learning Outcomes in Cycle II

No	Students	Score
1.	Student 1	85
2.	Student 2	75
3.	Student 3	90
4.	Student 4	70
5.	Student 5	90
6.	Student 6	75
7.	Student 7	50
8.	Student 8	70
9.	Student 9	80
10.	Student 10	85
11.	Student 11	80
12.	Student 12	75
13.	Student 13	70
	Average	76.538

Based on Table 4, four students received a *very good* qualification, five students received a *good* qualification, three students received a *sufficient* qualification, and one student received a *low* qualification. No students received a *very low* qualification.

Table 4. Classification of Student Learning Outcomes Cycle II

Value	Qualification	Many	Percentage
85-100	Very Good	4	30.770
75-84	Good	5	38.461
65-74	Sufficient	3	23.077
40-64	Low	1	7.692
<40	Very Low	0	0
	Total	13	100

Improvement in Student Learning Outcomes from Cycle I to Cycle II

Based on the data analysis and explanation above, it can be observed that in Cycle I, students achieved an average score of 58.462, which increased to 76.538 in Cycle II. This improvement is presented in Table 5 below.

Table 5. Improved Student Learning Outcomes

Action	Average	Gain Score	Percent	Category
Cycle I	58.462	0.435	43.5%	Medium
Cycle II	76.538			

In Cycle II, students received treatment using multiplication card media. In this cycle, students used multiplication card media to solve problems, leading to an improvement in their learning outcomes. A total of 4 students (30.77% of the class) received very good qualifications, whereas in Cycle I, no students achieved this level. Additionally, the number of students in the **low** qualification category decreased from 8 to just 1. These results mark the beginning of an improvement in the learning outcomes of fifth-grade students at SD Negeri Wironanggan 02. Following this progress, researchers designed Cycle III to further evaluate the effectiveness of multiplication card media in enhancing math learning.

Student Learning Outcomes Cycle III

Learning activity in Cycle III combines multiplication cards with problem-solving, as illustrated in Figure 4. This activity follows the same approach as in Cycle II, with the primary difference being the type of problems given. In Table 6, it can be seen that there was an increase in the average score. In Cycle III, the average score reached 93.077. Based on the table, many students achieved high scores.

Table 6. Student Learning Outcomes Cycle III

No	Students	Score
1.	Student 1	95
2.	Student 2	85
3.	Student 3	100
4.	Student 4	85
5.	Student 5	100
6.	Student 6	95
7.	Student 7	75
8.	Student 8	90
9.	Student 9	95
10.	Student 10	100
11.	Student 11	100
12.	Student 12	95
13.	Student 13	95
	Average	93.077

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Figure 2. Student Problem Solving and Application of Multiplication Cards in Cycle III

The distribution of student classifications in Cycle III also changed from the previous cycle..Based on the classification results in Table 7, 12 students achieved very good qualifications, while 1 student received a good qualification. No students received a low qualification. It is hoped that the continued use of multiplication card media will help students become more proficient in multiplication and enhance their overall learning experience.

Table 7. Classification of Student Learning Outcomes in Cycle III

Value	Qualification	Many	Percentage
85-100	Very Good	12	92.308
75-84	Good	1	7.692
65-74	Sufficient	0	0
40-64	Low	0	0
<40	Very Low	0	0
	Total	13	100

Improvement in Student Learning Outcomes from Cycle II to Cycle III

In Cycle III, treatment was administered again using multiplication card media to evaluate its effectiveness. There was a further increase in the average student learning outcomes. In Cycle II, students achieved an average score of 76.538, while in Cycle III, the average score increased to 93.077, demonstrating significant progress. This improvement is presented in Table 8. As shown in Table 8, the gain score of the average increased to 0.705 or 70.5%, which falls into the high category. This data indicates a significant improvement in learning outcomes from Cycle II to Cycle III.

Table 2. Improved Student Learning Outcomes

Action	Average	Gain Score	Percent	Category
Cycle I	76.538	0.705	70.5%	High
Cycle II	93.077			

Based on Table 7, which classifies student learning outcomes in Cycle III, there is a noticeable improvement in student qualifications at SD Negeri Wironanggan 02 from Cycle II to Cycle III. In this cycle, 92.308% of students (12 students) achieved very good qualifications, while 1 student received a good qualification. Therefore, it can be concluded that student scores improved across Cycle I, Cycle II, and Cycle III after implementing the multiplication card teaching media.

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This study is based on one of the learning theories, namely Bruner's Theory. This theory emphasizes active student involvement in acquiring and developing material to solve problems through cognitive processes of information processing, ultimately fostering more complex ways of thinking (Elfareta & Murtiyasa, 2022). According to this theory, students should be given opportunities to manipulate objects or specialized props, which help them understand mathematical concepts, patterns, and structures (Rahmadhani, 2022). In the multiplication card game, students engage in problem-solving activities to enhance their learning outcomes.

This learning theory is basically a cognitive process that occurs within a person, there are three cognitive processes in learning, namely: the process of acquiring new information, the process of transforming information, and testing the relevance and accuracy of knowledge (Sutarto, 2017). Furthermore, in receiving information, students employ different strategies, intellectual levels, and methods of acquisition, storage, and application of knowledge to solve mathematical problems (Hidajat et al., 2024).

From the three cycles above, it can be seen that there was an increase in student learning outcomes. Therefore, it can be concluded that learning by using multiplication card media is effective and can be used as a learning medium so that students are interested in understanding, remembering, and processing numbers. This can improve the learning outcomes of fifth grade students of SD Negeri Wironanggan 02 in learning mathematics, especially multiplication. This research also shows the potential of using simple media such as multiplication cards to encourage the development of learning technology and have a positive impact on improving the quality of education. Through this, it allows teachers or educators to identify and implement more effective activities or strategies and continue to innovate and improve to achieve the desired learning objectives (Suciani et al., 2023).

CONCLUSION AND SUGGESTIONS

Based on research conducted at SD Negeri Wironanggan 02, data from observations, presented in the discussion of results, show an increase in the average student learning outcomes. In Cycle I, the average learning outcome was 58.462, which increased to 76.538 in Cycle II, and further improved to 93.077 in Cycle III.

The gain score from Cycle I to Cycle II was 0.435, with a percentage increase of 43.5%, while from Cycle II to Cycle III, the gain score was 0.705, with a percentage increase of 70.5%. This indicates a steady improvement in learning outcomes across the cycles, demonstrating the effectiveness of multiplication card media in enhancing student learning.

From the findings above, it can be concluded that using multiplication card media is an effective strategy for improving student learning outcomes. The incorporation of teaching media in multiplication lessons fosters engaging and enjoyable learning, attracting students' interest and helping them memorize and understand multiplication concepts. This effectiveness is evident in the consistent improvement in learning outcomes across the cycles.

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