



## The Effect of a Realistic Mathematics Education on the Problem-Solving Ability of Mathematics

Dewi Soraya, Jupriyanto\*, Yunita Sari

Universitas Islam Sultan Agung, Indonesian

\*Correspondence: E-mail: [jupriyanto@unissula.ac.id](mailto:jupriyanto@unissula.ac.id)

### ABSTRACT

This study aims to determine the positive effect of using the Realistic Mathematics Education (RME) model on the learning outcomes of problem-solving math story problems for second-grade students of SDN 03 Pelang. The lack of students understanding of the issue of the story problems and imagining the problems in story questions is not optimal. The RME model will provide students with authentic experiences and opportunities to construct mathematical knowledge. The type of research conducted is experimental research. The design used in this study is quasi-experimental in the form of a nonequivalent control group design. The subjects in this study were second-grade students of SDN 03 Pelang. The data collection technique in this research is in the form of a test (description). While the data analysis techniques include analysis of instrument trials, prerequisite tests, and hypothesis testing. The results showed a significant effect of the RME learning model on the problem-solving ability of students' story problems between the experimental and control groups. So, the RME makes students actively participate in learning so that students' problem-solving skills are achieved optimally.

### ARTICLE INFO

**Article History:**

Submitted/Received 18 Aug 2022

First Revised 20 Nov 2022

Accepted 16 Jan 2023

First Available online 01 Jul 2023

Publication Date 01 Jul 2023

**Keyword:**

Problem-solving skills,  
Realistic mathematics education,  
Story problems.

## 1. INTRODUCTION

Education is one of the rights that humans must obtain. Education is closely related to human life, both now and in the future. Education is expected to improve human welfare in general because, through this education, humans can gain as much knowledge as possible, which benefits themselves and the environment around them. Teaching is shaping student character (Atikah and Resisca, 2021; Kurniawan, 2015; Telaumbanua, 2018). In elementary school, there is a subject that is mathematics. Some students also say that mathematics is a tricky subject. Fauzi et al., (2020) say that learning mathematics is a challenging, unpleasant, and scary lesson. Mathematics is an abstract subject. Learning mathematics cannot be separated from solving problems, especially word problems. Problem-solving ability is a critical ability possessed by students. Mathematics learning in elementary schools has a huge role in students' abilities, including thinking and solving problems in everyday life (Rosyada et al., 2019).

With the mathematical problem-solving exercises, students are expected to think critically and creatively and sharpen and train their reasoning in making decisions to solve mathematical problems in everyday life (Monica et al., 2019). It is necessary to understand the problem by writing down the mathematical model of the problem, planning how to solve it, and implementing the solution. According to Polya (August and Ramlah, 2021) that the steps for solving a problem are 1) understanding the problem, 2) planning a solution to the problem, 3) carrying out the plan (solving the problem), 4) re-examining the results obtained in solving the problem by writing a conclusion.

Assessment on a math problem is a problem whose solution strategy is not immediately visible, so its completion requires knowledge, skills, and understanding that has been learned before (Mulyati, 2016; Zebua, 2022). So every issue must have several paths or ways that can be taken to solve the form of knowledge, skills, and understanding. Solving problems requires a method in the form of problem-solving. (Kusumawati, 2017) suggests that problem-solving is a mental and intellectual process of finding and solving a problem based on accurate data and information so that precise and accurate conclusion can be drawn. He explained that problem-solving methods provide opportunities for students to play an active role in learning, searching, and finding information or data to process into concepts, principles, theories, or conclusions.

Based on the results of interviews with class second-grade teachers of SDN 03 Pelang, they said that students still had difficulty solving problems, especially math word problems in the division material. Students often find it difficult when faced with word problems about division. They are still confused about whether it is the arithmetic operation of division and how to solve it. It happens because students' understanding of the problem in word problems is still lacking, and imagining the problems in word problems is not optimal. Besides, teachers still use conventional learning models in teaching and learning activities.

Following the problems above that students still have difficulty solving math word problems in the distribution material. Learning mathematics needs to be developed using models and methods that fully involve students in a learning activity so that learning is more exciting and supported by a visual aid or media to increase the attractiveness of students to focus more on the material being taught (Devi, 2020; Shoimah and Syafi'aturrosyidah, 2021). To change students' mindsets, teachers need a learning model that can improve students' ability to solve problems in mathematics. Innovative learning that can be applied is the Realistic Mathematics Education (RME) learning model. The main focus of this RME model is the idea formed from the results of human activity and the process of

mathematical reality. Suhaedi and Abdillah (2018) state that RME is a model of learning mathematics that emphasizes students and connects mathematics with human activities in everyday life to serve as a learning experience for students on real things. RME brings students to the real world of everyday experiences so that the lessons learned in math class are not separated from the real world. It is related to Piaget's theory, where elementary school-age children, namely 7-11 years, are at the level of concrete operational cognitive development (Marinda, 2020).

This study aimed to determine the effect of the Realistic Mathematics Education (RME) learning model on the problem-solving abilities of math story problems in the second grade of SDN 03 Pelang. The learning model that can be used to improve students' ability to solve math word problems in the division of material is the RME learning model. Strengthening previous research (Muncarno and Nelly, 2018) conducted research titled "The Effect of the RME Approach on Mathematics Learning Outcomes".

## 2. METHODS

This study uses experimental research to find the effect of specific treatments on controlled conditions. The research method used is Quasi-Experimental Design by selecting the Nonequivalent Control Group Design. The sample was determined using the total sampling technique (population object that also serves as the sample), which involves second-grade groups A and B of SDN 03 Pelang. Class second-grade groups A, as the experimental group, will be given treatment by providing the RME learning model. In contrast, second-grade group B, the control group, is assigned the learning model. Conventional. Validity is a measure that shows the level of validity or validity of the instrument (Suparman et al., 2020). The validation criterion is that each item is valid if  $r_{xy} > r_{table}$ ,  $r_{table}$  is the result of the critical input torque value  $r$ , and with the Guilfort formula, each object is considered valid if  $r_{xy} > r_{table}$ . Research instrument reliability is a tool that provides the same or consistent results (Yusup, 2018). The researcher tested the reliability of the study using Cronbach's alpha ( $\alpha$ ) formula because the questions used were in the form of descriptions.

Data collection techniques were carried out in the form of essay test questions. Tests are given before learning activities (pretest) and after understanding activities (post-test). And this test sheet is given to both sample classes. The first data analysis technique uses prerequisite tests which include normality and homogeneity tests, while the second uses hypothesis testing, which provides for paired t-tests and independent t-tests.

## 3. RESULTS AND DISCUSSION

The research was conducted in the second grade of SDN 03 Pelang, where the class had two parallel courses. Second grade A consists of 23 students (12 girls and 11 boys), and Second grade B consists of 24 students (14 girls and 10 boys). This study consisted of experimental and control groups. The determination of the experimental and control groups uses the average mathematics score in Middle Semester Assessment which has the lowest average score as the experimental group. Second-grade A has an average score of 70, and Second-grade A has an average score of 73. The result is Second-grade B as the experimental group and Second-grade B as the control group. The experimental group will be given treatment by providing a Realistic Mathematics Education (RME) learning model, while the control group will be assigned a conventional learning model. Then the two groups were given pretest and post-test exams.

The data taken in this study were in the form of data on learning outcomes between the two classes, both the experimental class and the control class. Data collection was done twice (pretest and post-test) for each category. The pretest is carried out before learning occurs, while the post-test is carried out after learning ends. Based on student learning outcomes, the following data is obtained:

**Table 1.** Experimental and Control Group Learning Outcomes

Description	Experimental Group (RME Model)		Control Group (Conventional Model)	
	Pre test	Post test	Pretest	Post test
The number of students	23	23	24	24
Number of Questions	10	10	10	10
The highest score	90	100	86	96
Lowest Value	46	72	52	54
Average	68,70	86,78	70,00	75,21

After obtaining data on student learning outcomes, a prerequisite test is carried out, including the normality and homogeneity tests. The first is the normality test to find out whether the data collected is normally distributed or not normally distributed. The normality test in this study uses the Shapiro-Wilk test because  $n < 50$ . The following are the results of the normality test using the IBM SPSS Statistics program. (See table 2)

**Table 2.** Normality Test Results

Class		Tests of Normality					
		Kolmogorov-Smirnov <sup>a</sup>			Shapiro-Wilk		
		Statistic	Df	Sig.	Statistic	Df	Sig.
Learning outcomes	Pretest Experiment (RME)	.110	23	.200*	.981	23	.918
	Posttest Eksperimen (RME)	.119	23	.200*	.929	23	.102
	Pretest Control (Conventional)	.177	24	.050	.942	24	.176
	Posttest Control (Conventional)	.080	24	.200*	.992	24	.999

\*. This is a lower bound of the true significance.

#### a. Lilliefors Significance Correction

Based on the explanation above, the data is normally distributed if the significance value is  $> 0.05$ . From the results of the normality test output above, all variables are normally distributed because the value of Sig.  $> 0.05$ . The analysis used parametric test analysis.

After the normality test, the second is to do a homogeneity test to determine whether the data has the same variance. This homogeneity test was carried out using the IBM SPSS Statistics Program. The results of calculations based on the Sig value in the Test of Homogeneity of Variance table on the Based on Mean, in brief, the homogeneity test is obtained as follows.

**Table 3.** The Experimental Class Homogeneity Test Results

Test of Homogeneity of Variance					
		Levene Statistic	df1	df2	Sig.
Experiment Class Results	Based on Mean	2.535	1	45	.118
	Based on Median	2.273	1	45	.139
	Based on the Median and with adjusted df	2.273	1	41.551	.139
	Based on trimmed mean	2.521	1	45	.119

**Table 4.** The Control Class Homogeneity Test Results

Test of Homogeneity of Variance					
		Levene Statistic	df1	df2	Sig.
Control Class Results	Based on Mean	.485	1	46	.490
	Based on Median	.531	1	46	.470
	Based on the Median and with adjusted df	.531	1	44.266	.470
	Based on trimmed mean	.486	1	46	.489

The table above shows that all variables' significance value (Sig.) is more than 0.05. Experimental class learning outcomes on the value of Sig. Based on a mean of 0.118 > 0.05, it can be concluded that the variance of the pretest and Post-test data in the experimental class is the same or homogeneous. And the learning outcomes of the control class on the value of Sig. Based on the mean of 0.490 > 0.05, it can be concluded that the variance of the pretest and post-test data in the control class is the same or homogeneous.

After the normality and homogeneity tests were carried out, the hypothesis test included the paired sample t-test and independent samples t-test. The first, the paired sample t-test, was conducted to see whether there were differences in students' pretest and post-test results from the experimental and control groups. The following is a summary of the SPSS results:

- 1) In the output of Pair 1, a Sig. (2-tailed) value of 0.000 is obtained, which means 0.000 < 0.05. So,  $H_0$  is rejected, and  $H_a$  is accepted. It can be concluded that there is a difference in the average student learning outcomes for the Pretest and Posttest Experiment Class (RME Model).
- 2) In the output of Pair 2, a Sig. (2-tailed) value of 0.002 is obtained, which means 0.002 < 0.05. So  $H_0$  is rejected, and  $H_a$  is accepted. It can be concluded that there is a difference in the average student learning outcomes for the Pretest and Posttest Class Control (Conventional).

The control class uses the general method commonly used by classroom teachers, namely conventional methods, lectures, questions, and answers. Students only listen to explanations about the material from the teacher and work on practice questions. Students who actively follow the lessons have high rankings or are innovative in class. They are easy to understand the explanation from the teacher. Some students also looked bored with learning and playing alone. Some students cannot directly ask the teacher about the material they do not understand. With the lecture method, students are only fixated on the

teacher and are not actively involved in the learning process. This method is unsuitable for students learning to solve word problems.

The research results in the second grade of SDN 03 Pelang proved that the RME learning model positively and significantly influenced student problem-solving ability learning outcomes compared to conventional learning models. The RME learning model has an effect by experiencing an increase in the average value of students from before treatment to after being given treatment

After conducting the paired sample t-test, the second independent sample t-test was carried out to see whether there were differences in the post-test results of students from the experimental and control groups. The following is a summary result from SPSS that obtained a Sig. (2-tailed) value of  $0.000 < 0.05$ , then  $H_0$  is rejected, and  $H_a$  is accepted. So, it can be concluded that there is an average difference in student learning outcomes between the RME learning model and the conventional learning model.

Students will be faced with exploring a problem that is following students' daily lives. Students are asked to solve the problem in their way. Students can use objects around them to solve division problems in their way. Students are trained to increase their creativity by solving problems in their way. Students build their knowledge by making problem-solving strategies for dividing story problems. After students can solve the problem given, they are asked to convey their way of solving it to all other students. Students are trained to be responsible for their work. Students who listen to the explanation can express their opinion about the work of their friends. Students' self-confidence is taught by conveying their way of solving problems.

By listening to other friends' ways of solving problems, students will know that there is not only one way to solve problems. Students can choose the way they want to solve the problem. Students can also build their knowledge with the guidance of the teacher. The RME model is a student-centered learning model involving many students in their learning activities.

The explanation above is related to the theory of cognitivism learning, including the ideas of Piaget, Bruner, and Ausubel. The three theories both emphasize students' creativity in constructing their knowledge. Their knowledge emphasizes the learning process that lies in the students, while the teacher acts as a guide to encourage students to think actively, and learning is highlighted in the process and not the result. It has similarities with the principles and characteristics of the RME model of education.

Based on the data from the research results, it is known that realistic mathematics learning influences the learning outcomes of students' problem-solving abilities. By what was stated (Suhaedi and Abdillah, 2018) that realistic mathematics learning is oriented toward mathematical reasoning in solving problems. It is also supported that the advantages of RME can provide a clear understanding to students about how to solve a problem. This means that the problem does not have to be single or the same from one person to another (Suhono and Yuliantri, 2021).

Learning with RME also has the disadvantage that it requires quite a lot of time (Widana, 2021) because it trains students to solve problems in their way and uses natural objects for practice. Especially for second-grade elementary school students who still find it challenging to condition during lessons. However, RME can improve students' understanding of constructional thinking (Susilowati, 2018).

The results prove that the Realistic Mathematics Education (RME) model can improve students' problem-solving abilities. Several expert opinions have been described previously, along with the data analysis that has been carried out. It is also in line with research by

(Muncarno and Nelly, 2018), entitled "The Effect of the RME Approach on Mathematics Learning Outcomes," that the results of his study show that there is an effect of the RME approach on the learning outcomes of fifth-grade students in mathematics. The product can be seen from the difference in learning outcomes between the experimental and control classes. The average value of the post-test experimental class is 62.31, while the control class is 52.22. It can also be calculated by testing the hypothesis using the pooled variance t-test formula. The  $t_{\text{value}}$  data is 2.125, while the  $t_{\text{table}}$  is 2.000. This comparison shows ( $2.125 > 2.0000$ ) which can be interpreted that there is a significant influence on the mathematics learning outcomes of fifth-grade students.

#### 4. CONCLUSION

Based on the study's results, using the Realistic Mathematical Education (RME) model positively affected the ability to solve math story problems for second-grade students of SDN 03 Pelang. It was also strengthened by the increased problem-solving ability of students' story problems. Suggestions that future researchers are expected to master the steps and characteristics of the RME model so that the desired goals in learning activities are correctly achieved.

#### 5. REFERENCES

- Atikah, N., and Resisca, Y. (2021). Peningkatan mutu pendidikan peningkatan mutu pendidikan di sekolah dasar (SD). *Pedagogi: Jurnal Ilmu Pendidikan*, 21(1), 1-9.
- August, F. M., and Ramlah, R. (2021). Analisis kemampuan pemecahan masalah matematis siswa berdasarkan prosedur polya. *JIPMat*, 6(1), 43-59.
- Devi, N. M. I. A. (2020). Pengembangan media pembelajaran puzzle angka untuk meningkatkan kemampuan mengenal lambang bilangan. *Jurnal Ilmiah Pendidikan Profesi Guru*, 3(3), 416-426.
- Fauzi, A., Sawitri, and D. Syahrir.(2020). Kesulitan guru pada pembelajaran matematika di sekolah dasar. *Jurnal Ilmiah Mandala Education*, 6(1), 142-148.
- Kurniawan, M. I. (2015). Mendidik untuk membentuk karakter siswa sekolah dasar: studi analisis tugas guru dalam mendidik siswa berkarakter pribadi yang baik. *Pedagogia: Jurnal Pendidikan*, 4(2), 121-126.
- Kusumawati, N. (2017). Pengaruh kemampuan komunikasi dan pemecahan masalah matematika terhadap hasil belajar siswa dengan pembelajaran realistic mathematic education (rme). *Delta: Jurnal Ilmiah Pendidikan Matematika*, 1(1), 104-113.
- Marinda, L. (2020). Teori perkembangan kognitif Jean Piaget dan problematikanya pada anak usia sekolah dasar. *An-Nisa': Journal of Gender Studies*, 13(1), 116-152.
- Monica, H., Kesumawati, N., and Septiati, E. (2019). Pengaruh model problem based learning terhadap kemampuan pemecahan masalah matematis dan keyakinan matematis siswa. *Mapan: Jurnal Matematika dan Pembelajaran*, 7(1), 155-166.
- Mulyati, T. (2016). Kemampuan pemecahan masalah matematis siswa sekolah dasar. *EduHumaniora: Jurnal Pendidikan Dasar Kampus Cibiru*, 3(2), 1-15.

- Muncarno, M., and Nelly, A. (2018). Pengaruh pendekatan RME terhadap hasil belajar matematika. *Aksioma: Jurnal Program Studi Pendidikan Matematika*, 7(1), 103-114.
- Rosyada, T. A., Sari, Y., and Cahyaningtyas, A. P. (2019). Pengaruh model pembelajaran realistic mathematics education (RME) terhadap kemampuan pemecahan masalah matematika siswa kelas V. *Jurnal Ilmiah Pendidikan Dasar*, 6(2), 116-123.
- Suhaedi, S., and Abdillah, A. (2018). Efektifitas pendekatan RME (realistic mathematic education) terhadap prestasi belajar matematika siswa kelas VII tahun pelajaran 2013-2014. *Paedagogia: Jurnal Kajian, Penelitian dan Pengembangan Kependidikan*, 5(2), 51-57.
- Sahono, B., and Yuliantri, E. (2021). Penerapan pendekatan pembelajaran realistic mathematics education (RME) untuk meningkatkan berpikir kritis siswa. *Educate: Jurnal Teknologi Pendidikan*, 6(2), 01-08.
- Susilowati, E. (2018). Peningkatan aktivitas dan hasil belajar matematika siswa sd melalui model realistic mathematic education (RME) pada siswa kelas IV semester I di SD Negeri 4 Kradenan kecamatan Kradenan kabupaten Grobogan tahun pelajaran 2017/2018. *Pinus: Jurnal Penelitian Inovasi Pembelajaran*, 4(1), 44-53.
- Suparman, T., Prawiyogi, A. G., and Susanti, R. E. (2020). Pengaruh media gambar terhadap hasil belajar IPA pada siswa sekolah dasar. *Jurnal Basicedu*, 4(2), 250-256.
- Shoimah, R. N., and Syafi'aturrosyidah, M. (2021). Penggunaan media pembelajaran konkrit untuk meningkatkan aktifitas belajar dan pemahaman konsep pecahan mata pelajaran matematika siswa kelas III MI Ma'arif NU Sukodadi-Lamongan. *Mida: Jurnal Pendidikan Dasar Islam*, 4(2), 1-18.
- Telaumbanua, A. (2018). Peranan guru pendidikan agama Kristen dalam membentuk karakter siswa. *Fidei: Jurnal Teologi Sistematika dan Praktika*, 1(2), 219-231.
- Widana, I. W. (2021). Realistic mathematics education (RME) untuk meningkatkan kemampuan pemecahan masalah matematis siswa di Indonesia. *Jurnal Elemen*, 7(2), 450-462.
- Yusup, F. (2018). Uji validitas dan reliabilitas instrumen penelitian kuantitatif. *Tarbiyah: Jurnal Ilmiah Kependidikan*, 7(1), 17-23.
- Zebua, F. J. (2022). Analisis kemampuan pemecahan masalah matematika siswa pada materi aritmetika sosial kelas VII SMP Negeri 2 Toma tahun pembelajaran 2020/2021. *Afore: Jurnal Pendidikan Matematika*, 1(1), 50-63.