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APPLICATION OF REALISTIC MATHEMATICS APPROACH TO IMPROVE STUDENTS PROBLEM-SOLVING ABILITY IN ELEMENTARY SCHOOL

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Abstract

This research is motivated by the low level of problem-solving ability of grade IV students of SDIT Cendekia Purwakarta, from 30 students only 5 students who only get the percentage of learning mastery 16,6%. One alternative approach to learning that can be used to improve students' problem-solving skills is by applying Realistic Mathematics Education (RME). This approach in learning can relate learning to the real world and a problem imagined in the minds of students to be the starting point of learning so that abstract learning can be made real by the students. This study aims to improve students' problem-solving skills of grade IV SDIT Cendekia Purwakarta on the implementation of research by applying Realistic Mathematics Education. The research method used is Classroom Action Research with Kemmis and Mc. Taggart. Instruments used are student and teacher observation sheets and test problem-solving abilities. Based on the results of research for 2 cycles obtained results on the cycle I percentage mastery learning students reached 56.6% with many students who complete 17 students and on the second cycle increased to 27 students who complete learning with a large percentage of 90%. Therefore, it can be concluded that the application of realistic mathematics education can improve the problem-solving ability of elementary school students.

Keywords: approach, realistic, problem solving

Abstrak

Penelitian ini dilatarbelakangi oleh rendahnya kemampuan pemecahan masalah siswa kelas IV SDIT Cendekia Purwakarta, dari 30 jumlah siswa hanya 5 orang yang hanya memperoleh presentase ketuntasan belajar 16,6%. Salah satu alternatif pendekatan pembelajaran yang dapat digunakan untuk meningkatkan kemampuan pemecahan masalah siswa adalah dengan menerapkan Pendekatan Matematika Realistik (PMR). Pendekatan dalam pembelajaran ini dapat mengkaitkan pembelajaran dengan dunia nyata dan suatu permasalahan yang dibayangkan dalam pikiran siswa menjadi titik awal pembelajaran, sehingga pembelajaran yang abstrak dapat dibuat nyata oleh siswa. Penelitian ini bertujuan untuk meningkatkan kemampuan pemecahan masalah siswa dan aktivitas siswa kelas IV SDIT Cendekia Purwakarta pada pelaksanaan penelitian dengan menerapkan Pendekatan Matematika Realistik. Metode penelitian yang digunakan adalah Penelitian Tindakan Kelas (PTK) dengan model Kemmis dan Mc. Taggart. Instrumen yang digunakan yaitu soal tes kemampuan pemecahan masalah. Berdasarkan hasil penelitian selama 2 siklus diperoleh hasil pada siklus I persentase ketuntasan belajar siswa mencapai 56,6% dengan banyak siswa yang tuntas belajar 17 siswa dan pada siklus II meningkat menjadi 27 siswa yang tuntas belajar dengan besar presentase 90%. Oleh karena itu, dapat disimpulkan bahwa penerapan pendekatan matematika realistik dapat meningkatkan kemampuan pemecahan masalah siswa sekolah dasar.

Kata Kunci: pendekatan, realistik, pemecahan masalah

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INTRODUCTION

Mathematics is one of the subjects taught at every level of education, including in elementary school. The importance of mathematics being taught in elementary schools is to provide provisions for students to live in society and be able to continue to a higher level, this is intended so that students are not only skilled in using mathematics, but can provide provisions for students in the application of mathematics in everyday life in the midst of - in the community where he lives (Susanto, 2013). Considering mathematics as basic science, learning mathematics needs serious attention. However, based on observations at school, many consider that mathematics is a difficult and scary subject.

According to Kline in (Setiawan, P., I Dewa Nyoman S., 2018) states that "mathematics is not knowledge that can be perfect because of itself, but its existence to help humans understand, master social, economic and natural problems". Mathematics is useful in everyday life. All fields of study require mathematical skills and a teacher is obliged to teach them properly and correctly to students. In order for the teaching and learning process to run effectively, the teacher needs to pay attention to how to create a pleasant atmosphere for the teaching and learning process and choose the right learning approach in accordance with the development of a child.

In addition, a teacher who will teach mathematics to students, should know and understand the object to be taught, namely mathematics (Rahmah, 2013). Because in learning mathematics in elementary school according to Misel (2016) in (Suandito, 2017) explains that, "concepts in abstract mathematics arranged in tiers and sequences still require special proofs, so that in studying mathematics the previous concepts must be mastered because they are prerequisites for continuing the next concept".Therefore, to teach mathematics in elementary schools, teachers must master the teaching materials to be taught and preferably in stages, starting from simple ones to more difficult ones.

Along with the development of an increasingly complex era, these problems also appear and are increasingly diverse. In everyday life, we are often faced with problems that need a way to solve them. This condition requires problem-solving skills for students to be able to solve various problems in mathematics.

A math problem usually depends on each individual itself, a math problem can really be a problem for someone, but it can also not be a problem for someone else. In everyday life, problems related to mathematical concepts are often encountered (Suryadinata, N., & N. Farida, 2016). Problem solving is a natural extension of learning the rules. In problem solving, the process is mainly located within the learner (Nasution, R., & Halimah, S, 2016). That is, that in solving mathematical problems, it is not only transferring formulas into answers, but more than that it is necessary to expand thinking to solve a problem. Problem solving ability is very important for students and their future, learning experts agree that problem solving abilities within certain limits can be formed through the fields of study and disciplines taught (Nababan, 2019). To be skilled in solving problems requires various abilities, namely knowledge, attitudes , and skills.

Thus it is not easy to solve a problem because it involves various abilities of reasoning/thinking from low to high level. One of the main problems in learning in formal education (schools) is the low absorption of students. This encourages students to have abilities that require critical, creative, logical thinking, and the willingness to work together so that they are able to solve the problems they face (Muslim, 2015). Problems that require critical, creative, logical, and cooperative thinking are presented in the form of non-routine problems. But the problem obtained is a non-routine problem category. Non-routine problems are problems whose settlement procedures require completion planning, not just using formulas, theorems, or theorems (Lestari, K. E. & Yudhanegara, M. R., 2015).

To solve the problem required various stages of problem solving. One of the stages of solving mathematical problems that is often referred to is the Polya stage, which suggests four stages that need to be done, namely: (a) understanding the problem; (b) make a settlement plan; (c) implement the plans that have been made; (d) looking back or double-checking the answers obtained (Sholihah, 2016).

The mathematical material in this study is the operation of calculating the addition of fractions. Fractions can be interpreted as part of a whole thing that can be symbolized $\frac{a}{b}$, a is called the numerator and b is called the denominator. Where a and b are integers and b is not equal to 0. The form $\frac{a}{b}$ can also be interpreted as a: b (a is divided by b) where a is not divisible by b (Unaenah, 2019). In this study, problems often arise in everyday life that requires the ability to solve them. Teachers must be able to find a learning approach that is in accordance with the problems in the arithmetic addition of fractions in improving problem-solving skills.

Based on the results of the problem-solving ability pre-cycle test conducted in grade IV SDIT Cendekia Purwakarta, students had difficulty understanding the meaning of a problem-

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solving story given by the teacher, many students had difficulty identifying what was asked and what to look for. Often students are only fixated on the formula that has been determined by the teacher. This problem can be seen from the results of the pre-cycle problem-solving ability test, that the classical class learning completeness only reaches 16.6% or only 5 out of 30 students whose problem-solving ability test scores are above the KKM. This is because students are not used to getting questions about problem-solving. In addition, based on the results of observations, the lack of student activity in the classroom is caused in the learning process the learning approach used is teacher-centered so that it does not involve students to be active in learning activities. The lack of interest, motivation, and student learning attitudes towards mathematics is thought to be caused by the use of conventional methods when learning mathematics, and learning materials are still abstract and less related to everyday life. Therefore, this problem requires a solution to make it easier for students to solve fractional addition arithmetic operations in order to apply them in everyday life.

One solution that can be applied to these problems is to be able to relate lessons to reality or convey something abstract starting with something concrete so that lessons can be conveyed properly. The learning process that links lessons with reality can use a realistic approach.

According to Wijaya in (Astari, 2017) "A realistic approach is an approach to learning mathematics that refers to Realistic Mathematics Education (RME) which uses realistic problems as a starting point for learning. Realistic Mathematics Education (RME) or Realistic Mathematics Education (PMR) from the Netherlands has been developing since the 1970s. Hans Freudenthal". An example of horizontal mathematization is formulating everyday problems into mathematical form. While vertical mathematization is related to the process of reorganizing the knowledge obtained in more abstract mathematical symbols (Shoimin, 2014). In realistic mathematics, mathematical problem solving is presented in the form of horizontal mathematization and horizontal mathematization. An example of horizontal mathematization is formulating everyday problems into mathematical form. While vertical mathematization is related to the process of reorganizing the knowledge obtained in more abstract mathematical symbols (Shoimin, 2014). In horizontal mathematization, students use mathematics to transform realistic problem situations into mathematical situations in the form of mathematical models; and in vertical mathematization, students work in the world of mathematics through a process of model reorganization until problem solving is found (Sohilait, 2021).

This approach is considered capable of solving the problems in this study, because mathematics in schools is implemented by placing students' realities and experiences as the starting point of learning. Realistic problems are used as a source for the emergence of mathematical concepts that can encourage problem-solving activities, problem-solving, and organizing the subject matter (Lestari, K. E. & Yudhanegara, M. R., 2015). The application of this realistic mathematical approach to the completion of fractional addition arithmetic operations provides an opportunity for students to learn to understand mathematical problems and relate them to more complex real situations so that students will use their minds to solve a problem related to everyday life. According to Ananda (2018) stating that the operation of adding fractions with a denominator is not the same as the Realistic Mathematical Education (RME) approach can improve student learning outcomes.

To solve a problem, in addition to requiring comprehensive skills, such as observing, analyzing, reading, calculating, and concluding skills, knowledge and sharpness of reasoning are also needed. Learning is not just an individual activity, but something that happens in society and is directly related to the sociocultural context (Shoimin, 2014). Therefore, in learning, students must be given the opportunity to exchange ideas, argue, and so on. To provide opportunities for students to exchange ideas and argue with their friends, in the application of a realistic mathematical approach a group discussion method is needed.

This group discussion method can make students more actively involved in their lessons, and provide opportunities for students to use questioning skills more in discussing a problem (Heriawan, A., D.,& Senjaya, A., 2012). However, the problems faced must be gradual from simple to higher levels, so that slowly students will be able to understand the problem well. As prospective teachers, they must be able to prepare humans who are superior in their fields and able to compete in a complex life. In connection with the background that has been described, it is hoped that a realistic mathematical approach can improve students' problem-solving abilities in elementary schools. Based on this, the researcher feels the need to conduct classroom action research with a research entitled "Application of Realistic Mathematics Approaches to Improve Students' Problem-Solving Ability in Elementary Schools".

METHOD

This research is classroom action research (CAR). CAR is action research that is carried out in the classroom when learning takes place with the aim of improving or improving the quality of learning (Supardi & Suhardjono, 2012). The design used in this study uses a spiral

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model from Kemmis & Mc. Taggart. The model proposed by Kemmis & Mc. Taggart (Kusumah, W. & Dwitagama, D., 2010) is essentially in the form of devices or strands with one device consisting of four components, namely: planning (plan), action (action), observation (observation), and reflection (reflection). The four components are seen as one cycle, for actual implementation the number of cycles is very dependent on the problems that need to be solved.

The instruments needed in classroom action research (CAR) must be in line with CAR procedures and steps. The instruments used in this study were observation sheets, test sheets, and documentation. Then whether or not a question in the research that will be given to students can be known by testing the instrument first, the test questions carried out in this study are given to class VI students. After the test instrument was tested, each item was analyzed to determine the validity of the question.

The questions that will be given to students should be tested for validity first to find out whether the questions are valid or not. Then, the instrument was tested for reliability. The consistency of an instrument in a study can be known by conducting trials on the instrument so that it can measure students' mathematical problem solving abilities. After being tested for validity and reliability, the questions are seen to the level of difficulty. To calculate the level of difficulty of the test, the researcher uses the formula for finding the difficulty index according to Arikunto (2012), which is as follows:

$$P = \frac{B}{Js}$$

Information :
P = Difficulty Index
B = Number of students who answered the question correctly
JS = Total number of students taking the test

Data collection techniques are the most strategic step in research, because the main purpose of research is to obtain data. Without knowing data collection techniques, researchers will not get data that meets the standards set (Sugiyono, 2016). Data collection techniques are carried out by sorting out data sources, types of data, and instruments used. Data related to problem solving abilities were collected through tests, data related to learning activities were collected through observation activities.

The data collected will be meaningless without being analyzed, that is, processed and interpreted. Data analysis according to Bogdan (Sugiyono, 2016), is the process of systematically searching and compiling data obtained from interviews, field notes, and other

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materials, so that they can be easily understood and the findings can be informed to others. The data processing and analysis techniques are as follows: 1) data analysis of problem solving ability test results. The form of calculation of students' problem solving ability test results can be seen through the scores obtained by students through the scoring guide proposed by (Ekawati, E., & Sumaryanta., 2011) as follows:

Table 1. Scoring Guide

Criteria	0	1	2
Understanding the problem	Don't understand the problem	Don't understand the problem	Able to understand the problem
Develop a settlement plan	Unable to plan solution	Able to draw up a plan of completion, but not exactly	Able to draw up a plan of completion appropriately
Carry out the completion plan	Unable to carry out the settlement plan	Able to carry out the plan of completion, but not right	Able to carry out the plan of completion appropriately
Check again	Not checking back	Checked again, but the answer is not correct	Check back and all completion Correct

Then calculated the percentage of student learning completeness classically with the following formula:

$$\text{Student Learning Completeness} = \frac{\text{The number of students who scored} >= 65}{\text{Total number of students}} \text{ x } 100\%$$

After that, to find out the increase in students' problem solving abilities at the beginning and end of the test, you can use the gain formula according to Lestari and Yudhanegara (2015).

$$Normalize\ Gain\ (g) = \frac{Score\ of\ Postest - Score\ of\ Pretest}{Ideal\ Score - Score\ of\ Pretest}$$

The gain categories are as follows:
Ng < 0.3 : Low
0.3 < ng < 0.7 : Medium
Ng 0.7 : High

Observations made in this study consisted of two types, namely observations of student activities and teacher activities during learning. The data from the observation of student and teacher activities during learning through a realistic mathematical approach were observed by asking for help from the observer, namely the class teacher, then recorded on the observation sheet. The data obtained are interpreted and used as reflection material to improve learning in the next cycle, so that the data presented is qualitative. The results of the above formula calculations are then converted into the following form:

Table 2. Student activity assessment

Percentage	Criteria
86,65% ≤ P ≤ 100%	Very Active
73,32% ≤ P ≤ 86,65%	Active
59,99% ≤ P ≤ 73,32%	Quite Active
46,66% ≤ P ≤ 59,99%	Less Active
33,33% ≤ P ≤ 46,66%	Not Active

This study aims to determine the improvement of the problem-solving ability of fourth-grade students of SDIT Cendekia Purwakarta in learning mathematics, the subject of arithmetic operations, addition of fractions after applying a realistic mathematical approach.

RESULTS AND DISCUSSION

Before using a realistic mathematical approach, initial data is needed to determine the extent to which students of SDIT Cendekia Purwakarta class IV have problem-solving abilities. Researchers give problem-solving ability test questions to students. Based on the results of the initial analysis, the highest score obtained was 79 and the lowest score was 12. Classical student learning completeness reached 16.6% or only 5 people whose scores reached the minimum competency criteria of the total number of students, namely 30 students. The evaluation results are very far from what is expected because the completeness of individual learning outcomes obtained by students has not fully reached the predetermined minimum competency criteria value of 65 and has not achieved classical learning completeness, which is 85% of all students scored above or equal to the minimum competency criteria value.

Based on this fact, this is the basis for conducting classroom action research efforts in order to improve the mathematical problem-solving abilities of fourth-grade students of SDIT Cendekia Purwakarta. This classroom action research was carried out in 2 cycles. In the results of the problem-solving ability test in the first cycle, there was an increase in students who reached the KKM. In the pre-cycle test results, the highest score was 79 and the lowest was 12. While in the first cycle evaluation test, there was an increase for the highest score reaching 91 and the lowest score 33. The average score in the first cycle increased from 36 (pre-cycle average) to 63 (the average in the first cycle). Classical student learning completeness reached 56.6% or only 17 people whose scores reached the KKM out of 30 people, and still lacking the classical completeness criteria of 85%. Based on this, classically students have not finished learning because they have not reached the specified criteria, so improvements are needed in cycle II.

Furthermore, the results of the pre-cycle test with the results of the first cycle evaluation test obtained were then analyzed to determine the improvement of problem-solving using normalized gain. Following are the results of normalized gain in cycle I.

Table 3. Improving Student Problem Solving Ability Test Results Cycle I

Category	N	Percentage
High	0	0%
Middle	22	73,33%
Low	8	26,66%
Average N-Gain	**0,41**	
Category	**middle**	

Based on the table, the results of the first cycle of normalized gain were obtained for individuals with a low category of 8 people or a percentage of 26.66%, a medium category of 22 people with a percentage of 73.33%, and a high category with a percentage of 0%. So that the average normalized gain in the first cycle is 0.41 in the medium category. The average normalized gain is obtained from the total gain obtained by each student, then the total gain for all students is averaged and the average normalized gain is obtained in the first cycle.

The planning stage in cycle II refers to the results of the reflection of a cycle I. The steps of this planning activity are not much different from cycle I. Prior to the implementation of the learning process using a realistic mathematical approach, several stages of preparation for the implementation of learning related to devices and instruments are carried out.

The results of the problem-solving ability test increased in students who reached the minimum competency criteria. In the results of the evaluation test cycle II, the highest score reached 100 and the lowest score was 45. The average score in the second cycle increased from 63 (the average in the first cycle test) to 80 (the average in the second cycle test). The table above shows a significant increase. It is recorded that 27 students have reached the minimum competency criteria or about 90% of the 30 people, meaning that there are 3 (10%) students who have not finished their studies or have not reached the minimum competency criteria. Because the classical completeness criteria are 85%. Based on this, classically students

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complete their studies because they have reached the specified criteria, so these results indicate that researchers have succeeded in improving students' problem-solving abilities.

Furthermore, the results of the first cycle evaluation test with the second cycle evaluation test results obtained were then analyzed to determine the improvement of problem-solving using normalized gain. Following are the results of normalized gain in cycle II.

Table 4. Improving Student Problem Solving Ability Test Results Cycle II

Category	N	Percentage
High	8	26,66%
Middle	13	43,33%
Low	9	30%
Average N-Gain	**0,51**	
Category	**middle**	

Based on the table above, the results of the second cycle of normalized gain can be obtained for individuals with a low category of 9 people or a percentage of 30%, a medium category of 13 people with a percentage of 43.33%, and a high category of 8 people with a percentage of 26.66%. So that the average normalized gain in the second cycle is 0.51 in the medium category. The average normalized gain is obtained from the total gain obtained by each student, then the total gain for all students is averaged and the average normalized gain is obtained in cycle II.

After making observations in the classroom while learning with the Realistic Mathematics Approach, then the next step is to reflect on the symptoms of something that has been done in cycle II at the 1st meeting and 2nd meeting. This reflection has the aim of conducting an evaluation of the learning process in cycle II. In the implementation of the second cycle, the following results were obtained. 1) some students have started to get used to solving problems in the form of problem-solving with appropriate steps and 2) Overall learning mathematics with Realistic Mathematics Approach (PMR) to improve students' problem-solving ability in cycle II has increased compared to cycle I.

It can be seen from the percentage of complete learning that most of them have reached the expected target. Of the 30 students in the second cycle, there are 27 students who have achieved the meanwhile, based on the percentage of classical learning completeness, an increase in problem-solving abilities in the pre-cycle, cycle I, and cycle II is presented through the following diagram: score with the percentage of classical learning completeness reaching 90% and the remaining 3 students have not achieved the meanwhile, based on the percentage of classical learning completeness, an increase in problem-solving abilities in the pre-cycle, cycle I, and cycle II is presented through the following diagram: score with the percentage of learning incompleteness that is 10%. Meanwhile, based on the percentage of classical learning completeness, an increase in problem-solving abilities in the pre-cycle, cycle I, and cycle II is presented through the following diagram.

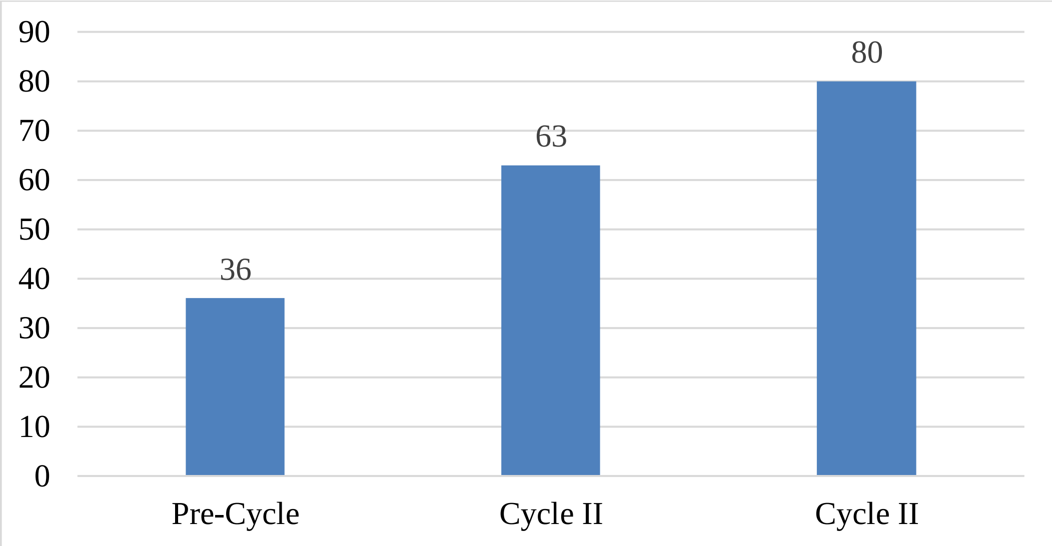

Figure 1. Percentage of Improvement in Class Average Score

Based on a diagram the results of classical learning completeness of all students reach the minimum competency criteria value or equal to the minimum competency criteria and have reached 85%. So the action research class with the Realistic Mathematics Approach to improve students' problem-solving ability which was carried out in class IV SDIT Cendekia Purwakarta has been successful.

CONCLUSION

This research on the application of a realistic mathematical approach to improving students' problem-solving abilities in elementary schools (Class Action Research on Operational Counting Addition of Fractions Class IV SDIT Cendekia, Purwakarta District, Purwakarta Regency) resulted in the conclusion that students' problem-solving abilities in learning mathematics with the application of the Mathematical Approach Realistics (PMR) have improved. The level of mastery learning outcomes has increased from cycle I to cycle II. In the implementation of a cycle I the average value obtained by students has not reached the predetermined standard, then improvements are carried out in cycle I. Through the implementation of corrective actions in cycle II, an increase can be seen, students have

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achieved classical completeness, the average value of the solving ability test student problems has reached the specified standard.

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