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The Effect of Ralistic Mathematics Education Models to Enhancement Students' Mathematics Problem-Solving Ability

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Abstract

Teachers still use traditional teaching methods, so students' mathematical problem-solving abilities must improve. Because the anticipated model lends itself to improving students' math problem-solving abilities, the authors of this study applied the Realistic Mathematic Education model. This study aims to ascertain how the Realistic Mathematics Education Model affects students' aptitude for solving mathematical problems. Quasi-experimentation is an adopted research approach. Nonequivalent Control Group Design is the format adopted for design. The participants of this study were all fourth-grade students of SDN Cipadu 1 Tangerang City for the 2022–2023 year. The research uses a saturation sampling strategy. Sixty-one students were included in the sample for this investigation. This study uses verified and considered reliable tools in the form of tests. The aim is to determine how students' ability to solve math problems affects data; the SPSS 22.0 program is used for analysis. The results showed that the significance of the t-test was 0.000, indicating that the Realistic Mathematics education paradigm significantly impacted students' mathematical problem-solving ability.

INTRODUCTION

Problem-solving is an achievement process objective with organizing ideas and abilities in fresh. The process of overcoming obstacles is a settlement problem to achieve the desired result—critical problem-solving skills in education and curriculum studies at all levels, particularly in Indonesia. Until recently, students were not fully trained in problem-solving skills. This data can be seen from the results of the OECD program for the International Study of Student Achievement (PISA). The actual situation in this field shows that the students' mathematical problem-solving level still needs improvement. In the 2015 OECD, Indonesian students were ranked 62nd out of 69 participating countries.

Given the importance of mathematical problem-solving, it is only natural that students have this skill. However, in reality, students tend to have low math problem-solving skills. This data results in weak problem-solving abilities [1]–[4]. Namely, students must choose appropriate problem-solving procedures or strategies. Students failed to apply the concepts being taught when asked about the problem-solving task stories with slightly different patterns of examples, and students needed help understanding what words looked good [5]. The results of another showed weak problem-solving skills [6], [7]; When solving open-ended problems [8], students

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only understand the problem without remembering the following steps, regarding students' low ability to solve mathematical problems is caused by several factors. Namely, students only use the formula the teacher gave, and the teacher still refers to the textbook in his hand. So the teacher in question only focuses on the problem in the textbook and does not cause the actual problem. Therefore, learning that takes place in the classroom is less related to everyday life.

The realistic learning model can solve learning mathematics problems because this learning model is based on the use of reality and the environment that students know to facilitate learning mathematics. Hopefully, students can rediscover mathematical ideas and concepts by providing context with the teacher's help. Thus, students can translate questions into mathematical language.

Realistic Mathematics Education (RME) is a learning method that encourages students to think critically, creatively, innovatively, and collaborate in solving mathematical problems [9]–[12]. "Realistic Mathematical Learning" is Derived from the term "Realistic Mathematical Education" (RME), which refers to mathematics subjects that allow students to adapt their knowledge to the realities of everyday life. This strategy can encourage students to talk and work together while studying mathematics, exchange ideas with their peers, and develop their ideas. According to Polya, the troubleshooting indicator measures the problem-solving competencies demonstrated in this study, including difficulty understanding and planning, implementing problem-solving, and checking whether problem-solving has been completed.

Applying Realistic Mathematics education models can develop mathematical problem-solving skills through realistic mathematics [13], [14]: Understanding context, explaining context, discussing context, drawing and discussing answers, and highlighting conclusions. So they can give them the tools they need to deal with any problems that may arise. This study focuses on the problem of how students' memory-based problem-solving abilities can be influenced when Realistic Mathematics education models have been applied to the learning process.

METHOD

In this study, the author uses quantitative research methods. The experiment type used researcher is quasi-experimental because no one already creates a new class but takes an introductory change class at school. This research consists of two classes: the experimental and control classes. Method mathematics realistic education is a treatment for the experimental class (IV A), whereas the learning standard is used in the comparison class (IV B). The time of this research was conducted in the even semester of Class IV Cipadu 1 year lesson 2021/2022. The population used in this study are students exclusively for class IV SDN Cipadu 1. The sample for this study was 31 students of class IV A and 30 students of class IV B at SDN Cipadu 1 Kota Tangerang. Variable free in this study is the learning model mathematics realistic; meanwhile, the bound variable is students' mathematics problem-solving ability.

Data collection techniques are researchers use pre-test and post-test. Validity and reliability instrument test tested. Testing the validity of the data in this study using formula product-moment correlation and testing data reliability using Cronbach's alpha formula. Based on validity test results, known that mark correlation from the fifth question being tested such > r-table. So all valid questions. Besides, Therefore, the value obtained in the reliability test is 0.8, where 0.8 > 0.6. From here can conclude that this device can be dependable.

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The data analysis technique used in this study is the t-test. However, before doing a t-test, The necessary tests are carried out, namely the normality and uniformity tests. The normality test uses the Kolmogorov-Smirnov formula, while the homogeneity test uses Levene's test.

RESULTS AND DISCUSSION

Based on the results of quantitative data analysis, performed test mathematical problem-solving ability of fourth-grade students in learning mathematics through operation count number round using descriptive statistics. With SPSS 22.0 software assistance, the pre and post-test results are explained in Table 1.

Table 1. Capability Data Description Solving Problem

	N	Minimum	Maximum	Means	std. Deviation
Pre-test-Experiment	31	13	30	21.90	4,693
Post-test-Experiment	31	34	49	41.39	4,055
Pre-test- Control	30	14	32	23.03	4,701
Post-test- Control	30	14	39	27.50	5,764
Valid-N (listwise)	30				

Based on the calculation, it is known that in the experimental class pre-test value, the highest is 30 dan score, the lowest is 13, and the highest post-test result using mathematics realistic learning models. The score was 49, and score the lowest was 34. Besides that, on the pre-test results given to the control class using the method of learning normal, the highest score was 32, and the lowest was 14. On the other hand, the post-test results got the highest mark. Score highest 39 and score lowest 14. This information can also be seen in the histogram image below for easy reading and conclusion pre-test results.

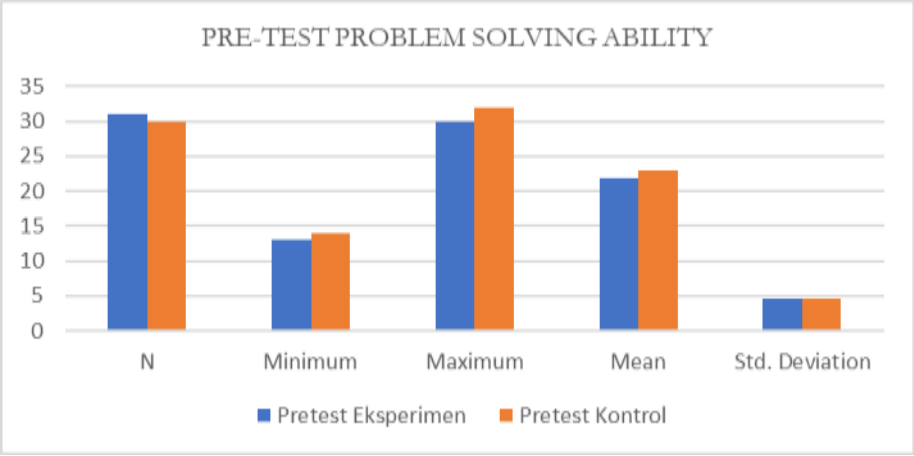

Figure 1. Pre-test results for the experimental class and the control class

Figure 1 informs that results control class performance has standard the same deviation, and the average, maximum, and minimum values are better than the test class. The pre-test results in the experimental class reached a maximum of 30 and a minimum score of 13. Besides, it was a pre-test control class with a marked maximum of 32 and a minimum of 14. This

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information can be seen in the table descriptive section over the histogram below to make it easier to read and evaluate post-test results.

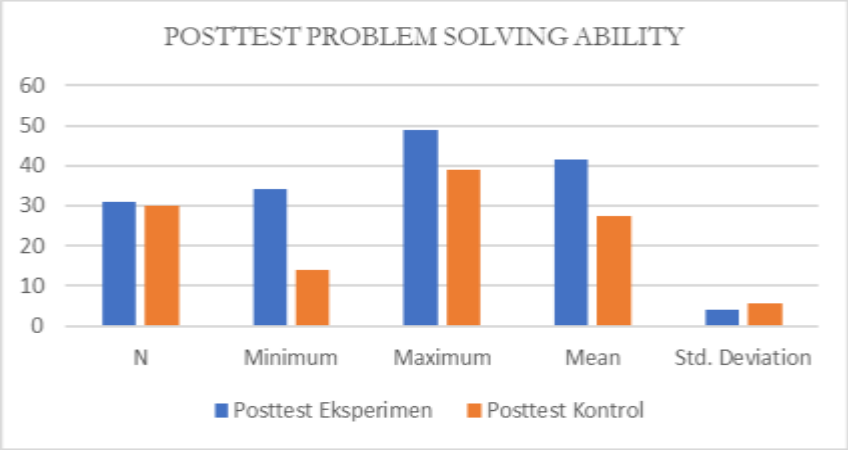

Figure 2. Post-test Class Experiment and Control Results

Figure 2, the experimental class results are better than the control class. Other data can also be seen based on normality test results and homogeneity test based on the Kolmogorov-Smirnov analysis used in the normality test and the Levene test in the uniformity test. Following normality test results and homogeneity test :

Table 2. Normality Test Results

	Class	Kolmogorov-Smirnov			
		Statistics	Df	Sig.	statistics
Problem-Solving Ability	Pre-test-Experiment	.119	31	.200*	.965
	Post-test-Experiment	.121	31	.200*	.964
	Pre-test- Control	.129	30	.200*	.973
	Post-test- Control	.117	30	.200*	.966

Based on Table 2, conclusions of the experimental and control classes obtained mark significance 0.2 > 0.05 which means accepted. It means capability data solving mathematical problems in both classes are typically distributed.

Table 3. Homogeneity Test Results

		Levene Statistics	df1	df2	Sig.
Problem-Solving Ability	Based on Means	3.077	1	59	085
	Based on Median	2.955	1	59	091
	Based on the Median and with adjusted df	2.955	1	52.821	091
	Based on trimmed mean	3.089	1	59	084

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Based on data analysis, the results of the data homogeneity test between the experimental class and control classes have a value significance > 0.05, so accepted. Data shows that variant both classes are homogeneous.

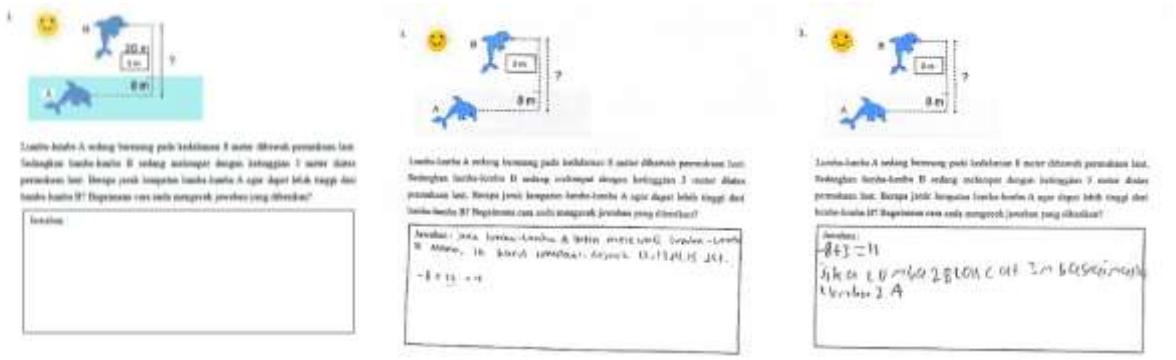
If the conditional test from hypothesis testing is by the standard, then the data is normally distributed, and its variance is homogeneous; the t-test was performed using SPSS 22.0 software. Here are the results of the t-test:

Table 4. T-test results

		Paired Differences							
		Means	std. Deviation	std. Error Means	95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
					Lower	Upper			
Pair 1	Pre-test-Experiments-Post-test-Experiments	-19.484	5489	.986	-21.497	-17.471	-1.765	30	.000
Pair 2	Pre-test - Control - Post-test- Control	-4.467	5970	1,090	-6.696	-2.238	-4.098	29	.000

Based on Table 4 is known that sig. is 0.000. From 0.000 <; 0.05, then rejected, meaning learning with realistic mathematics education helps students finish mathematical problems.

The mathematical student can see the influence on the problem-solving ability by comparing the results test students' mathematical problem-solving ability in practical classes that teach realistic mathematics learning models with the control class taught using traditional models. Results for test device number 3 are shown in fig following :



a) Instument Tes b) Experiment Class c) Control Class

Figure 3. Instrument Tes, Students Answers Experiment and Control Class

Figure 3(a) is the instrument test based on Mathematics Realistics Education. Figure 3(b) shows correct and complete answers to question number 3 given by a class student using mathematics realistic learning models . Figure 3(c) shows students in a class with traditional models of mathematical problem-solving that are not good because the calculation results are wrong, and they need help to understand and solve these problems.

Research Classes that use realistic (real-life) mathematics learning models with higher mathematical problem-solving assessment characteristics than traditional methods, namely the

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difference between practical classes (Realistic Mathematics education models) and classes with traditional learning models. These differences include the following: Students who get a Realistic Mathematics education model do not feel bored because of the concrete media provided; They are very enthusiastic about using media in arithmetic, whereas, in classes with traditional learning models, students feel bored learning because learning is only student-centered.

When a realistic mathematical model is used in learning, the researcher asks questions about briefly remembered integers. Researchers invite students to do ice-breaking to increase enthusiasm for learning. In addition, learning takes place according to the Realistic Mathematics Education level:

Table 4. Teacher dan Students Mathematics Ralistics Education Models

Teacher Activity	Students Activity
The teacher asks questions in context; Then, students are asked to understand the problem.	Students understand the problem from the question asked.
	
The teacher gives an explanation of the contextual problems presented. If some students need help understanding it, the researcher will explain and give instructions.	A student noticed the teacher's explanation and asked about the problem, yet understood.
	

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Teacher Activity	Students Activity
Teacher helps students in problem-solving 	Students solve individually and independently. At this stage, the researcher provides several board media to bridge students in solving problems. 
The teacher guides students in discussing.	Students discuss and compare answers in groups.
	
The teacher directs students to give a conclusion after discussing the results.	Students conclude learning and researchers as facilitators based on discussion.
	

Analyzing natural mathematics learning processes and using Realistic Mathematics education models can produce an active learning environment, stimulate problem-solving ability, and allow students to discuss with others. This is due to the existence of substantial and

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contextual solution resources that are applied. This method is based on the natural characteristics of mathematics, namely contextual problems as a starting point for learning mathematics.

The concrete source researchers use is a number board circle whose subject is a cartoon in the presented story task. Fundamental tools used in learning realistic (real-world) math are related to each other because they help students solve problems, students can research, investigate, and express their opinions. Students are no longer confused by subtraction (-) and negative sign (-) because the media is. In addition, the existence of the media also bridges contextual problems with formal mathematical forms. This research is appropriate with previous research on applying real-world (realistic) mathematics learning models that improve problem-solving, especially in subtraction and addition of integers.

This research shows that realistic mathematics education affects students' mathematics learning outcomes. RME in learning Mathematics effectively improves learning outcomes [11], [13], [15]–[18]. Mathematics learning is best done by giving students active solving contextual problems. Students face deep mathematics problems. Teachers can use informal everyday activities that students know to help them identify Mathematical situations.

Furthermore, the research results in this study are supported by the results that the learning steps in PMR help students be better prepared for the learning process in class [10], [19]. Meanwhile, the results of this study also reveal that students in the learning process look active and enthusiastic when learning, which has a positive effect on the learning outcomes obtained. Realistic Mathematics education is seen as effective when viewed from the activeness and student learning outcomes.

RME in the learning process supports student activity and supports the process of solving student problems in learning Mathematics. This certainly affects the results of learning mathematics students. This finding is supported by Suci, Firman & Neviyarni [20], who found that Realistic Mathematics education effectively improved students' critical thinking skills. Students become systematically trained and organized. Besides, students seem more active and motivated in learning if taught with a realistic mathematics approach. Suggestions that can be given to teachers should be able to apply more varied strategies, models, and approaches to learning so that students are more enthusiastic about learning. This study also showed that students' mathematical problem-solving ability and learning independence increased after learning a realistic mathematics approach. It can be seen that the quality of learning must meet the criteria of effectiveness.

In addition, the study results also reveal that applying Realistic Mathematics education requires teachers to be more creative and innovative in designing learning with this approach. The development of learning media as a tool for concretizing Mathematical objects is also recommended to make it easier for teachers to communicate and teach these concepts to students.

CONCLUSION

Based on the information obtained from data description, hypothesis testing, and research discussion, it concluded that there is a significant difference in score problem-solving ability in experimental class students who use realistic mathematics education and control classes that use classic learning models. Application learning practice with approach influential positive to

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mathematical problem-solving ability, having a learning model mathematics real impact positive to learning math. Application of mathematics realistic learning models to increase students' problem-solving ability. The learning process received by students, especially formerly, must verify the order of learning realistic mathematics models smoothly.

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