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Increasing Students' Mathematical Problem Solving Ability through the Realistic Mathematic Education (RME) Approach

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Abstract. This research is a descriptive qualitative-quantitative research that aims to find out how to improve students' problem-solving abilities through the Realistic Mathematic Education (RME) learning model on social arithmetic material. The research was carried out at SMP Negeri 1 Sukosewu, with the selection of class VII C as the class studied with a total of 31 students. The method used is a mix method. The data collection techniques in this study are through observation, test techniques and interviews. Data analysis in this study is qualitative analysis with data triangulation and quantitatively which includes normality tests, summary models, coefficients and gain scores using the SPSS version 26 statistical application program with a significant level of 5%. The results of the coefficients test calculation obtained a significance value (2-tailed) of 0.000 < 0.05, which means that there is an increase in students' problem-solving ability through the Realistic Mathematic Education learning model and the results of the gain score calculation obtained a value of 0.7066. The conclusion of this study shows that there is an increase in students' problem-solving ability through the Realistic Mathematic Education (RME) learning model, the increase is "High".
Keywords: Realistic Mathematics Education, Problem Solving, Social Arithmetic.

Abstrak. *Penelitian ini merupakan penelitian kualitatif-kuantitatif deskriptif yang bertujuan untuk mengetahui peningkatan kemampuan pemecahan masalah matematis siswa melalui model pembelajaran Realistic Mathematic Education (RME) pada materi aritmatika sosial. Penelitian dilaksankaan di SMP Negeri 1 Sukosewu, dengan pemilihan kelas VII C sebagai kelas yang diteliti dengan jumlah siswa sebanyak 31 siswa. Metode yang digunakan yaitu mixed methode. Teknik pengumpulan data melalui observasi, teknik tes dan wawancara. Analisis data terdiri dari analisis secara kualitatif dengan triangulasi data dan secara kuantitatif yang uji coefficient dan gain score dengan taraf signifikan sebesar 5 %. Hasil perhitungan uji coefficients diperoleh nilai signifikasi (2-tailed) sebesar 0,000 < 0,05 yang artinya terdapat peningkatan kemampuan pemecahan masalah matematis siswa melalui pembelajaran Realistic Mathematic Education dan hasil perhitungan gain score diperoleh nilai sebesar 0,7066. Kesimpulan dari penelitian ini menunjukkan bahwa terdapat peningkatan kemampuan pemecahan masalah matematis siswa melalui pendekatan Realistic Mathematic Education (RME) dengan kriteria peningkatanya adalah "Tinggi".*
Kata kunci: *Realistic Mathematic Education, Pemecahan Masalah, Aritmatika Sosial*

INTRODUCTION

The development of the times must also be accompanied by the development of superior human resources. Today's human resources must be able to solve every problem they face. Problem solving abilities can be sharpened through learning mathematics. Mathematics is a way or method of thinking and reasoning. Mathematics was formed as a result of human thinking related to ideas, processes and reasoning. Mathematics subjects need to be given to all students as a basis for improving logical, analytical, systematic, critical thinking and problem solving abilities, so mathematics is felt to be understood and mastered by all levels of society, especially elementary school to university students. (Kusumawardani *et al.* , 2018). Problem solving ability is one of the important goals in learning mathematics (Gre, 2019). Problem solving is also a learning approach, which is used to reinvent and understand mathematical material, concepts and principles. Learning begins with the presentation of a contextual problem or situation then through induction students discover mathematical concepts/principles (Sumarmo, 2007).

Mathematical problem solving abilities include the ability to identify and understand problems, develop mathematical models that are appropriate to the problem, work on mathematical models that have been prepared and interpret the solutions obtained. Mathematical material that requires mathematical solving skills includes social arithmetic material. Social arithmetic is a branch of mathematics which studies mathematics in social life, for example in the field of economics, geography, and sociology. This material is very appropriate when used to train students' mathematical solving abilities.

Mathematical problem solving abilities are very necessary for students, but in fact many students have low mathematical problem solving abilities. The fact that researchers obtained after conducting observations at SMP Negeri 1 Sukosewu by asking one of the mathematics teachers at the school was that the mathematical problem solving abilities of SMP Negeri 1 Sukosewu students were quite low. Students' difficulty in solving problems is influenced by several factors,

namely internal and external factors. One of the factors causing students' low mathematical problem solving abilities is errors in using learning models during teaching and learning activities.

To improve students' mathematical solving abilities, teachers must find the right learning approach. Learning activities must be able to focus on students. These learning activities can be achieved through a Realistic Mathematical Education approach. The RME (Realistic Mathematic Education) approach is a learning approach that focuses on mathematics learning which is focused on students' daily lives (contextual) which presents real problems to be taught to students (Gusnarsi et al., 2017:33). Furthermore Gravemeijer (1994) emphasized that the form of RME is learning that is not only the development of students which is seen as a guide in mathematics education but also mathematics itself. So that students can imagine various facts, concepts, and principles in real mathematics to make it easier for students to understand various mathematical problems. Learning starts with concrete things that students understand more easily than abstract things. The teacher's task in the Realistic Mathematical Education learning model is to help students achieve their goals, where the teacher deals more with strategies rather than providing information and the teacher directs students to discover something new independently.

The principles of RME (Realistic Mathematic Education) learning are effectiveness (teachers must be able to encourage students to be physically and mentally active), Reality (learning begins by raising real problems around the students' environment), problem solving in stages (students are directed to carry out the stages to solve the problem), connectedness (showing the relationship between the mathematical concepts), and social interaction (mathematics learning activities to be able to create social relationships between teachers and students so that learning takes place, interactive, active and fun) (Fauzan et al., 2017). Furthermore (Papadakis et al., 2021) stated that the RME learning model is related to mathematical concepts, critical thinking skills, creative thinking and problem solving. These learning principles are expected to be RME (Realistic Mathematics) based learning Education) is expected to be able to increase

understanding and improve students' problem solving abilities in solving mathematical problems by providing a direct picture of real life.

The indicators of mathematical problem solving ability according to (Suraji, 2018) are as follows: 1) Students can choose and apply strategies to solve mathematical problems or outside mathematics. 2) Students can explain and interpret the results. Students' mathematical problem-solving abilities in learning mathematics need to be improved so that mathematics becomes easy to learn and mathematics does not become a frightening specter for students. So that it is necessary to use a fun and problem-based learning approach, namely the Realistic Mathematical Education learning approach.

RESEARCH METHODS

The method in this research uses mixed methods. Cresweell (2010) states that the mixed methods research approach is research that combines qualitative and quantitative research. This research uses concurrent mixed methods, namely a research strategy that combines qualitative methods and quantitative methods at one time. Quantitative methods are used to measure students' mathematical problem solving abilities through test questions, and then the results of these questions will be tested to see whether students' mathematical problem solving abilities have improved after receiving Realistic Mathematic Education (RME) learning. The test questions are given twice. The first exam is called a pretest which aims to determine students' initial mathematical solving abilities. The second exam is called the posttest which aims to determine the increase in students' mathematical problem solving abilities after being given learning treatment using the Realistic Mathematical Education approach. While the qualitative method is used to find out student responses and responses, namely through questionnaires and questions and answers, so that researchers can find out directly from students and can draw conclusions.

The subjects of this research were 31 students of SMPN 1 Sukosewu class VII C. In this study, samples were taken that got high posttest scores or students

with high scores (SNT) and students with low scores (SNR) for interviews. The object of this research is to improve students' mathematical problem solving abilities by applying the Realistic Mathematics Education (RME) approach to social arithmetic material. Data collection techniques through observation, documentation, test techniques and interviews. Preliminary observations have the goal of obtaining real and concrete data by visiting the research location at SMP Negeri 1 Sukosewu so that researchers can obtain information from research subjects, whether it is information about students to students' initial mathematical solving abilities. Documentation is carried out by taking pictures or taking photos of the location and research subject.

Questions test will be given twice. The first question was given to class VII C before receiving the learning treatment from the researcher. The first test is called the pretest. The second question was given to class VII C after getting the learning action through the Realistic Mathematical Education approach. This test is called posttest. This question is given to determine whether there are differences in students' critical thinking abilities after learning actions using the PBL (Problem Based Learning) learning model. The test technique uses HOTS (high Order Thinking Skill) questions in the form of essay questions which of course have been validated beforehand. Furthermore, data analysis techniques consist of quantitative and qualitative analysis.

RESULTS AND DISCUSSION

The data obtained after conducting research at SMP Negeri 1 Sukosewu to be exact for class VII C, the results are as follows:

Mathematical Problem Solving Ability Test

After getting the test scores the next step is to analyze the average test scores of students whose scores are above average and below average. Based on the results of the pretest, students still lack understanding about problem solving abilities and student results are still far below the average, namely 38 and it can be seen from the posttest results that students increase after implementing the

Realistic Mathematic Education approach, the average is to 72 . the average results can be observed in table 1 as follows:

Table _ 1. Average Pretest t And Post t test t

Pre Test Average	Average Post Test t
38	72

Results and Analysis of Interview Data

After the written test is carried out, the next stage is to interview students whose scores are high and low or below average. To make the data analysis process easier, the names of the 2 subjects will be expressed in code form. Besides being used to find the truth about the results of the written test, the completion of the sample for problem solving ability test questions using interview techniques will also be analyzed according to the indicators of problem solving ability. Indicators of problem solving ability are as follows:

1. Identifying the problem, understanding the problem correctly, stating what is known and being asked about the problem
2. Indicators Plan to solve the problem, state, and write down the model or formula used to solve the problem
3. Indicators Solve problems according to plan, perform calculation operations correctly
4. Indicators Evaluate, draw conclusions from the answers obtained and re-check the calculations obtained

Problem Solving Ability of High Score Students (SNT)

Based on the indicators of problem solving ability, the researcher first conducted interviews on the problem solving ability of students with high scores (SNT). The questions are given based on indicators and answers from question number 1 to question number 4.

a. Results of answers and interviews with SNT subjects in solving question no 1

Improved problem-solving abilities can be seen from changes in the pattern of students' answers during the pre-test and post-test. Changes in the pattern of answers can be seen in Figure 1 as follows:

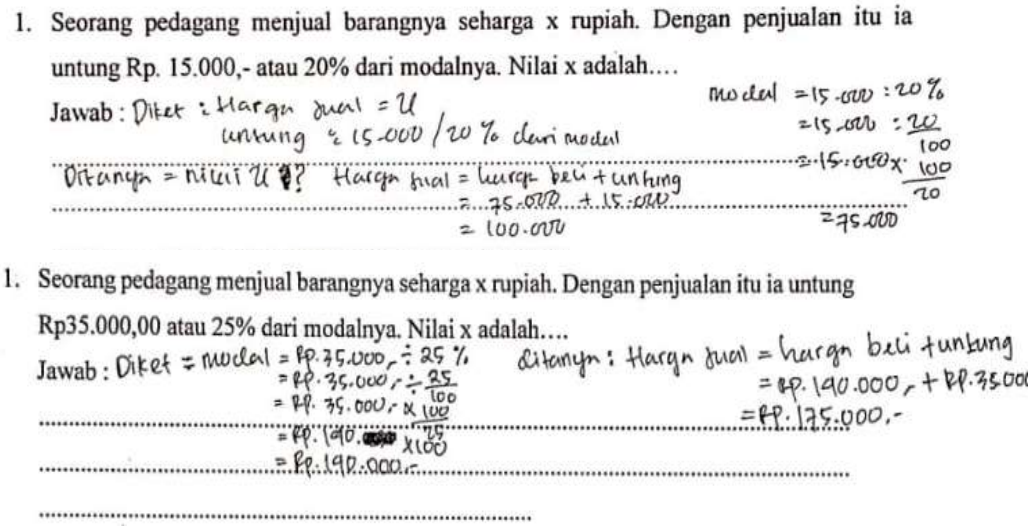


Figure 1. Answers to pre-test and *post- t test questions* no. 1 SNT

Based on Figure 1, it can be said that SNT experienced a significant increase in changes in answers during the pretest and posttest. It can be seen that when the SNT pretest was able to identify problems, make mathematical models well but still make mistakes in calculating where SNT answered 75,000 + 15,000 = 100,000. This resulted in SNT making mistakes in giving the final results so that in the pretest SNT had not carried out the problem solving steps properly. When the SNT posttest experienced a significant increase in the pattern of answers, the SNT was correct in doing the calculations and was able to draw conclusions. After knowing the increase in the pattern of answers, the researcher will give interviews to SNT on question number 1, the results of the interviews will be presented in Table 2 as follows:

Table 2. Interview Results of SNT Subjects in Solving Problem No. 1

Perpetrator	Interview snippet
Researcher	How do you do question number 1?
Subject	I read the question sir, then I identified the problem from the question by writing down the answers known to be asked and answered
Researcher	During the pretest, why did you make the wrong calculation?
Subject	Because it took me a long time to understand the problem so I was in a hurry while working on it
Researcher	When you have a posttest, you can identify the problem well, then how do you determine the buying price first and how do you determine the selling price?
Subject	My first read the sir, then remember the capital formula and determine the purchase price by calculating the capital gain after that determine the selling price

Based on changes in the pattern of SNT answers and interviews, the researcher concluded that SNT had experienced an increase in that SNT was able to identify problems well, create solution models, carry out calculations correctly and be able to draw appropriate conclusions.

b. Results of answers and interviews with SNT subjects in solving question no 2

Improved problem-solving skills can also be seen from changes in the pattern of students' answers during the pre-test and post-test. Changes in the pattern of answers can be seen in Figure 2 as below:

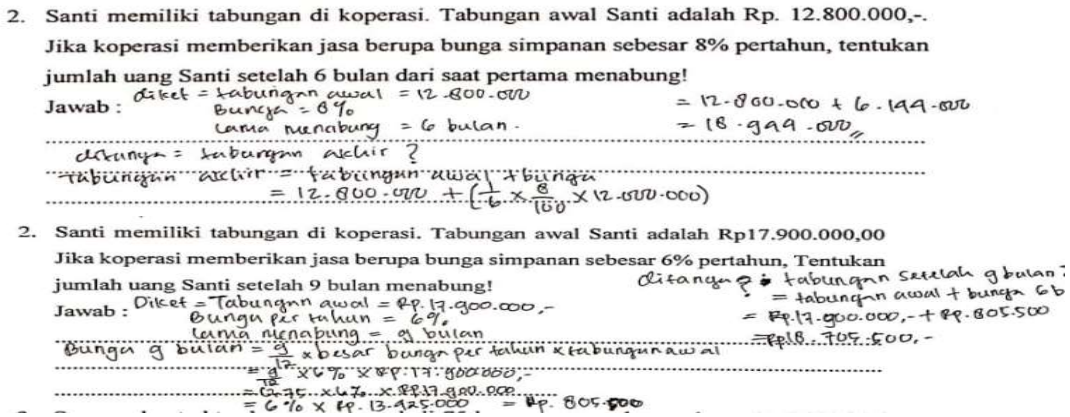


Figure 2. Answers to Pretest and Posttest questions no 2 SNT

Figure 2 explains that the change in answer patterns shows an increase in students' problem solving abilities. When the SNT Pretest was able to identify the problem well, there were still errors in creating the mathematical model. SNT made a mistake when determining the interest value, which should have been 6 months ($\frac{6}{12}$) but SNT only wrote the number 6 so the results of the SNT calculation were also wrong. Based on figure 2. It can also be seen that SNT has not been able to draw conclusions from the answers that have been given. However The results of the SNT posttest showed a significant change in the answer pattern, the SNT answer pattern from pretest to posttest increased so that the researcher then gave an interview to SNT. The results of the SNT interview on question number 2 can be seen in table 3 as follows:

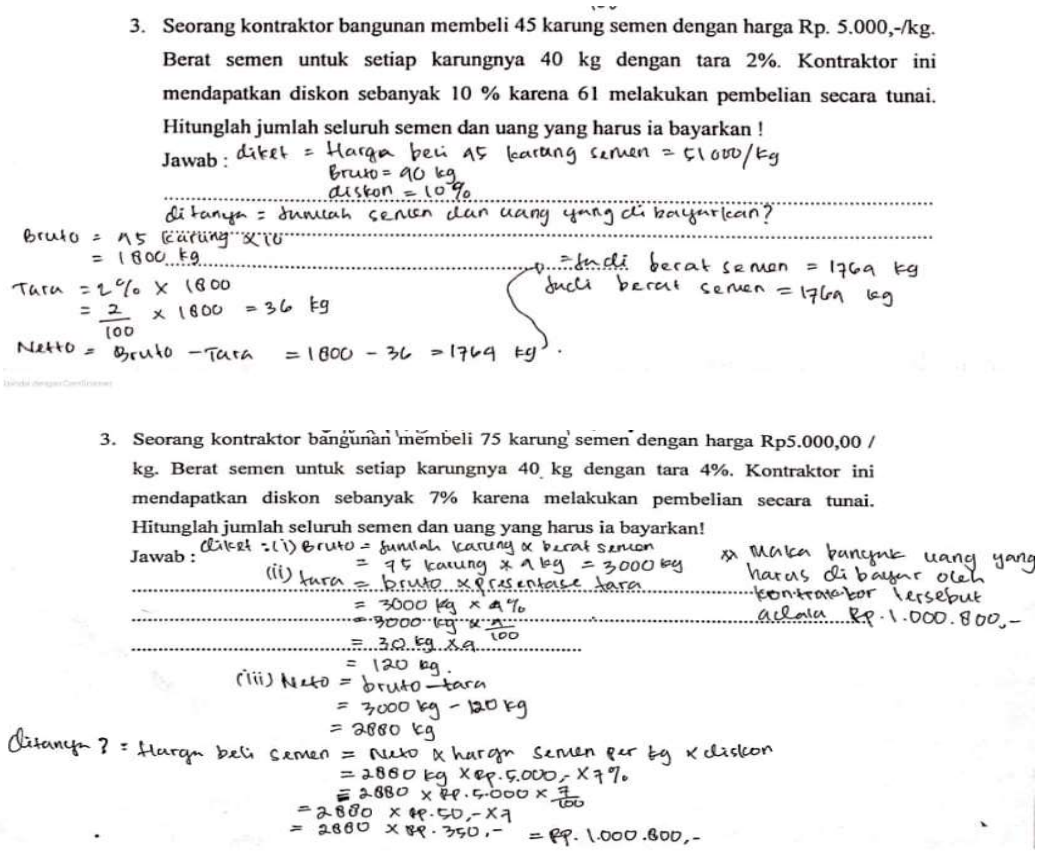
Table 3. Interview Results of SNT Subjects in Solving Problem No 2

Perpetrator	Interview snippet
Researcher	Now for question number 2 , during the pretest why did you make the wrong research model?
Subject	Because I forgot the formula and how to do it
Researcher	How do you plan to solve problems during the posttest?
Subject	Just like question number 1, sir, I wrote down the answer known to be asked and answered first
Researcher	After planning to solve the problem, what steps do you take to solve the problem?
Subject	After I know the plan that I will use to solve the problem, then I remember the formula and the next step I make an error in the model or formula for solving the problem

Based on table 3, the results of changes in students' answer patterns after being given treatment using the Realistic Mathematic Education (RME) learning model and after giving interviews, it can be concluded that SNT has experienced an increase in problem solving abilities, where SNT is able to understand related formulas, identify problems, create a solution model, carry out calculations correctly and be able to draw appropriate conclusions.

c. Results of Answers and Interviews of SNT subjects in solving question number 3

Increased problem solving abilities can also be seen from changes in students' answer patterns during the posttest. The change in answer pattern can be seen in Figure 4.3 as below:



3. Seorang kontraktor bangunan membeli 45 karung semen dengan harga Rp. 5.000,-/kg. Berat semen untuk setiap karungnya 40 kg dengan tara 2%. Kontraktor ini mendapatkan diskon sebanyak 10 % karena 61 melakukan pembelian secara tunai. Hitunglah jumlah seluruh semen dan uang yang harus ia bayarkan !

Jawab : diket = Harga beli 45 karung semen = 5.000/kg
Bruto = 90 kg
diskon = 10%
ditanya = jumlah semen dan uang yang di bayarkan?

Bruto = 45 karung x 40
= 1800 kg

Tara = 2% x 1800
= 2/100 x 1800 = 36 kg

Netto = Bruto − Tara = 1800 − 36 = 1764 kg

= jadi berat semen = 1764 kg
jadi berat semen = 1764 kg

3. Seorang kontraktor bangunan membeli 75 karung semen dengan harga Rp5.000,00 / kg. Berat semen untuk setiap karungnya 40 kg dengan tara 4%. Kontraktor ini mendapatkan diskon sebanyak 7% karena melakukan pembelian secara tunai. Hitunglah jumlah seluruh semen dan uang yang harus ia bayarkan!

Jawab : diket : (i) Bruto = jumlah karung x berat semen
= 75 karung x 1 kg = 3000 kg
(ii) tara = bruto x presentase tara
= 3000 kg x 4%
= 3000 kg x 4/100
= 30 kg x 4
= 120 kg.
(iii) Netto = bruto − tara
= 3000 kg − 120 kg
= 2880 kg

ditanya ? = Harga beli semen = Netto x harga semen per kg x diskon
= 2880 kg x Rp.5.000,- x 7%
= 2880 x Rp.5.000 x 7/100
= 2880 x Rp.50,- x 7
= 2880 x Rp.350,- = Rp.1.000.800,-

* maka banyak uang yang harus di bayar oleh kontraktor tersebut adalah Rp.1.000.800,-

Figure 3 Answers to Pretest and Posttest question number 3 SNT

Based on Figure 3, it can be concluded that SNT has experienced an increase in answers during the pretest and posttest. The next step that the researcher took after knowing that there was an improvement in students' answers was to give an SNT interview on question number 3. The results of the interview can be summarized in table 4 as follows:

Table 4. SNT Subject Interview Results in Solving Question No. 3

Perpetrator	Interview snippet
Researcher	Now for question number 3, why during the pre-test you can only find the total weight of cement?
Subject	Because I'm confused about how to find the price to pay
Researcher	At the time of the post test, why did you choose this plan to solve the problem?
Subject	Because after I identified the problem, I concluded that the problem was related to tare, so I thought about looking for gross, tare and net. After that, I determine the purchase price.

The Realistic Mathematics Education (RME) learning model makes students experience an increase in problem solving abilities. This can be observed based on changes in students' answer patterns during the pretest and posttest. Based on the changes in the pattern of student answers and the results of the interviews, it can be concluded that SNT has been able to identify the problem, create a complete settlement model, namely finding the weight of the cement and the costs to be paid, doing the calculations correctly and being able to draw the right conclusions.

d. Results of Answers and Interviews of SNT subjects in solving question number 4

Increased problem solving abilities can also be seen from changes in students' answer patterns during the pre-test and post-test. The change in answer pattern can be seen in Figure 4 as follows:

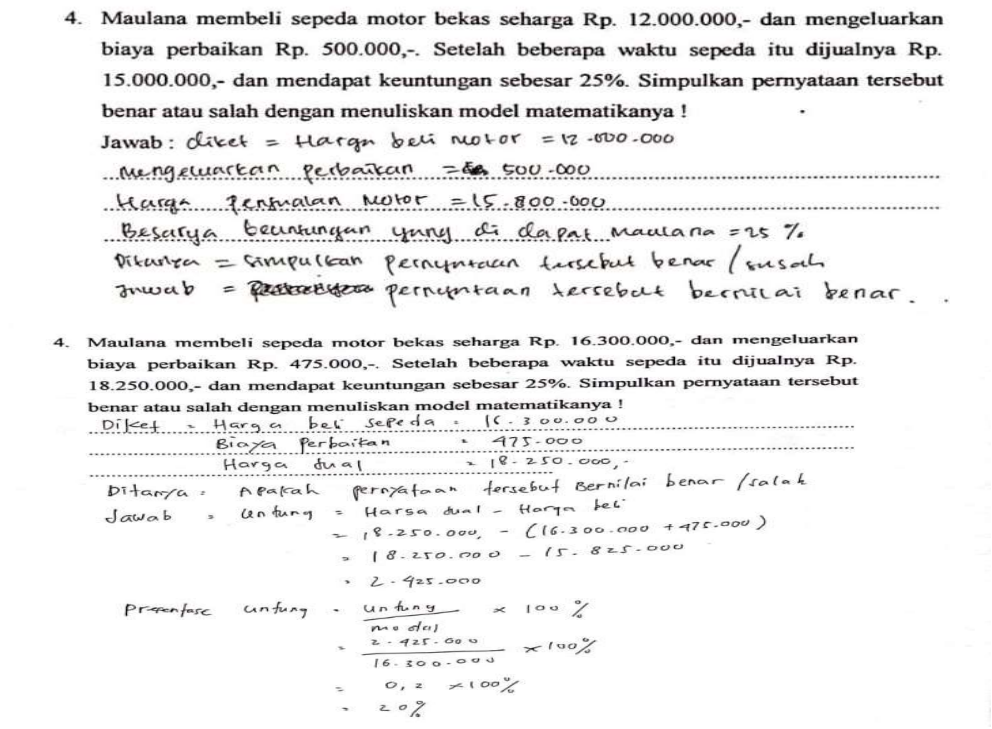


Figure 4 Answers to the pretest t and posttest questions no 4 SN *T*

Figure 4 can explain that when the SNT Pretest can only identify the problem, the SNT has not been able to create a mathematical model of the question so that the SNT only provides answers without creating a mathematical model but the answer is wrong. Based on Figure 4.4 it can be said that at the pretest SNT has low problem solving abilities. However, the SNT posttest results showed significant changes. SNT experienced an increase during the posttest, namely SNT was able to make a mathematical model. There was an increase in the pattern of SNT answers. During the pretest and posttest on question number 5, the researcher gave interviews to SNT. The results of interviews with SNT on question number 5 can be summarized in table 5 as follows:

Table 5 Interview Results of SNT Subjects in Solving Problem No 4

Perpetrator	Interview snippet
Researcher	Now for question number 4, during the pretest why did you immediately give an answer without including the method?
	Because I am confused to determine the solution model
Subject	When posttest, how do you do and determine the settlement model?
	I read the question before, sir. then i try to identify the problem.
Researcher	Do you have difficulty solving question number 4 ?
Subject	Yes, I'm having trouble
Researcher	What's the difficulty?
Subject	Because after I identified the problem I had difficulty determining the steps to solve it and I was also in a hurry to run out of time so I didn't have time to draw a comprehensive conclusion.

Based on changes in students' answer patterns during the pre-test and post-test and based on the interview excerpts above, after being given treatment using the Realistic Mathematical Education (RME) learning model, the researcher concluded that SNT was able to identify problems, create correct solution models, carry out calculations correctly. However, she/he still can not draw the conclusion yet.

Low Score Students' Problem Solving Ability (SNR)

Based on the indicators of problem solving ability after conducting interviews with SNT, the researcher then conducted interviews on the problem solving ability of students with low scores (SNR). These questions are given based on indicators and answers from question number 1 to question number 4.

a. Results of Answers and SNR subject interviews in solving question no 1

Improved problem-solving abilities can be seen from changes in the pattern of students' answers during the pre-test and post-test. Changes in the pattern of answers can be seen in Figure 5 as below:

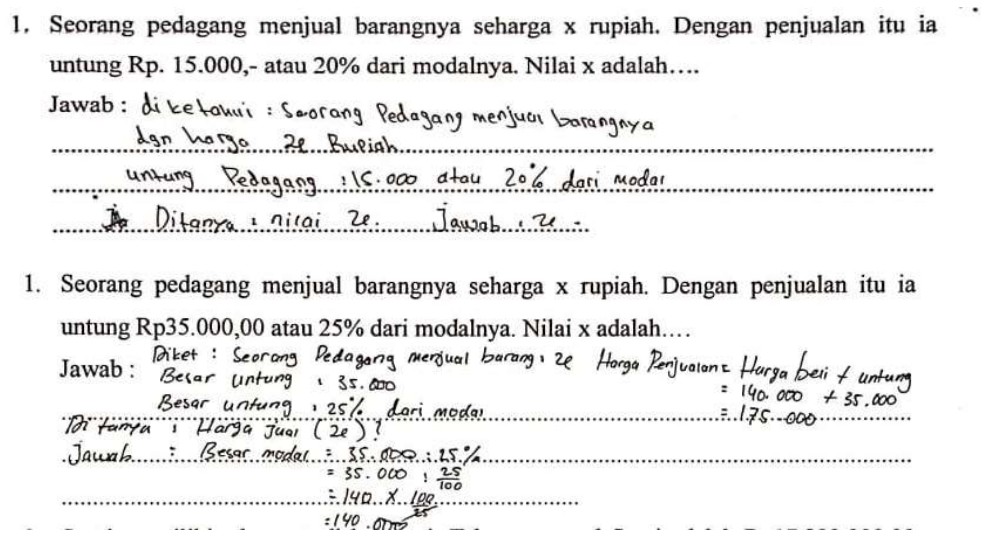


Figure 5. Answers to Pretest and Posttest question number 1 SNR

Based on Figure 5, it can be seen that during the pretest the SNR could only identify problems and could not create a mathematical model to solve the problem. However, when the SNR posttest experienced a significant increase in answers. There was an increase in the answer pattern from SNR, so the researcher then gave an interview to SNR regarding question number 1. The results of the SNR interview on question number 1 can be summarized in table 6 as follows:

Table 6. SN R Subject Interview Results in Solving Problem No. 1

Perpetrator	Interview snippet
Researcher	Why at the pretest you can only identify the problem?
Subject	Because I don't know the formula sir.
Researcher	During the post test What was the first step you took to work on question no 1?
Subject	I identified the problem first sir
Researcher	How do you determine the purchase price first and how do you determine the selling price?
Subject	I tried to remember the formula and then I started working on it
Researcher	Why is there no conclusion in your answer?
Subject	Because I feel nervous and forget that writing a problem-solving model in mathematics must be accompanied by a conclusion.

The treatment of learning by using the Realistic Mathematics Education (RME) learning model makes students experience an increase in problem solving abilities. This can be observed based on changes in the pattern of students' answers during the pretest and posttest. Based on the changes in the pattern of student answers and the results of the interviews, it can be concluded that the SNR has been able to identify the problem well, create a settlement model, carry out calculations correctly but has not been able to draw the right conclusions.

b. Results of Answers and SNR subject interviews in solving question no 2

Improved problem-solving abilities can be seen from changes in the pattern of students' answers during the pre-test and post-test. The change in answer pattern can be seen in Figure 6 as below:

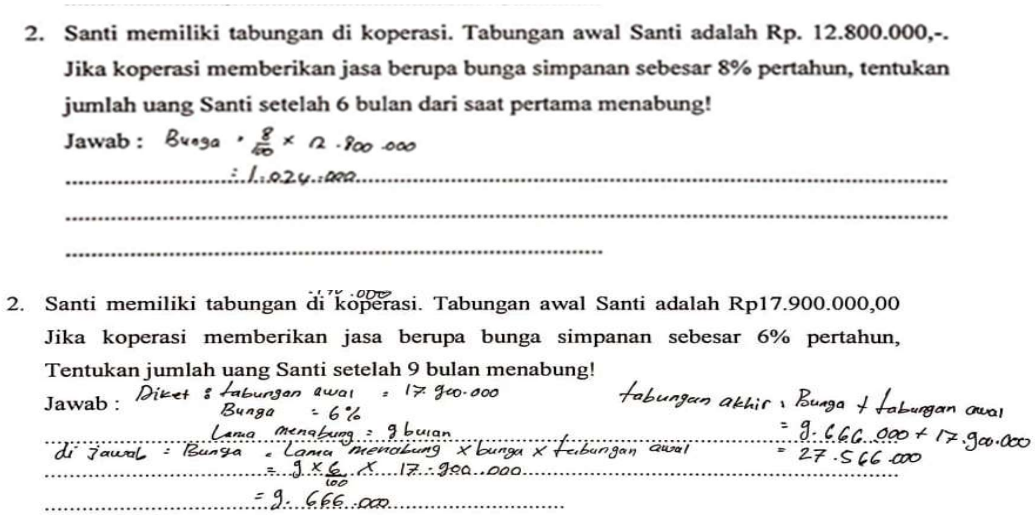


Figure 6. Answers to Pretest and Posttest questions no 2 SNR

Based on Figure 6 it is observed that question number 2 when the SNR pretest has not been able to solve the problem at all. This can be seen from SNR's answer, which has not been able to identify the problem, has not been able to create a mathematical model, so SNR only provides answers without creating a mathematical model. Problem number 2 shows that SNR has not been able to take steps to solve the problem. However, the increase in SNR answers occurred during the posttest. It can be seen that the SNR has been able to identify problems. The next step, after seeing the increase in answers from SNR, was that the

researcher gave an interview to SNR on question number 2. The results of the interview can be summarized in table 7 as follows:

Table 7. SNR Subject Interview Results in Solving Problem No 2

Perpetrator	Interview snippet
Researcher	Now for question number 2, during the pretest why didn't you identify the problem first?
Subject	Because I was confused and forgot the formula sir.
Researcher	Furthermore, during the posttest, how do you plan to solve the problem?
Subject	Just like question number 1, sir, I identified the problem from the question by writing down the answers, known to be asked and answered
Researcher	After planning to solve the problem, what kind of steps did you make to solve the problem?
Subject	After I know the plan that I will use to solve the problem, then I remember the formula and the next step I create a model or formula for solving the problem
Researcher	Do you have difficulty solving problem number 2?
Subject	I'm having a little trouble, sir.
Researcher	Where does the difficulty lie?
Subject	I needed a long time to understand the problem and determine the solution model so I was in a hurry until I couldn't conclude the answer.

Based on table 7 it can be observed that the SNR has increased in problem solving abilities and based on the interview table 7, the researcher can conclude that after being given treatment using the Realistic Mathematics Education (RME) learning model the SNR has increased where the SNR has been able to identify problems well, make a settlement model, but do the wrong calculations and have not been able to draw the right conclusions.

c. Results of Answers and SNR subject interviews in solving question no 3

Improved problem-solving abilities can be seen from changes in the pattern of students' answers between the pre-test and post-test. Changes in the pattern of answers can be seen in Figure 7 as below:

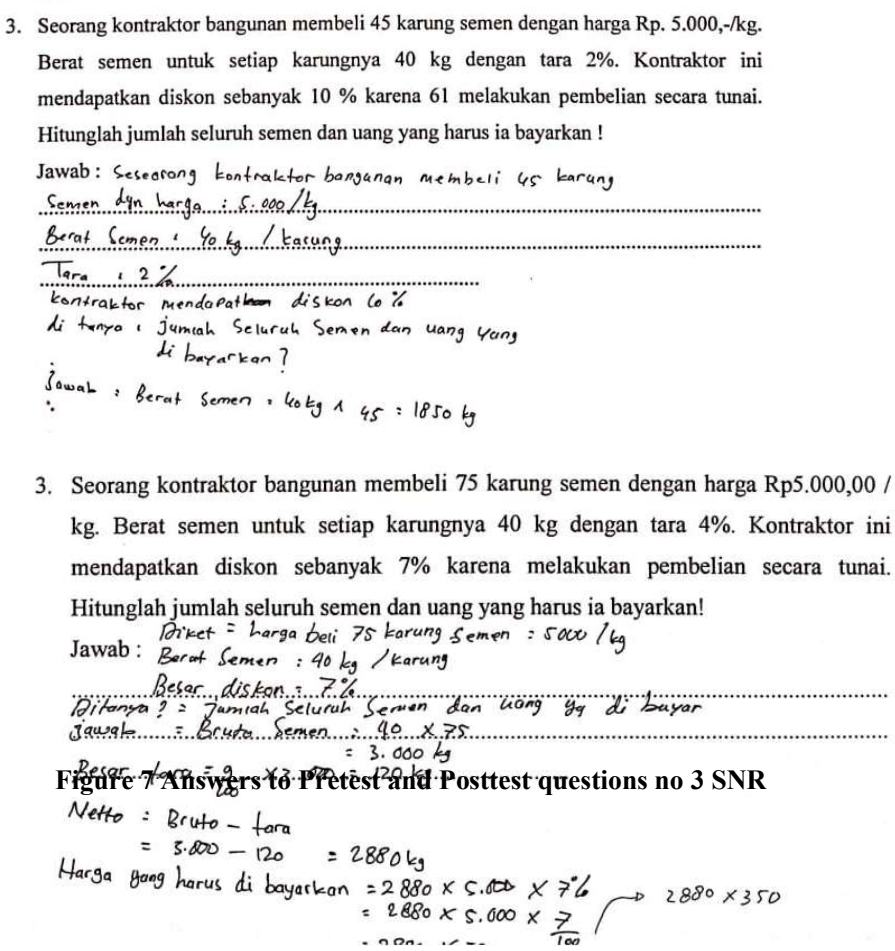


Figure 7 Answers to Pretest and Posttest questions no 3 SNR

Based on Figure 7, during the pretest, SNR was able to identify the problem well, but SNR was not able to create a mathematical model correctly. SNR tries to find the total weight of cement but the SNR calculation results are still wrong. The increase in SNR answers can be seen in the posttest results, SNR has been able to create a mathematical model even though it has not been able to find the final answer results. The next step, the researcher gave an interview to SNR related to question number 3. The results of the interview are summarized in table 8 as follows:

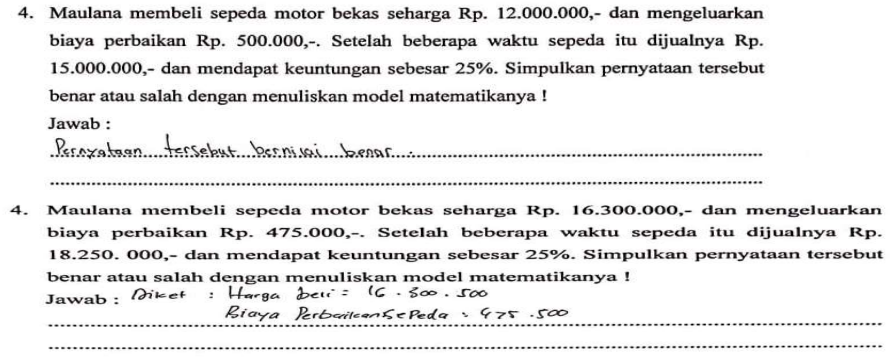
Table 8. SNR Subject Interview Results in Solving Question No. 3

Perpetrator	Interview excerpt
Researcher	Are you having difficulty determining a plan to solve the problem?
Subject	Yes sir, I'm having trouble
Researcher	Where does the difficulty lie?
Subject	I had difficulty creating a solution model because I forgot the formula a little
Researcher	Why do you only make part of the mathematical model in your answer?
Subject	Because at that time I was confused about what to calculate so I stopped working and continued with question number 4

Based on changes in the pattern of SNR answers between pretest and posttest as well as from the results of interviews, the researcher concluded that after being given treatment using the Realistic Mathematical Education (RME) learning model, SNR's problem solving ability had increased, where SNR was able to identify problems well and create a solution model. However, the SNR has not yet included the final results and the SNR has not provided a conclusion.

d. Results of Answers and SNR subject interviews in solving question no 4.

Improved problem-solving abilities can be seen from changes in the pattern of students' answers between the pre-test and post-test. Changes in the pattern of these answers can be seen in Figure 8 as below:


4. Maulana membeli sepeda motor bekas seharga Rp. 12.000.000,- dan mengeluarkan biaya perbaikan Rp. 500.000,-. Setelah beberapa waktu sepeda itu dijualnya Rp. 15.000.000,- dan mendapat keuntungan sebesar 25%. Simpulkan pernyataan tersebut benar atau salah dengan menuliskan model matematikanya !

Jawab :

Pernyataan tersebut bernilai benar

4. Maulana membeli sepeda motor bekas seharga Rp. 16.300.000,- dan mengeluarkan biaya perbaikan Rp. 475.000,-. Setelah beberapa waktu sepeda itu dijualnya Rp. 18.250. 000,- dan mendapat keuntungan sebesar 25%. Simpulkan pernyataan tersebut benar atau salah dengan menuliskan model matematikanya !

Jawab : Diket : Harga beli = 16 . 800 . 500

Biaya Perbaikan Sepeda = 475 .500

Figure 8 Answers to pretest question no 4 SNR

Based on Figure 8 it can be interpreted that the SNR has not been able to understand the intent of the problem, this is clearly seen when the SNR cannot identify the problem and the SNR only gives original answers without including the mathematical model. However, when the SNR posttest experienced an increase in answers where the SNR had begun to be able to identify problems. it can be said that the SNR experienced a significant increase in answer changes between the pretest and posttest. The researcher gave interviews to SNR regarding question number 4 because there was an increase in SNR answers between the pretest and posttest. The results of the interview about number 3 to the SNR can be summarized in table 9 as follows:

Table 9. SN R Subject Interview Results in Solving Question No 4

Perpetrator	Interview snippet
Researcher	Now question number 4, Do you have difficulty summarizing problems?
Subject	Yes sir, I'm having trouble
Researcher	Where does the difficulty lie?
Subject	It took me quite a long time to understand the problem and identify the problem.
Researcher	However, can you determine a model for solving the problem?
Subject	I can't do it yet, sir, I just identify the problem and the time to work on the problem has run out.

Based on Figure 8, it can be observed that students' answers have increased and based on the interview results in Table 9, the researcher can conclude that after being given treatment using the Realistic Mathematical Education (RME) learning model, SNR has experienced an increase in problem solving abilities, where SNR has been able to identify problems. well, even though SNR has not been able to model problem solving correctly, and SNR has not been able to draw conclusions.

Descriptive Statistical Data Analysis

Descriptive statistical analysis is statistics used in analyzing data by describing or describing the data that has been collected. Descriptive statistics are statistics used in describing data into clearer and easier-to-understand information which provides an overview of research in the form of relation and independent variables proxied by the Realistic Mathematical Education (RME) model and problem-solving skills.

1. Normality Test

The results of descriptive statistical analysis research can be seen in table 10 as follows:

Table 10 Descriptive Statistics v

Tests of Normality				
		Shapiro-Wilk		
	Class	Statistics	df	Sig.
Assess Problem Solving Ability	Experiment Class Pretest	,936	31	,064
	Experimental Class Posttest	,937	31	,067

Table 10 above uses calculations with the SPSS version 26 statistical program using the *Shapiro-Wilk normality* test. It is known that the significance value in the normality test is 0.064 for students' initial problem solving abilities and 0.067 for final problem solving abilities. Both data have higher significance values. greater than 0.05, so that $H\sigma$H is accepted and αrejected and it can be concluded that the two data are normally distributed.

Table 11. Capital Summary

Summary Model [b]				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,913 [a]	,834	,831	11.21223

a. Predictors: (Constant), Class

b. Dependent Variable: Problem Solving Ability Value

The results of the summary model aim to determine the relationship between two or more variables in the regression equation. The results of the relationship between the two variables can be seen in the value of R Square. The basis for making R Square decisions is that if the R Square value is more than 50% then the two variables have a good relationship and if the R Square value is less than 50% then the two variables have a poor relation. From table 4.20 above, it can be seen from the R Square results above that it is 0.834 or 83.4% and this value means that the influence of the RME model on problem solving abilities is 83.4% and the remaining 16.6% is influenced by other external variables. RME learning model. Because the result of R Square is 83.4% > 50%, it can be concluded that the two variables have a good relation.

2. T test

T able 12. T Test Results

Coefficients [a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-20,565	4,503		-4,567	,000
	Class	49,395	2,848	,913	17,344	,000

Constant number of unstandardized coefficients, in this model the value is -20.565. This number is a constant number which means that if there is no RME model (X) then the value of problem solving ability (Y) is -20.565. The regression coefficient figure is 49.395 this means that every increment of 1% levels the model RME (X), then the ability to solve problems (Y) will increase by 49.395. Because the regression coefficient value is positive (+), it can be said that the Treffinger model (X) has a positive effect on problem solving abilities (Y). Thus, the regression equation is Y = -20.565 + 49.395 (X). The hypothesis in this study is formulated as follows:

H_0= The Realistic Mathematical Education (RME) approach to learning mathematics cannot improve students' mathematical problem solving abilities.

H_a=The Realistic Mathematical Education (RME) approach to learning mathematics can improve students' mathematical problem solving abilities.

If the significant value (Sig) is less than 0.05, it means that it $H_0$is rejected or $H_a$accepted, so it can be concluded that the Realistic Mathematic Education (RME) approach to mathematics learning can improve students' mathematical problem solving abilities. On the other hand, if the significant value (Sig) is greater than 0.05, it means that it $H_0$is accepted and $H_a$rejected, so it can be concluded that the Realistic Mathematic Education (RME) approach to mathematics learning cannot improve students' mathematical problem solving abilities.

Based on table 12 it is known that the significant value is 0.000 <0.05 so H_0it is rejected and $H_a$accepted and it can be concluded that the Realistic Mathematical Education (RME) approach to learning mathematics can improve students' mathematical problem solving abilities.

Data Analysis for Increasing Students' Problem Solving Abilities Using the RME Learning Model

This test aims to find out how much the students' problem-solving abilities have increased using the RME learning model. This test was carried out using the SPSS version 26 statistical program by looking for the N-Gain Score. The category of score gain or the effect of increasing the N-Gain score can be seen in Table 13 as follows:

Table 13. N-Gain

N-Gain Value	Category
$g \geq 0.7$	Tall
$0.3 \leq g < 0.7$	Currently
$g < 0.3$	Low

The data obtained from the experimental class were then tested for the gain score and the average gain score was obtained which can be seen in table 14 below:

Table 14. Average N-Gain

Experimental Class	
Average N-Gain	0.7066
At a minimum	0.50
Maximum	0.88

Based on the results of the N-Gain test, it can be observed that the average N-Gain in the experimental class is 0.7066 and if it is rounded up it becomes 0.71 > 0.70, which means that the RME learning model has a high influence on students' mathematical problem solving abilities.

RME approach on social arithmetic material, students can carry out the learning steps properly so they can get the expected learning outcomes. Learning steps using the RME approach according to Gravemeijer (1994) are

1) Understanding contextual issues
2) Solve Contextual problems
3) Compare and discuss answers
4) Draw a conclusion

The advantages of learning with the RME approach increase students' interest in learning mathematics so that it can also improve students' problem-solving abilities. As stated by Nurfadilah et al. (2021), namely the advantages possessed by the RME learning model such as being based on real conditions, is able to motivate students to study harder because they feel that learning mathematics is useful. Furthermore, Saprizal (2018) & Mulyati (2017) in their research stated that abstract mathematical concepts are more easily digested by students based on learning media in their surroundings. The participants' interest in learning mathematics increased to utilize mathematical theories to solve math problems given by the teacher. Even students also get other impacts in the form of increasing confidence in their mathematical abilities (Susanti, 2017). This study also provides different problems for each group but with the same level of difficulty. The answers given by students indicate that they can carry out the

learning steps using the RME approach well so that the results of the answers given by students between before and after being given the learning treatment with the RME approach experience a significant increase. The increase was experienced by all students, both students with high scores and students with low scores.

Learning activities using the RME approach require students to really understand the contextual problems given by researchers. So that learning activities that were originally teacher-centered will change to student-centered. Learning activities like this can improve students' ability to solve problems or what we often call students' problem solving abilities.

CONCLUSION

(Realistic Mathematic Education) approach can improve students' mathematical problem solving abilities in the high level category. There is a positive influence on students' problem solving abilities. Increased problem solving ability scores for students at SMPN 1 Sukosewu from initial data. The score for one of the students on the pretest was 56.25. then at posttest it increased to 93.75. The results of the hypothesis analysis of the problem solving abilities of SMPN 1 Sukosewu students using the RME model obtained a sig value of 0.000 < 0.05. This shows that there is a significant difference in the problem solving abilities of classroom students after and before being treated with the RME learning model. Based on the results of the gain in the average score of critical thinking ability of experimental class students, namely 0.7066 and the change in answer patterns between before and after being treated with the RME learning model, it can be concluded that the RME learning model improves students' mathematical problem solving abilities in the "High" category ”.

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