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The Use of Manipulative Media to Enhance Concept Understanding in Area Measurement Using Non-Standard and Standard Units among 4th Grade Students at SD Negeri 2 Lawang

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Abstract- At SD Negeri 2 Lawang, the process of teaching Mathematics is still often presented in the form of lectures. This causes students to be passive and have difficulty understanding a mathematical concept. To address this, the necessary step is to use appropriate learning media so that students can think critically, logically, and solve problems with an open, creative, and innovative attitude, especially in learning the material on Area Measurement using Non-Standard and Standard Units. This research aims to improve the ability to understand the concept of Area Measurement using Non-Standard and Standard Units through the use of Mathematical Manipulative Media. This research is a classroom action research using a qualitative approach conducted through two cycles.The sample for this research consists of 28 fourth-grade students from SD Negeri 2 Lawang, comprising 12 male students and 16 female students.The instruments used in this study are tests, observations, and documentation. The research results show that there is an improvement in students' conceptual understanding of Area Measurement with Non-Standard and Standard Units using Manipulative Media, as evidenced by the increase in students' learning outcomes. This research shows that the use of Mathematical Manipulative Media in the material of Area Measurement with Non-Standard and Standard Units has proven effective in improving students' conceptual understanding and learning outcomes.

Keywords: *mathematical manipulative media, conceptual understanding, Area Measurement*

INTRODUCTION

Mathematics is one of the subjects taught at various educational levels, from elementary to higher education. In addition, Mathematics is a subject that plays an important role in the development of logical and systematic thinking skills. Kusumaningrum in the journal (Fadjri, 2017:3) mentions that in mathematics learning, students are trained to think and reason in drawing conclusions through activities such as investigation, exploration, experimentation, showing similarities and differences, consistency, and inconsistency. Through Mathematics education, it is expected that students will have the ability to solve problems in everyday life. This shows that Mathematics plays an important role in everyday life.

In Mathematics learning, understanding concepts plays an important role, because mastering concepts will make it easier for students to learn Mathematics. Zulkardi in Murizal, et al. (2012:20) states that Mathematics lessons emphasize concepts. So, in studying Mathematics, of course, one must understand the existing Mathematical concepts. If students in Mathematics learning do not understand the concepts well, it will be difficult for them to learn the next higher-level material.

Conceptual understanding consists of two words, namely understanding and concept. The word "pemahaman" comes from the root word "paham," which means to understand well (something); and "pemahaman" means the process of understanding something, while "konsep" means a design. Purwanto in Murizal, et al. (2012:19) states that understanding is a level of ability that expects students to be able to comprehend the meaning or concept, situation, and facts they know.From the above definition, when combined, conceptual understanding is the process of correctly comprehending a design. This means that a person is said to understand a concept if they fully comprehend a design/concept they are familiar with.

There are several indicators used to determine students' understanding of a concept. Rismawati & Hutagaol (2018) in their research state that the indicators of mathematical concept understanding are as follows:(1) Able to explain a definition in their own words according to its essential characteristics or features, (2) Able to mention or provide examples and non-examples, and (3) Able to use the concept in solving problems. From the explanation, it can be said that a student is considered to understand a mathematical concept if they can explain a definition in their own words, able to provide examples and non-examples, and able to use the concept in solving problems.

One of the topics in 4th-grade mathematics is measuring area using non-standard and standard units. Understanding the concept in this material is very important so that students can measure and compare the area of a field accurately. Non-standard units are measurement units that yield different results because they use different or non-standard measuring tools. Examples of objects used as measuring tools for non-standard units of area include paper money, origami paper, books, and so on. Whereas the standard unit is a unit that is officially used throughout the country. That means the value of the standard unit will always be the same. The characteristic of standard units is to produce the same measurement even when performed by different people and at different times. Standard units are centimeters, meters, kilometers, grams, kilograms, tons, and so on.

From the author's experience in teaching that material, students still find it difficult to understand the concept of area measurement in non-standard and standard units. Students merely memorize formulas without relating them to real life. The lack of media and teaching aids that support the delivery of learning materials also affects the process of students' understanding of mathematical concepts. As a result, students' learning outcomes on this material are quite low.

Based on the above problem, the author strives to improve students' conceptual understanding regarding area measurement with non-standard and standard units using mathematical manipulative media. Manipulative Media are objects, tools, models, or machines that can be used to assist in understanding during the problem-solving process related to a mathematical concept or topic. Manipulative Media in Mathematics learning are learning aids that can be held, moved, assembled, flipped, arranged, folded, and manipulated by hand, which function to help students understand mathematical concepts and explanations. This is in accordance with what Hardiyana (2010:8) stated, which mentions that manipulative media are teaching aids used by teachers to explain lesson material and communicate with students, making it easier to convey the concept of the material being taught using objects designed to resemble real-life items close to students' daily lives, such as fruits, animals, transportation toys, and beads that can be easily manipulated and altered.

There are several types of manipulative media, namely: Paper Manipulative Media, Stick Manipulative Media, Square and Strip Manipulative Media made of Wood/Triplex, Dotted/Squared Paper Manipulative Media, Transparent Manipulative Media. In this case, the author uses easily found manipulative media in the surrounding environment, such as paper money, origami paper, books, and graph paper. Many studies have shown the effectiveness of manipulative media in enhancing conceptual understanding and mathematics learning outcomes. Research by Setiawan (2021) concluded that students who used manipulative media were more capable of solving area measurement problems compared to students who only received lecture-based learning.

METHOD

This research is a classroom action research (CAR) or what is often referred to as Classroom Action Research (CAR). The design of this research uses the research model developed by Kemmis and McTaggart, which is a spiral form of cycles from one cycle to the next. The stages of this research consist of 4 series of activities conducted in a repeating cycle. Each cycle consists of four steps including; planning, acting, observing, reflecting.

The subjects of this research are the 4th-grade students of SD Negeri 2 Lawang, totaling 28 students, consisting of 12 male students and 16 female students. This research was conducted in the 4th-grade class of SD Negeri 2 Lawang, located at Jl. Kartini no. 7 Lawang. This research uses instruments such as tests, observations, and documentation. The observation technique in this research is used to observe and record every activity of the teacher and the students during the learning process. The author uses the test technique in this research in the form of evaluation questions at the end of each lesson. As well as the documentation technique in the research in the form of photos of teacher and student activities during the learning process.

RESULT AND DISCUSSION

Based on the implementation of actions over 2 cycles conducted in 4 meetings, data was obtained showing that students' conceptual understanding improved, as indicated by the increase in learning outcomes. This is evident in the percentage of learning completeness obtained from the evaluation test results at the end of each learning session. In the pre-cycle activities, the students' mathematics learning outcomes were still low. This is evidenced by looking at the results obtained in Table 1. A comparison of students' mathematics learning outcomes between cycles. Based on these results, it was identified that the evaluation test scores conducted by 28 students yielded a total score of 1729, with the highest score being 100 and the lowest score being 40. Based on the total score, an average score of 61,75 can then be calculated. The increase in the obtained learning scores can indicate an improvement in the percentage of learning completeness, as can be seen in Figure 1, the graph comparing the percentage of mathematics learning completeness between cycles. If we look at the established criteria for learning mastery with a score of 70, it has been identified that in this pre-action activity, only 9 students achieved scores above the learning mastery criteria (LMC) with a classical mastery percentage of 32%. Meanwhile, there are still 19 students who scored below the KKTP with a classical completeness percentage of 67%.

In this pre-cycle learning, data was obtained indicating that students were less enthusiastic when the teacher explained the material. Most students find it difficult to understand the material. This is because teachers still rely heavily on the lecture method in their teaching, which makes students bored and even unfocused during the ongoing lessons. In addition, in the learning activities, the teacher still dominates and the students tend to be passive. The use of less engaging media also makes students less enthusiastic about understanding the material. Students complete evaluation questions based solely on memorization. Students do not fully understand the concepts of the material being taught, which affects the resulting grades, making them less than optimal. It can be interpreted that the low evaluation results of the students indicate that the students do not understand the concepts of the material taught by the teacher. Seeing the stark difference between students who have completed their studies and those who have not, it is necessary to improve the learning process.

Cycle I research was conducted on Tuesday, January 7, 2025, and Friday, January 10, 2025.Cycle II research was conducted on Tuesday, January 14, 2025, and Friday, January 17, 2025.Each meeting was conducted for 2 class hours (2x35 minutes). Based on the implementation of manipulative media in the learning process in the 4th grade of SD Negeri 2 Lawang, it can be observed that students' understanding of mathematical concepts improved from cycle I to cycle II. In cycle I and cycle II, tests were conducted to measure students' understanding of mathematical concepts, which were carried out at the end of each cycle.

The results in Cycle I after the implementation of manipulative media on the material of area measurement with non-standard and standard units showed a slight improvement in learning outcomes. This is evidenced by looking at the results obtained in Table 1, which compares the students' mathematics learning outcomes between cycles. Based on these results, it was identified that the evaluation test scores conducted by 28 students yielded a total score of 1985, with the highest score being 100 and the lowest score being 50. Based on the total score, an average score of 70,89 can then be calculated. The increase in the learning scores obtained can indicate that there is an increase in the percentage of learning completeness, as can be seen in Figure 1, the graph comparing the percentage of mathematics learning completeness between cycles. If we look at the determination of the learning completion criteria (KKTP) of 70, it has been identified that in cycle I activities, there were 12 students who achieved scores above the KKTP with a classical completion percentage of 42%. Meanwhile, there are still 16 other students who scored below the minimum completeness criteria (KKM) with a classical completeness percentage of 57%.

The reflection from the implementation of Cycle 1 is that there has been an improvement from the students, namely that the students' attention to the learning material has started to become focused, and the students also appear enthusiastic in the learning process, as evidenced by their active questioning and responding to the teacher's feedback. In this activity, manipulative media have started to be used in the learning process. The manipulative media used are paper materials available around the students, namely paper money, origami paper, and books. The use of manipulative media in learning during this cycle has somewhat improved student evaluation results, although the results still have not reached the expected standards. The use of manipulative media in this activity increased student enthusiasm in learning, as evidenced by the noticeable rise in students actively asking questions and providing feedback to the teacher. The evaluation results also show improvement, although not yet optimal, which can also be interpreted as the students' understanding of the concept of area measurement with non-standard and standard units using the manipulative media has increased.

The results obtained in cycle II show good outcomes, as there has been a significant improvement in mathematics learning outcomes through the application of manipulative media. This is evidenced by looking at the results obtained in Table 1, which compares the students' mathematics learning outcomes between cycles. Based on these results, it was identified that the evaluation test scores conducted by 28 students yielded a total score of 2250, with the highest score being 100 and the lowest score being 60. Based on the total score, an average score of 80,53 can then be calculated. The increase in the learning scores obtained can indicate that there is an improvement in the percentage of learning completeness, as can be seen in Figure 1, the graph comparing the percentage of mathematics learning completeness between cycles. If we look at the KKTP standard of 70, it has been identified that in the second cycle activities, there are 23 students who have achieved scores above the KKTP with a classical completeness percentage of 82%. However, there are still 5 students who scored below the KKTP with a classical completeness percentage of 18%.

In this second cycle, the manipulative media used is grid paper. The learning in this cycle can be considered quite good, as indicated by the improved evaluation results achieved by the students, even exceeding the standard at 82%. Students in the learning process were already active and able to solve evaluation questions quickly and well, which means that the students have understood the concepts of the material that the teacher has delivered. The drawback of the implementation of cycle II is that some students are still found to have difficulties in completing and understanding the material. From the evaluation results, it was found that those

students have consistently scored below the predetermined KKTP from the beginning of the activities, namely the pre-cycle to Cycle II.

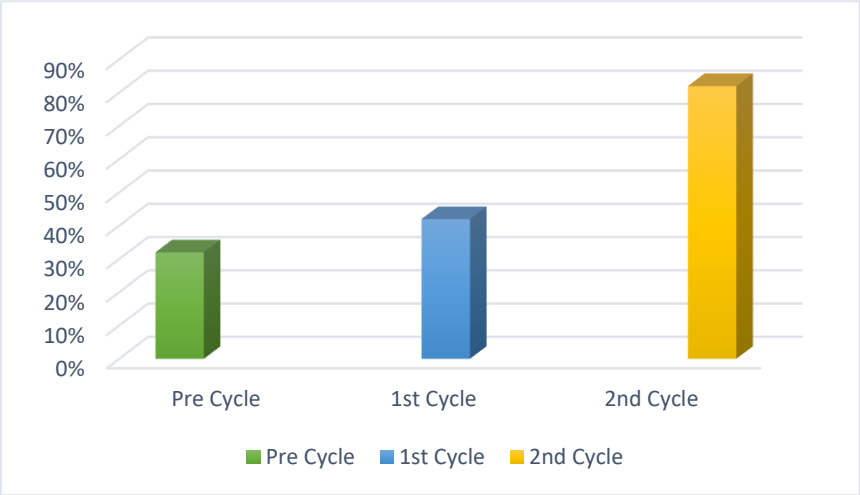
Table and Figure

The research results related to the use of manipulative media to improve conceptual understanding in Area Measurement with Non-Standard Units and Standard Units can be illustrated in the following table comparing students' mathematics learning outcomes between cycles:

Table 1. Comparison of Learning Outcomes between Cycles

Category	Data Results		
	Pre Cycle	*1st Cycle*	*2nd Cycle*
Maximum Score	100	100	100
Minimum Score	40	50	60
Total Score	1729	1985	2255
Average Score	61,75	70,89	80,53
Amount of Complete Student	9	12	23
Amount of Incomplete Student	19	16	5
Percentage of Classical Completeness	*32%*	42%	82%
Percentage of Classical Incompleteness	67%	57%	18%

Figure 1. Comparison of percentage of mathematics learning completeness between cycles



Based on the results of the graph above, it can be seen that completeness of learning outcomes increased consecutively from the pre-cycle, cycle I, to cycle II, thus the use of manipulative media was able to enhance the understanding of concepts and mathematics learning outcomes for 4th-grade students at SD Negeri 2 Lawang with the material on Area Measurement using non-standard and standard units.

CONCLUSION

Based on the results of the research that has been conducted, it can be concluded that the use of manipulative media can enhance the understanding of concepts in area measurement with Non-Standard Units and Standard Units, particularly among 4th-grade students at SD Negeri 2 Lawang. This was proven in the pre-cycle with an average score of 61,75. Then it increased in cycle I with an average score of 70,89. Then the research improved in cycle II with an average score of 80,53. Another aspect observed is the increasing percentage of student learning completeness consecutively. This is evidenced by the pre-action phase where the percentage of learning outcome completion was 32%, while in Cycle I it increased to 42%, and in Cycle II it further increased to 82%.

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