Analysis of Improving Mathematics Learning Outcomes through Realistic Mathematics Education in Grade IV Students of SD Negeri 9 Sila

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Abstract

The purpose of this study is to improve mathematics learning outcomes through Realistic Mathematics Education (PMR) for grade IV students of SD Negeri 9 Sila on the material Build a Simple Space. This research is a Classroom Action Research (PTK) with a design according to Kemmis and Mc.Taggart. The research subjects used were 26 grade IV students of SD Negeri 9 Sila. The data collection techniques used are observation and tests. Data analysis uses qualitative descriptive and quantitative descriptive analysis. The results of classroom action research show that the application of Realistic Mathematics Education (PMR) can improve the learning process and student mathematics learning outcomes. In the pre-action, there were 7 students (26.9%) who achieved the Minimum Completeness Criteria (KKM). In the first cycle as many as 15 students (57.7%) have achieved the Minimum Completeness Criteria (KKM) and in the second cycle as many as 24 students (92.3%) have achieved the Minimum Completeness Criteria (KKM).

Keywords: *mathematics learning outcomes, realistic mathematics education, qualitative descriptive and quantitative descriptive*

Abstrak

Tujuan dari penelitian ini ialah untuk meningkatkan hasil belajar matematika melalui Pendidikan Matematika Realistik (PMR) pada siswa kelas IV SD Negeri 9 Sila pada materi Bangun Ruang Sederhana. Penelitian ini merupakan Penelitian Tindakan Kelas (PTK) dengan desain menurut Kemmis dan Mc.Taggart. Subjek penelitian yang digunakan adalah 26 siswa kelas IV SD Negeri 9 Sila. Teknik pengumpulan data yang digunakan yaitu observasi dan tes. Analisis data menggunakan analisis deskriptif kualitatif dan deskriptif kuantitatif. Hasil penelitian tindakan kelas menunjukkan penerapan Pendidikan Matematika Realistik (PMR) dapat meningkatkan proses pembelajara dan hasil belajar matematika siswa. Pada pratindakan terdapat 7 siswa (26,9%) yang mencapai Kriteria Ketuntasan Minimal (KKM). Pada siklus I sebanyak 15 siswa (57,7%) telah mencapai Kriteria Ketuntasan Minimal (KKM) dan pada siklus II sebanyak 24 siswa (92,3%) telah mencapai Kriteria Ketuntasan Minimal (KKM).

Kata kunci: *hasil belajar matematika, pendidikan matematika realistik, deskriptif kualitatif dan deskriptif kuantitatif*

INTRODUCTION

Mathematics is a science with a very important role in various activities of human life. Human activities in everyday life cannot be separated from the use and application of concepts in mathematics.

As a universal science, mathematics is inseparable from various other disciplines that exist in human life. Mathematics subjects need to be given to all students starting from elementary school to equip students with logical, analytical, systematic, critical, and creative thinking skills and the ability to work together. These competencies are needed so that students can have the ability to acquire, manage, and utilize information to survive in ever-changing, uncertain and competitive circumstances.

Learning mathematics is a lesson given from primary, secondary education and even to the level of higher education where at the basic education level the time allocated to learn mathematics tends to be more than other subjects. This is because science and technology really need mathematics.

Mathematical concepts are also used to solve problems in other fields, Sujono revealed that "Mathematics is a supporting factor in the pace of development and competition in various fields of economy, technology, weapons, business, space exploration". Therefore, mathematics learning is always sought to be in accordance with the development of science and technology.

The success of learning activities cannot be separated from how a teacher performs. Sanjaya in Susanto (2013: 32) suggests that teachers are a very decisive component in the implementation of a learning strategy. The

successful implementation of a learning strategy will depend on the teacher's expertise in using the approaches, methods, and learning techniques that will be used by the teacher. A teacher must be able to deliver learning that requires students to be active in learning. This is necessary because students are the center of learning activities. Therefore, students need to be accustomed to independent learning, conveying thoughts or opinions, critical thinking, working together and so on.

In general, schools at the basic education level still carry out the mathematics learning process by prioritizing knowledge transfer and practice questions only. Teachers usually present or explain mathematical material briefly then give examples and continue by doing practice questions. Such a learning process does not pay attention to student activeness and student knowledge construction. Teachers still concentrate on doing practice questions so that learning becomes less interesting for students and has an impact on low learning outcomes.

Mathematics subjects are one of the subjects that relate a mathematical problem in everyday life so that it requires a way to solve the problem. One effort that can provide opportunities for students to be able to construct their own knowledge and be actively involved in learning so that it can affect student learning outcomes is the application of Realistic Mathematics Education (PMR).

Realistic Mathematics Education (PMR) prioritizes student activities in the learning process. The approach emphasizes on the importance of the real context known to the student and the construction process carried out by the student himself. Students are stimulated to build their own knowledge through discovery activities using events and objects that are contextual and imaginable to students.

In essence, learning mathematics is not enough to remember material or formulas, but students are required to apply the knowledge gained to solve mathematical problems in various ways and in principle in realistic mathematics learning a student is encouraged to understand something.

Realistic Mathematics Education (PMR) allows students to learn mathematical ideas and concepts from contextual problems related to the student environment. Therefore, with the application of realistic mathematics education in mathematics learning in elementary schools (SD), it is expected that mathematics learning will be more meaningful for students and will also have an impact on student learning outcomes and learning activities that increase or satisfy.

RESEARCH METHODS

1. Research Subjects

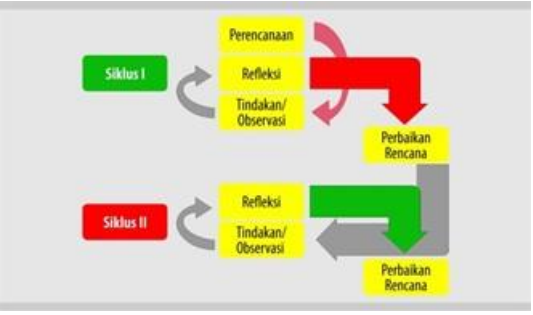
The subjects of this study are grade IV students of SD Negeri 9 Sila for the 2023/2024 academic year with a total of 26 students, consisting of 15 male students and 11 female students.

2. Time and Place of Research

This research was conducted from June to July 2023, namely in mathematics subjects with simple space building material. The study was conducted on grade IV students of SD Negeri 9 Sila which is located in Tambe Village, Bolo District, Bima Regency, West Nusa Tenggara Province.

3. PTK Implementation Procedure

Research planning begins with diagnosing problems in the learning process that occur at SD Negeri 9 Sila. Then the activity continues by planning the actions to be carried out. Action plans and observations are then implemented based on planned instruments and end with evaluation and reflection.



Spiral Image of Classroom Action Research According to Kemmis & Mc. Taggart *(in Trianto, 2011: 30)*

a. Cycle 1

1. Planning

Some things that need to be

planned before research are as follows.

a. Prepare a mathematics Learning Implementation Plan (RPP) on simple space building material by applying Realistic Mathematics Education (PMR).
b. Create observation guidelines that will be used to observe teacher activities and student activities during the learning process.
c. Develop an evaluation tool that will be given at the end of each cycle.

2. Acting

At this stage, the class teacher teaches according to the learning plan regarding simple room building material using the Realistic Mathematics Education (PMR) approach.

3. Observing

At this stage, the researcher makes observations and records all the things that are necessary and occur during the implementation of the action. This data collection is carried out using observation sheets that have been prepared before.

4. Reflecting

The final activity of the PTK series of activities is the reflection stage. At the reflection stage, researchers and class teachers evaluate the implementation of the actions that have been taken. The results of these reflections are used as material to reformulate corrective action plans that will be implemented by teachers in the next cycle. Reflection is performed at the end of each action cycle until the objectives of the study show success.

b. Cycle 2

Action scenarios in cycle II are prepared based on the results of reflection from the implementation of cycle I actions. Cycle II is carried out to provide reinforcement and to improve the results of cycle I implementation that are not in accordance with the goals and expectations to be achieved.

Research will be continued in the next cycle if in cycle I the results obtained have not been achieved optimally. However, if the expected results have been achieved in cycle I, then cycle II is only used as a stabilization of the previous cycle. The cycle will be stopped when the purpose of this research has been achieved, namely increasing mathematics learning outcomes in simple room building materials for grade IV students of SD Negeri 9 Sila.

4. Data Collection Techniques

Data collection techniques use observation and test methods.

a. Observation

According to Sanjaya (2010: 86), observation is a technique of collecting data by observing every ongoing event and recording it on an observation sheet about things to be observed or researched. Observations in this study were made during the mathematics learning process by applying Realistic Mathematics Education (PMR).

b. Test

A test is a tool or procedure used to find out or measure something in an atmosphere in a predetermined way or rules (Arikunto, 2007: 53). The procedure used in the test is the final test with the type of written test in the form of multiple choice and essay. Formative tests are carried out at the end of cycles I and II.

While the instruments used in this study are observation sheets and learning outcome tests.

a. Observation Sheet

The observation sheet in this study is in the form of a *checklist* consisting of observation sheets of teacher activities and observation

sheets of student activities. The teacher's observation sheet consists of 5 aspects arranged based on the characteristics of Relistic Mathematics Education (PMR)

b. Learning Outcomes Test

The tests used in this study were multiple-choice questions and essays, which were given at the end of the cycle.

5. Data Analysis Techniques

The data processing used in this study is qualitative and quantitative. Data from observations of teacher and student activities in the application of Realistic Mathematics Education (PMR) are analyzed descriptively qualitatively and test data on student learning outcomes are analyzed descriptively quantitatively by presenting tables and percentage diagrams.

6. Success Indicators

The success of an action is usually based on a standard that must be met. The success criteria set out in this study were ninety percent (90%) of students getting a score of ≥70. In addition, success is also marked by teacher and student activity scores reaching seventy-five percent (75%) or it can be said that the qualifications are good.

RESULTS AND DISCUSSION

Classroom action research on grade IV students of SD Negeri 9 Sila showed that the learning process carried out by the teacher before the action was carried out was the teacher explaining the material in front of the class, doing a brief question and answer then the students were asked to try to do the practice questions contained in the package book. When the learning process takes place, it appears that students' enthusiasm in participating in learning is diminishing. Most students begin to feel bored, so concentration becomes reduced. This can be seen from the sitting position of students who are starting to no longer calm down and some students are busy chatting with their deskmates or even with friends in front or behind them. When the teacher asks a question, only a few students answer the question from the teacher. In the learning process, teachers also do not use teaching aids so that the learning process becomes less interesting.

After that, researchers conducted an initial ability test which was used to determine students' initial ability to solve problems regarding building simple spaces, cycle I and cycle II learning tests.

Table 1. Data on Student Learning Activities in Cycle I and Cycle I

KETERANGAN	SIKLUS I		SIKLUS II	
	PERTEMUAN			
	I	II	I	II
Skor Aktivitas	122	134	146	154
Persentase Keterlaksanaan	69,3 %	76,1 %	82,9 %	87,5 %

Table 2. Teacher Activity Data in Cycle I and Cycle II

NO	KETERANGAN	PERTEMUAN		RATA-RATA SIKLUS I dan SIKLUS II
		SIKLUS I	SIKLUS II	
		I	II	
I	Pendahuluan	13	14,7	13,8
II	Kegiatan Inti	23,3	26	24,7
III	Penutup	12	14,3	13,2
IV	Suasana Kelas	56,7	6,67	6,17
Jumlah		54	61,7	57,8
Rata-rata		3,18	3,63	
Persentase		79,4 %	90,7 %	

Table 3. Student Learning Test Results Data

KETERANGAN	PRATINDAKAN	SIKLUS I	SIKLUS II
Nilai Rata-rata Siswa	57,1	65,4	74,4
Siswa Yang Tuntas	7	15	24
Siswa Yang Belum Tuntas	19	11	2
Persentase Ketuntasan	26,9 %	57,7 %	92,3 %

Based on the results of the initial ability test, it is known that the average score of the student's initial ability test is 57.1. The percentage of student learning completeness was twenty-six point nine percent (26.9%). The results of the initial ability test showed that students still have difficulty in understanding simple space building materials, namely the properties of building cubes and blocks as well as cube and block nets. Based on the results of observations and tests of students' initial abilities, the researcher aims to improve the mathematics learning process (teacher activities and

student activities) and improve student learning outcomes of simple space building materials, namely the properties of building cubes and blocks as well as cube and block nets through the application of Realistic Mathematics Education (PMR).

This class action research consists of two cycles. Each cycle consists of four stages as proposed by Kemmis and Mc. Taggart.

a. Cycle I, will be held on June 20, 2023 and June 21, 2023 with an allocation of three hours of lessons each (3 x 35 minutes). In the first cycle, the mathematics learning process by applying Realistic Mathematics Education (PMR) has been carried out according to the Learning Implementation Plan (RPP) that has been designed previously. Teachers have applied Realistic Mathematics Education (PMR) to learning mathematics simple space building materials. Of the eight aspects observed, the learning process carried out by teachers is almost all implemented. At the first meeting the teacher carried out seven aspects of the eight aspects observed. In the second meeting, the teacher also carried out seven aspects of the eight aspects observed in the learning process. The average observation of teacher activity in cycle I was seventy-nine point four percent (79.4%), the percentage of student activity in participating in mathematics learning by applying Realistic Mathematics Education in the first cycle of the first meeting was sixty-nine point three percent (69.3%), in other words the student activity was in the sufficient category. While in the first cycle of the second meeting, the percentage of student activity increased to seventy-six point one percent (76.1%) in other words the student activity was in the good category. In the table, it can also be seen that the highest aspect is related to students' attention to contextual problems presented by the teacher. While the lowest aspect is related to the courage of students to express opinions or respond to the results of other groups' presentations. The average percentage of observations of student activities during the learning process in cycle I was seventy-six point nine percent (76.9%). As for the average score of students in the first cycle, results were obtained of 65.4. This shows an improvement in student learning outcomes in the initial test (pre-action) and after the first cycle is implemented. The average score of students who were initially 57.1 increased to 65.4 in cycle I. The percentage of student completeness also increased initially in the initial ability test by twenty-six point nine percent (26.9%) to fifty-seven point seven percent (57.7%) in cycle I.

b. Cycle II, will be held on June 27, 2023 and June 28, 2023 with an allocation of three lesson hours (3 x 35 minutes) for each meeting. Based on observations of teacher activities and student activities in cycle II, overall the results are very good. Teachers and students have carried out the learning process as previously planned and have implemented Realistic Mathematics Education (PMR). This can be seen from the average results of observation of teacher activities and student activities. The average observation of teacher activity in cycle II was ninety point seven percent (90.7%), the percentage of student activity in participating in mathematics learning by applying Realistic Mathematics Education in the second cycle of the first meeting was eighty-two point nine percent (82.9%), in other words the student

activity was in the Good category. While in the second cycle of the second meeting, the percentage of student activity increased to eighty-seven point five percent (87.5%) in other words the student activity was in the good category. The results of these observations increased when compared to the results of observations in cycle I. In addition, related to students' mathematics learning outcomes also increased. In cycle II the average score of students was 65.4 from the original 57.1 in cycle II with learning completeness reaching ninety-two point three percent (92.3%).

Based on the results of the research obtained, it shows that there is an increase in both learning activities and student learning outcomes. The following diagram shows an increase in student activity in the mathematics learning process that occurs in cycle I and cycle II.

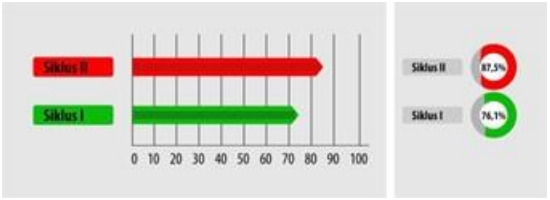


Diagram 1. Comparison of Average Student Activities of Cycle I and Cycle II

In addition, teacher activity in implementing Realistic Mathematics Education (PMR) has also increased from cycle I to cycle II. The following diagram shows the increase.

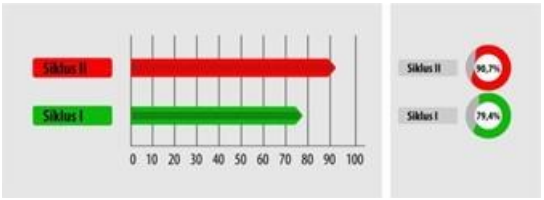


Diagram 2. Comparison of Average Teacher Activities in Cycle I and Cycle II

While learning outcomes can be seen through the presentation of a comparison of the percentage of completeness and the average value of mathematics learning outcomes on simple space building materials, namely the properties of building simple spaces and cube nets and blocks by applying Realistic Mathematics Education (PMR).

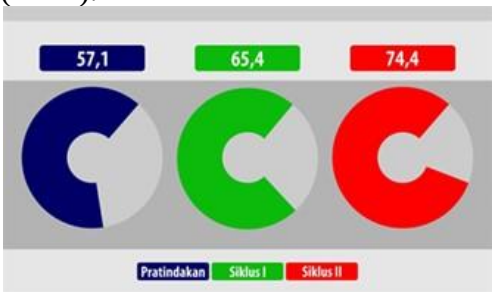


Diagram 3. Comparison of the Percentage of Mathematics Learning Results in Preaction, Cycle I and Cycle II

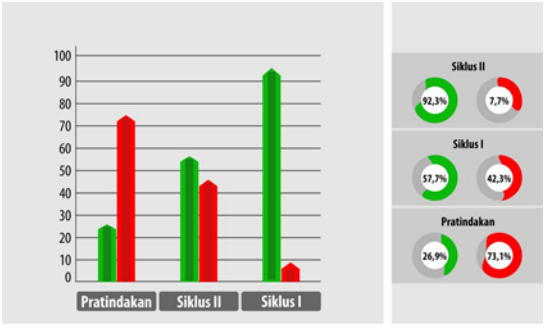


Diagram 4. Comparison of Average Scores of Student Learning Outcomes

Based on the diagram above, it can be seen that the completeness of learning before action is carried out is twenty-six point nine percent (26.9%) with an average value of learning outcomes of 57.1, after action in cycle I the percentage of learning completeness becomes fifty-seven point seven percent (57.7%) with an average value of 65.4 and the percentage of learning completeness in cycle II becomes ninety-two point three percent (92.3%) with an average value of 74.4. From these data, it shows that there is an increase in the percentage of student learning completeness and the average value of learning outcomes. The percentage of

learning completeness and the average score of students have also reached the established success criteria.

Based on the explanation above, it can be concluded that the classroom action research carried out has succeeded according to the goal, namely to improve mathematics learning outcomes by applying Realistic Mathematics Education (PMR) to grade IV students of SD Negeri 9 Sila on simple space building materials. The percentage of student learning completeness in this study has reached ninety-two point three percent (92.3%) at the end of cycle II. This proves that there is an increase in the percentage of student learning completeness or in other words student learning outcomes have (reached the specified Minimum Completeness Criteria (KKM), which is more than ninety percent (90%).

These results show that the application of Realistic Mathematics Education (PMR) in mathematics learning is in accordance with the characteristics of grade IV students of SD Negeri 9 Sila whose average age is between 9 to 10 years. According to Piaget (Susanto, 2012: 77), in that age range students are in the concrete operational stage. At that stage, the child can already know mathematical symbols, but cannot yet deal with abstract things. In this case, it is necessary to hold a learning approach that provides real experience for students. One approach that provides real experience for students is Realistic Mathematics Education (PMR). This is because Realistic Mathematics Education (PMR) is a form of learning that uses the real world and learning activities that emphasize student activities to find, find and build their own knowledge needed so that learning becomes student-centered (Muchlis, 2012: 136). That way students can construct their own knowledge and get a meaningful learning experience so that the material students learn is not easily forgotten.

CONCLUSION

Based on the results of data analysis conducted, it is proven that the application of Realistic Mathematics Education (PMR) in mathematics learning on simple space building materials can improve the learning process and learning outcomes of grade IV students of SD Negeri 9 Sila. The improvement of the learning process can be seen from the results of observation of student activities during learning. In the first cycle of the first meeting, the number of student activity scores was 122 with a percentage of implementation of sixty-nine point three percent (69.3%), increasing in the second meeting to 134 with a percentage of implementation of seventy-six point one percent (76.1%). Then at the end of the second cycle of the first meeting, the number of student activity scores increased from the first cycle to 146 with a percentage of eighty-two point nine percent (82.9%) and at the second meeting increased again to 154 with an implementation percentage of eighty-seven point five percent (87.5%). As for teacher activities in cycle I, the score with a percentage of completeness of seventy-nine point four percent (79.4%) increased in cycle II with the score of completeness percentage of ninety point seven percent (90.7%). The increase has met the predetermined success criteria, namely learning activities (teacher and student activities) reaching seventy-five percent (75%) or in good criteria.

The increase in learning outcomes can be seen from the average value of mathematics learning outcomes in cycle I, which is 60.9, increasing to 71.1 in cycle II. Students who completed learning with Minimum Completeness Criteria (KKM) ≥ 70 increased by thirty-four point six percent (34.6%), which initially in cycle I as many as 15 students who completed or amounted to fifty-seven point seven percent (57.7%), then in cycle II increased to 24 students or by ninety-two point three percent (92.3%). This result has reached the previously set success criterion of ninety percent (90%).

ACKNOWLEDGMENTS

On this occasion, researchers appreciated and expressed their gratitude to parties who have played a role in research, both in the form of moral support, licensing, consultation, and

assisting in data collection so that this research runs smoothly.

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