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Mathematical Understanding and Self Confidence of Elementary School with Realistic Mathematics Education Model

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Abstract

Mathematical understanding is one of the important goals in learning. Students are not just memorizing but are expected to understand the concept of the subject matter itself. In developing mathematical abilities, especially mathematical understanding, students must have self-confidence in their abilities to avoid anxiety and doubt. This study aims to determine the effect of the Realistic Mathematics Education model on the mathematical understanding and self-confidence of fourth grade students. This study uses a combination method (Mixed Method) Concurrent Embedded design. The results showed that there was an effect of the Realistic Mathematics Education learning model on the mathematical understanding and self-confidence of the students who were shown to have successfully completed the mathematical understanding of 25 out of 30 students. Meanwhile, students who got individual scores 70 or 83.33% of the proportion who achieved the above mastery at least were 75% classically. The average mathematical understanding using Realistic Mathematics Education learning model with an average result percentage of 82.00%. Students' self-confidence influences mathematical understanding by 43.5% and 56.5% is influenced by other factors. Based on the results of the study, it can be concluded that the Realistic Mathematics Education model has a strong influence on students' mathematical understanding and self-confidence in elementary schools.

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INTRODUCTION

Education is a process of changing one's behavior and abilities to progress and improvement. Education can change a person's mindset to always innovate and improve in all aspects of life towards self-quality. In formal education, the implementation of education cannot be separated from the educational goals to be achieved due to its function as a benchmark for the success of education. The goals of national education are adjusted to the demands of the development and development of the Indonesian nation so that the goals of education are dynamic (Widodo, 2013).

The functions and objectives of education are summarized in chapter 2, article 3 of Law No. 20 of 2003 on the national education system that National Education serves to develop and shape the character and civilization of the nation in order to enlighten the life of the nation, aims to develop the potential of learners to become human beings who believe and fear God Almighty, virtuous, healthy, knowledgeable, talkative, creative, independent and become democratic and responsible citizens.

National Education which is based on Pancasila and the 1945 Constitution aims to educate the nation and eradicate all kinds of ignorance of the Indonesian nation. Education is a process to develop all aspects of the human personality which includes knowledge, values, attitudes, and skills. One of the sciences that is part of improving education is mathematics. According to Amir (2014) mathematics learning is process of providing learning experiences to students through a series of planned activities so that students gain knowledge about the mathematics being studied, are intelligent, skilled, and able to understand well. In addition, in learning practice, consider the appropriate curriculum and need to take the right approach (Shannon, 2021).

In mathematics learning there are abstract concepts that are difficult for students to understand, it is necessary to apply learning that can make abstract concepts into something more concrete so that students can understand (Jäder et al., 2020). Learning mathematics is an important lesson, but its implementation still faces various challenges and problems. Ningsih (2013) stated that the main problem that is often faced in mathematics is the low ability of students' mathematical understanding.

The ability to understand mathematics is one of the important goals in learning (Astuti, 2018). Mathematical understanding can also be said to be the ability of students to master several subject matters, where students not only know or remember a concept being studied, but students are able to re-express and apply it in other forms that are easy to understand according to their abilities. This provides an understanding that the material taught to students is not only memorized, but it is hoped that students can better understand the meaning of the concept of the subject matter itself. Mathematics is meaningless if it is only memorized, but with understanding students can better understand the concept of the subject matter itself (Alam, 2012).

In line with that Sutisna & Subarjah (2016) states the ability to understand mathematics is one of the important goals in learning, providing an understanding that the materials taught to students are not only memorized, but more than that with understanding students can better understand the concept of material the lesson itself. Purnamasari & Herman (2016) also stated that the ability to understand mathematics is an important basis for thinking in solving mathematical problems or everyday problems. Students who can understand mathematical concepts well will find it easier to apply them in various life problems.

Understanding ability is needed to master teaching materials that contain many formulas so that students can understand the concepts in the material as a whole and skillfully use various procedures in it in a flexible, accurate, efficient and precise manner.

There are several factors that cause low mathematical understanding of students, namely, lack of focus of students when following the learning process, resulting in students not

understanding the material presented by the teacher. According to Sarwoedi et al. (2018) students who have less ability to understand a math problem will get low learning achievement. To overcome mathematical understanding in students, teachers are expected to be able to make innovations and apply appropriate strategies. During the learning process when students still have material that has not been understood, students can ask the teacher so that students will better understand the material presented (Putra et al., 2018). During the learning process, students who have low mathematical understanding are less active and only listen to the explanation of the material without daring to ask the teacher.

Based on the results of interviews with fourth grade teachers at SD Negeri 04 Serang, it was found that most students stated that mathematics was considered difficult and boring because they could not directly practice the material taught by the teacher. In addition, the process of learning mathematics cannot be understood only by reading the material or listening to the explanation from the teacher alone, it must be accompanied by practice questions in accordance with the nature of abstract mathematics. Studying mathematics requires the right way of learning so that mathematics can be studied well by students so that the learning achieved is in accordance with what is expected (Santoso, 2017).

In addition to the ability to understand mathematics, there is an affective aspect that also provides an understanding of student success, namely self-confidence. In developing mathematical abilities, especially the ability to understand mathematics, that self-confidence must be instilled and developed in students from an early age so that they are able to when faced with any problem they will face (Rosidin et al., 2019).

Furthermore, self-confidence will also provide motivation for achieving one's success in solving the problems at hand. So that the higher one's self-confidence in one's own abilities, the stronger the spirit to complete the work. This attitude can be interpreted as a person's fighting power in solving the problems at hand (Hidayat, 2017).

As stated Lesmana et al. (2018) self-confidence is an attitude of believing in one's own abilities and every individual must have been instilled and trained from an early age. Students who have self-confidence can optimize their abilities. Mathematics as one of the subjects considered difficult by students can be a means to build student confidence (Andayani & Amir, 2019).

So that a student to have good self-confidence, the teacher must arrange a lesson with an atmosphere that is rich in interaction between students and students, or students and teachers through class discussions. Self-confidence can be developed through social interaction, where students are required to actively participate in exploring and discovering their own knowledge.

Self-confidence can be developed through social interaction, where students are required to participate actively and calmly in exploring, discovering their own knowledge. Indriani et al. (2019) revealed that self-confidence is a calm attitude of students that has a positive impact on every activity they do, and students do it without hesitation. In addition, self-confidence can also be developed by conducting rational and realistic learning in the classroom, this is in line with the Realistic Mathematics Education learning model.

In Realistic Mathematics Education, the learning carried out starts from discussing examples, as has been carried out in schools, but these things were discovered by themselves through the context that the teacher gave (Jarmita & Hazami, 2013). Realistic Mathematics Education (RME) model is mathematics learning that utilizes student activities in reality and their environment to transform problems in their daily lives into symbols and mathematical problem solving models (Sutisna & Subarjah, 2016).

The use of Realistic Mathematics Education learning is an alternative learning that requires students to construct knowledge with their own abilities through the activities they do

in learning activities (Susilowati, 2018). Students are given the opportunity to find ideas so that they can solve a mathematical problem.

Realistic Mathematics Education is one of the models in learning mathematics. According to Delina et al. (2018) Realistic Mathematics Education is mathematics education that implemented by placing students' reality and experience as the starting point of learning. Realistic problems are used as a source of emergence of mathematical concepts or formal mathematical knowledge. Realistic mathematics learning in the classroom is oriented to the characteristics of Realistic Mathematics Education, so that students could rediscover mathematical concepts or formal mathematical knowledge. Furthermore, students are given the opportunity to apply mathematical concepts to solve everyday problems or problems in other fields.

The Realistic Mathematics Education learning model has 5 characteristics as described Isrok'atun & Rosmala (2018) including: (1) context in learning; (2) using models to support learning; (3) involve students to be active; (4) there is a learning relationship. While the steps of Realistic Mathematics Education consist of; (1) understanding contextual; (2) solving contextual problems; (3) compare and discuss answers; (4) draw conclusions.

Realistic Mathematics Education model learning can change abstract subject matter into real concepts. As stated Pakarti et al. (2016) that the Realistic Mathematics Education learning model relies on the reality in everyday life so that abstract teaching materials are more concreted by the teacher and then connected to students' daily experiences, so that students can better understand the material presented. Thus the Realistic Mathematics Education model is one model that is suitable for use in elementary schools (Mirza et al., 2019).

Learning with Realistic Mathematics Education is carried out starting from the discussion of examples, as has been implemented in schools. However, he found these things himself through the context that the teacher gave. In learning students are actively involved in the learning process, so that the classroom atmosphere becomes more pleasant. Because student activity both physically and mentally is a good interaction during learning.

The teacher's ability to make the learning process using Realistic Mathematics Education and the use of textbooks run well because it is more effective and in accordance with the objectives. In addition Silvia et al. (2020) explained that the Realistic Mathematics Education model learning is associated with contextual problems so that it can help students to find concepts and principles from the topic of the material being studied. Then, students will be actively involved in the learning process and be able to state the problems given in the form of mathematical language. Realistic Mathematics Education can facilitate students in improving their mathematical understanding skills and being more active in learning.

Realistic Mathematics Education learning model emphasizes more on the use of objects or events that come from the environment of students' lives, so that students can play an active role in digging up information to solve problems that exist in this case math problems. Artika et al. (2019) showed that as long as the Realistic Mathematics Education model was implemented, students were very enthusiastic in participating in learning, students were more active, reactive, and had a high curiosity, because it related to the students' daily lives.

The purpose of this study is to determine the effect of Realistic Mathematics Education learning model on mathematical understanding and self-confidence of fourth grade students of SD Negeri 04 Serang.

METHOD

This study uses combination research (Mixed Method). The combination research model used in this study is a combination of Concurrent Embedded design. The population in this study were all fourth-grade students at SD Dabin 1 KWK, Petarukan District, Pemalang Regency with a total of 408 students. Sampling using Simple Random Sampling technique. The

sample in this study was the fourth-grade students of SDN 04 Serang as the experimental class as many as 30 students and the fourth-grade students of SDN 03 Serang as the control class as many as 25 students. The research design is shown in Figure 1

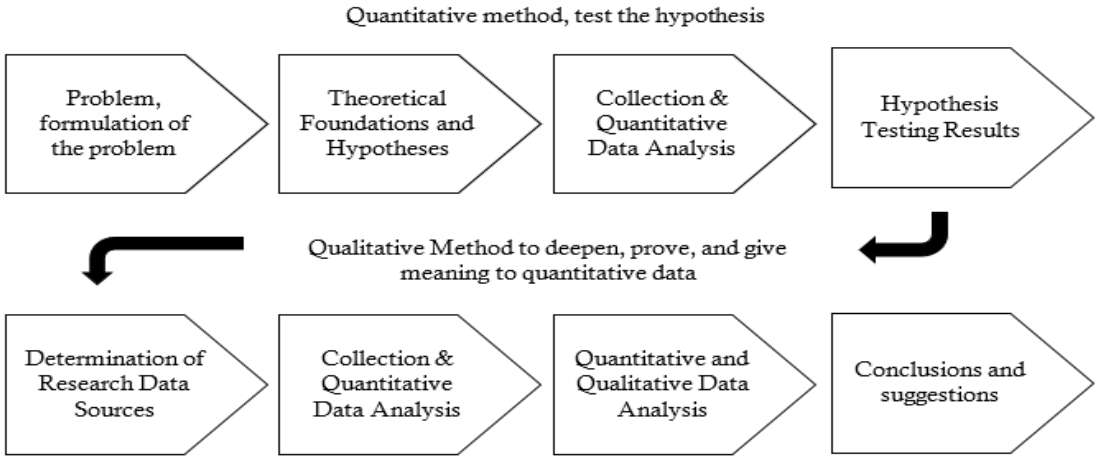

Figure 1. Research Design

In the Figure 1, the steps in this study use the concurrent embedded design method in obtaining quantitative data, first by giving a pretest question. The teacher delivers direct and virtual learning materials, then students practice measuring objects in the form of flat shapes. After that students are given posttest questions and students worked on posttest questions, then students worked on the questionnaire that has been provided. Meanwhile, for the analysis of qualitative data collected from students who meet the criteria include 2 students with high scores, 2 students with moderate scores and 2 students with low scores given interview questions based on the student's self confidence indicators that have been determined. The self-confidence indicators used in this study are (1) confident in their abilities; (2) act independently in making decisions; (3) Always optimistic, calm, and never give up; (4) Always be positive in various situations.

The indicators of mathematical understanding are measure using pretest and posttest questions, and self-confidence are measure using questionnaires and interviews.

RESULTS AND DISCUSSION

The magnitude of the effect of using the Realistic Mathematics Education learning model can be known more clearly and accurately because it compares the state of using the Realistic Mathematics Education learning model with the Direct Instruction learning model after being given treatment. The learning control class uses the Direct Instruction model, while the learning experiment class uses the Realistic Mathematics Education model. The research data analyzed were in the form of mathematical understanding ability and Self Confidence using the Realistic Mathematics Education model for elementary school students.

To find out the average mathematical understanding of students, the data on the value of mathematical understanding was tested using the one-way ANOVA test. Based on the results of the analysis of the fourth-grade students' mathematical understanding test at SD Negeri 04 Serang which was used to determine the average mathematical understanding. The results of the research on students' mathematical understanding can be seen in Table 1.

Table 1. The Average Test of Understanding Mathematical

	Sum of Squares	Df	Mean Square	F	Sig.
Between Gruops	2492.596	1	2492.596	23.282	.000
Within Groups	5674.240	53	107.061		
Total	8166.836	54			

The results of the data in Table 1 state that there is a difference in the average increase in students' mathematical understanding. Based on the output above, the significance probability value is 0.000. Therefore, the significance probability value is 0.000 <0.05, which means that the average mathematical understanding of students with the Realistic Mathematics Education learning model is better than using the Direct Instruction learning model.

According to Ding et al. (2020) states that in the field of mathematics education it is possible for a teacher to identify success by using work examples, representations, and informative in-depth questions to better support student development. think mathematically as a whole. In understanding mathematics, students show that the average value of mathematical understanding is better than the results before treatment (Sachdeva & Eggen, 2021).

Based on the analysis of students' mathematical understanding tests seen from the results of students' posttest scores, the results of the calculations can be seen in Table 2.

Table 2. Final Test

	Test Value = 70					
	t	Df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Mathematical Understanding	5.959	29	.000	12.000	7.88	16.12

Learning with the Realistic Mathematics Education model succeeded in completing the understanding of mathematics as many as 25 students from 30 students who got an individual score of 70 or 83.33% of the proportion of students who achieved a minimum mastery of 75% classically.

Based on the questionnaire analysis to find out the average self-confidence of students after finishing learning with a questionnaire of 20 statements, a maximum score of 4 in each statement. The results of the questionnaire calculation can be seen in Table 3.

Table 3. The Test of Average self-confidence

	Sum of Squares	df	Mean Square	F	Sig.
Between Gruops	449.546	1	449.546	5.246	.026
Within Groups	4541.760	53	85.694		
Total	4991.307	54			

The results of the data in Table 3 show that there is a difference in the average increase in students' self-confidence. Based on the output above, the significance probability value is 0.026. Therefore, the significance probability value is 0.026 <0.05, which means that the average self-confidence of students using the Realistic Mathematics Education learning model is better than using the direct instruction learning model.

Based on research according to Lintang et al. (2017) he stated that the implementation of

using Problem Based Learning (PBL) learning tools was effective to improve problem solving abilities and self-confidence in solving problems during learning both individually and in groups, so that it could lead students to think. Meanwhile (Ulusoy & Incikabi, 2020) revealed that the use of textbooks in learning mathematics can improve understanding, because textbooks involve real-life problems that make students think critically and students can solve problems independently.

The results of the study Jananti & Tarmudji (2014) he revealed that partially self-confidence has an influence on students' economic learning outcomes, the higher students' self-confidence, the better students' economic learning outcomes. Self-confidence can foster the courage to ask if there is subject matter that has not been understood by students.

In line with research according to Amri (2018) he stated that the effect of self-confidence on student achievement is in the good category, because students who have high self-confidence will be motivated to learn. In the opinion of Januarsi et al. (2021) states that learning using the Problem Based Learning model is proven to be effective in improving student learning outcomes and self-confidence compared to using the Think Pair Share learning model.

Based on the analysis of the effect of students' self-confidence on students' mathematical understanding, the data obtained were tested using a simple linear regression test. The results of the calculation of the simple linear regression test are presented in Table 4.

Table 4. Simple Linear Regression Test

Model RME	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	29.918	11.323		2.642	.013
Self Confidence	.720	.155	.660	4.643	.000

Based on the results presented in Table 4, the results of students' self-confidence have a significant effect on students' mathematical understanding.

The magnitude of the influence of students' self-confidence in using the Realistic Mathematics Education learning model is 43.5% while 56.5% is influenced by other factors, due to experiencing limitations in learning. Thus, there is a 43.5% effect of self-confidence using the Realistic Mathematics Education learning model on the mathematical understanding of fourth-grade students at SD Negeri 04 Serang.

Overall students' understanding of mathematical has increased from the pretest and posttest results. Increased students' mathematical understanding can also be seen in classical completeness. Increased understanding of students' mathematical can also be seen per-indicator, in this study the understanding of concepts taken consists of 4 indicators, namely; (1) Define the concept in writing; (2) Give examples of problems and change the form of representation; (3) Identifying problems and determining the outcome of a problem; (4) Concluding from the results of a problem.

The following is an analysis of mathematical understanding abilities with high, moderate, and low self-confidence. In Figure 1, it is stated that students have mathematical understanding with high self-confidence, the questions answered correctly meet the requirements on the indicators, student E-08 write down what information they know and are asked on the questions, student E-08 writes the formula for the perimeter of a triangle and enters what is known into the formula. After all that is known is entered into the formula, student E-08 calculate and answer the question. In addition, student E-08 also make conclusions on the results of the answers.

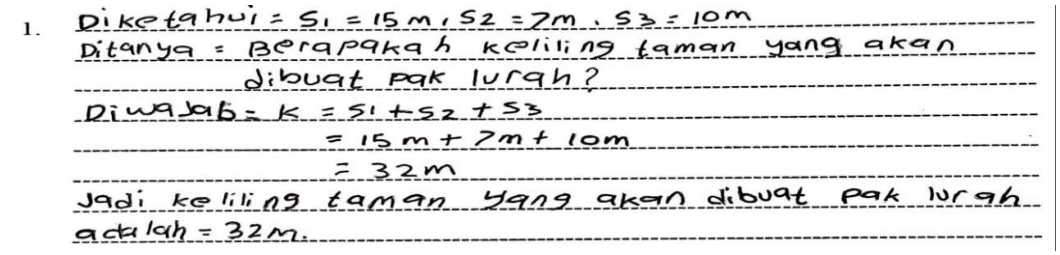

Figure 2. Student E-08 result

In the Figure 2, indicator defining the concept, student E-08 can write down what is known and what is asked in the complete question. In the indicator of the problem and changing the form of representation, student E-08 can convert a known information into a mathematical formula correctly. In the indicator of identifying problems and determining the results of a problem, student E-08 can use the steps that are in accordance with the instructions on the questions to solve problems and determine the results of the problems that exist in the questions. In the indicator concludes from the results of a problem, student E-08 can conclude the results obtained from the problems that have been solved. Based on the results of the analysis, it is concluded that students with high self-confidence can master 4 indicators of mathematical understanding on the questions.

In Figure 3, it is stated that students have mathematical understanding with high self-confidence, the questions answered correctly meet the requirements on the indicators, student E-09 write down what information is known, write the formula for the circumference of a triangle and enter what is known into the formula. After all that is known is entered into the formula, student E-09 calculate and answer the question and draw conclusions from the answers.

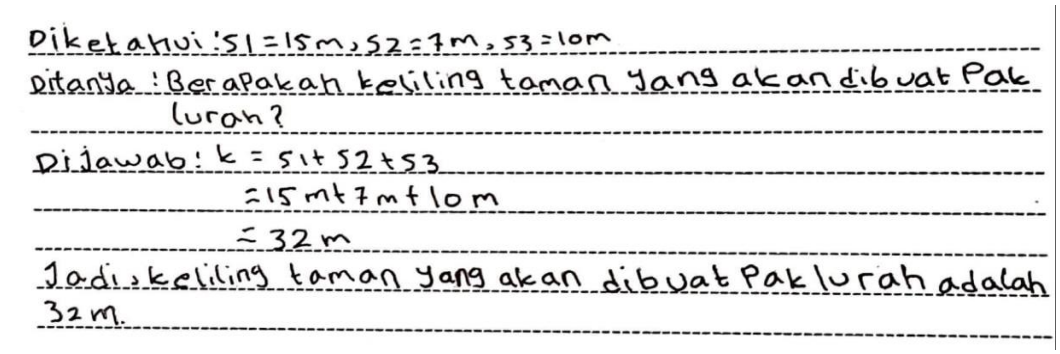

Figure 3. Student E-09 result

In Figure 3, the indicator defines the concept, student E-09 can write down what is known and what was asked in the question correctly. In the indicator of the problem and changing the form of representation, student E-09 can convert a known information into a mathematical formula correctly. In the indicator of identifying problems and determining the results of a problem, student E-09 can use appropriate steps to solve problems and determine the results of the problems that exist in the problem. In the indicator concludes from the results of a problem, student E-09 can conclude the results of the problem. Based on the results of the analysis, it is concluded that students with high self-confidence can master 4 indicators of mathematical understanding and have no difficulty in working on the questions.

In Figure 4, it is stated that students have mathematical understanding with moderate self-confidence, student E-07 can master the indicators of mathematical understanding on questions. However, there are several indicators that have not been met or still need some improvement.

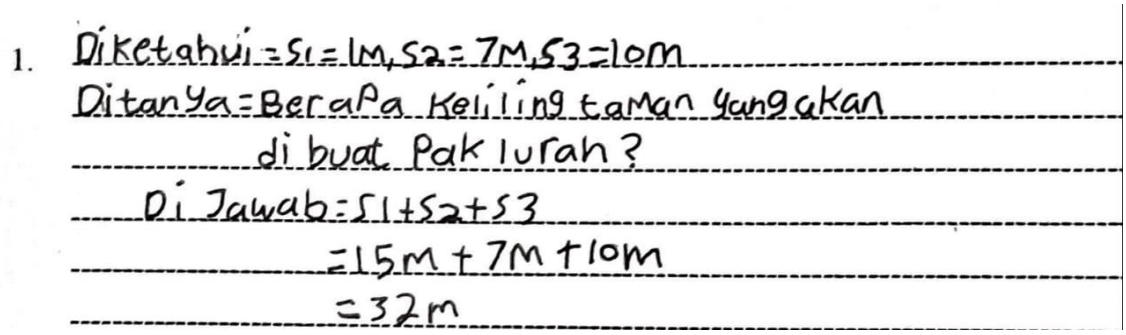

Figure 4. Students E-07 result

In Figure 4, the indicator defines the concept, student E-07 can write down what is known and what is asked in the questions and students are able to find important information contained in the questions and rewrite the information. In the indicator of the problem and changing the form of representation, student E-07 can change the information obtained into a mathematical formula correctly. In the indicator of identifying problems and determining the results of a problem, student E-07 can use appropriate steps to solve problems and determine the results of the problems that exist in the problem. However, there were several questions which showed that student E-07 were still confused because some questions were answered incorrectly. In the indicator concludes from the results of a problem, students E-07 have several questions that are concluded and there are some questions that are not concluded.

In Figure 5, it is stated that students have mathematical understanding with moderate self-confidence, student E-18 can master the indicators of mathematical understanding on the questions but there are some indicators that have not been met.

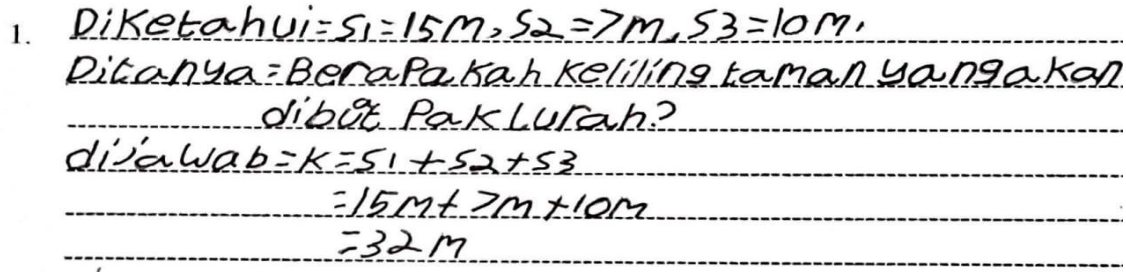

Figure 5. Students E-18 result

In Figure 5, the indicator defines the concept, student E-18 can write down what they know and what is asked in the question. In addition, student E-18 can find information and rewrite the information. In the indicator of the problem and changing the form of representation, student E-18 can convert the information they get into a mathematical formula correctly. In the indicators of identifying problems and determining the outcome of a problem, student E-18 can use appropriate steps to solve problems and determine the outcome of the problem. However, there are some questions that show that there are still some questions that are answered incorrectly for student E-18. In the indicator concludes from the results of a problem, student E-18 have several questions that are concluded and there are some questions that are not concluded.

In Figure 6, it is stated that students have mathematical understanding with low self-confidence, student E-12 write down what they know, write down what is asked and write down the formula. But student E-12 could not solve the problem.

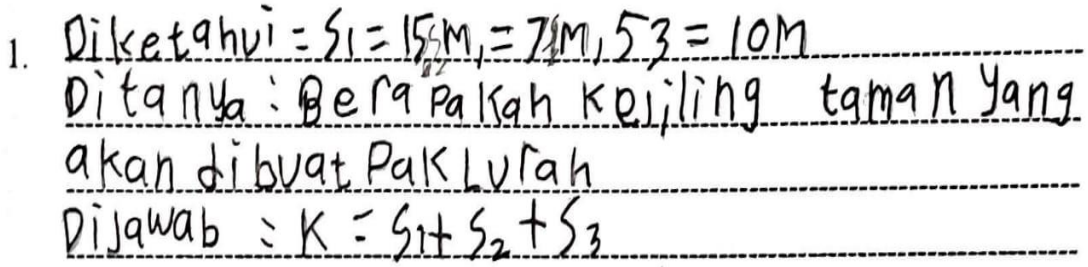

Figure 6. Student E-12 result

In Figure 6, the indicator defines the concept, student E-12 can write down what is known and what was asked in the question correctly. In addition, student E-12 can find information and rewrite the information. In the indicator of the problem and changing the form of representation, student E-12 can change the information obtained into a mathematical formula correctly. In the indicator of identifying problems and determining the results of a problem, student E-12 is still confused in using the steps that are in accordance with the instructions on the questions to solve problems and determine the results of the problems on the questions. In the indicator of concluding from the results of a problem, student E-12 did not provide an answer conclusion.

In Figure 7, it is stated that student have low self-confidence in mathematical understanding, student E-14 write down what they know, write down what is asked, write formulas and student E-14 cannot solve the problem.

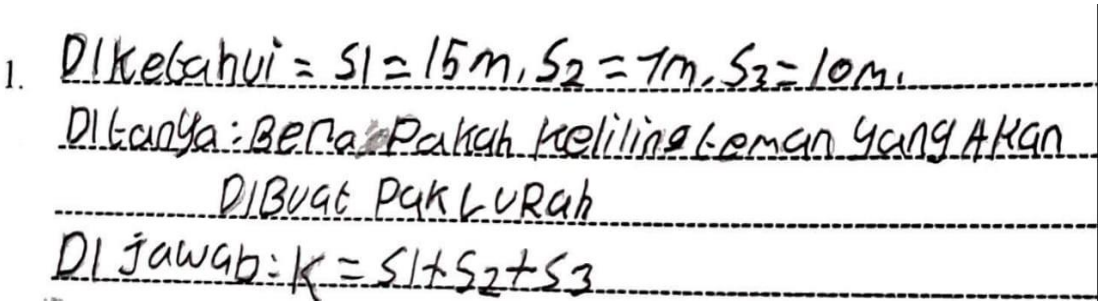

Figure 7. Student E-14 result

In Figure 7, the indicator defines the concept, student E-14 can write down what is known and what was asked in the question correctly. In the indicator of the problem and changing the form of representation, student E-14 can change the information obtained into a mathematical formula correctly. In the indicator of identifying problems and determining the results of a problem, student E-14 are still confused in using the appropriate steps to solve problems and determine the results of the problems in the questions. In the indicator concludes from the results of a problem, student E-14 do not provide a conclusion answer.

The results of the calculation of the percentage of the influence of students' self-confidence can be seen in Table 5.

Table 5. Determination Test

R Square	Adjusted R Square	Std. Error of the Estimate
.435	.415	8.43770

Based on Table 5, it shows that there is a 43.5% effect of self-confidence on the use of the Realistic Mathematics Education learning model on the mathematical understanding of fourth grade students at SD Negeri 04 Serang.

The Realistic Mathematics Education learning model influences increasing students' mathematical understanding, this can be seen from the results of the posttest scores which have increased from the pretest scores. In learning, students are enthusiastic when practicing directly what is in the problem. Research by Ardina et al. (2019) states that with the Realistic Mathematics Education learning model students are able to know how to solve problems correctly, besides that students can think critically in working on problems related to everyday problems.

The results of the study according to Mawaddah & Jannah (2016) they stated that the use of the Quantum Teaching learning framework, namely TANDUR, can improve mathematical understanding skills by involving students to actively observe, adjust theory, and try to do it themselves. Likewise, according to Santoso (2017) states that the mathematical understanding obtained through learning using contextual learning models can be further increased because students are able to develop thinking skills to solve problems and find new concepts from a problem.

The students' mathematical understanding ability in the experimental class was better than the control class. This is obtained because with the Realistic Mathematics Education learning model students learn to understand problems, solve problems, discuss answers, and draw conclusions according to the students' own understanding (Astuti, 2018).

Research according to Purwasih (2015) inquiry learning model plays a role in improving mathematical understanding skills, which emphasizes critical and analytical thinking processes to seek and find answers to a problem in question.

Based on some of the research above, it can be concluded that students' mathematical understanding can be better if it is balanced with learning models or learning approaches according to student needs and in accordance with the material presented.

In improving student achievement, it is necessary to have a supportive attitude in the learning process. As stated Yulianto et al. (2020) revealed that in the use of the Role Playing learning model students are more enthusiastic and can increase their confidence in learning. This is evidenced by the students' belief in their abilities which is shown by an optimistic attitude and does not hesitate in doing something.

Previous research by Endramawati (2021) states that the application of the Guided Discovery Learning model can increase self-confidence. Students have the initiative to work on the questions given by the teacher without being appointed by the previous teacher. As stated by Akbari & Sahibzada (2020) that students who have a high level of self-confidence, then these students will be enthusiastic in solving problems or assignments given. Likewise, if students have low self-confidence, students lack or even do not have the enthusiasm to solve the problems given.

Based on the results of research conducted by Reni, et al. (2020) states that there is an effect of learning achievement and self-confidence on students using the SAVI (Somatic, Audiotory, Visual and Intellectual) learning model, after comparing before and after learning activities. The use of Realistic Mathematics Education learning on mixed arithmetic operations in grade IV SD IT Adzkia I Padang can make students' problem-solving skills better. It can be said that Realistic Mathematics Education learning has an influence in improving students' problem solving abilities, especially for fourth grade students at SD IT Adzkia I Padang (Mulyati, 2017). On the student's self-confidence variable, it showed an increase in the results of the questionnaire after the learning was carried out.

CONCLUSION

Based on the value of students' mathematical understanding and the results of students' self-confidence questionnaires, it can be

said that the Realistic Mathematics Education learning model can effectively increase the mathematical understanding and self-confidence of fourth grade students of SD Negeri 04 Serang. This is compared to the achievement of the average mathematical understanding ability with the Realistic Mathematics Education learning model which is better than the average mathematical understanding ability with Direct Instruction learning.

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