Increasing Junior High School Students' Mathematical Comprehension with Realistic Mathematics Education (RME) Approach

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Abstarct. Mathematical understanding is an important basis for thinking when solving mathematical problems. Mathematical understanding is also the basis of thinking in learning mathematics to find out the results of mastery learning. This can be seen in the results of the test scores of students with mathematical understanding abilities that are still below the level of mastery learning, therefore the importance of mathematical understanding abilities is increased by using the Realistic Mathematical Education (RME) learning approach. This study uses mixed methods where the research strategy combines qualitative and quantitative methods simultaneously. The results of the research conducted the average score was still low, namely 62.5% below the average and 37.5% above the average, but after applying the RME learning method, it showed that the average student score increased to 21.9 % below average and 78.1% above average. Based on the results before and after the test, students' mathematical understanding ability increased by 40.6% after applying the RME teaching method, thus proving that RME had a positive effect on increasing mathematical understanding.
Keywords: Mathematical Understanding, Realistic Mathematics Education (RME)

*Abstrak. Pemahaman matematis merupakan dasar berpikir yang penting ketika memecahkan masalah matematika. Pemahaman matematika juga merupakan landasan berpikir dalam pembelajaran matematika untuk mengetahui hasil ketuntasan belajar. Hal ini dapat dilihat pada hasil nilai tes siswa dengan kemampuan pemahaman matematika yang masih di bawah tingkat ketuntasan belajar, maka dari itu pentingnya kemampuan pemahaman matematis ditingkatkan dengan mengunakan pendekatan pembelajaran Realistic Mathematic Education (RME). Penelitian ini menggunakan metode campuran, dimana strategi penelitian menggabungkan metode kualitatif dan kuantitatif secara bersamaan. Hasil penelitian yang dilakukan nilai rata-rata masih rendah yaitu 62,5% di bawah rata-rata dan 37,5% di atas rata-rata, namun setelah menerapkan metode pembelajaran RME, menunjukkan bahwa rata-rata nilai siswa meningkat menjadi 21,9% di bawah rata-rata dan 78,1% di atas rata-rata. Berdasarkan hasil sebelum dan sesudah tes, kemampuan pemahaman matematika siswa meningkat sebesar 40,6% setelah menerapkan metode pengajaran RME, sehingga membuktikan bahwa RME berpengaruh positif terhadap peningkatan pemahaman matematis.
Kata kunci: Pemahaman Matematis, Realistic Mathematics Education (RME)*

INTRODUCTION

Mathematics is an important science in which all students are involved in reasoning processes, form character and mindset, develop attitudes of objectivity, honesty, systematic, critical, innovative and learn how to draw conclusions (Wanti, 2017). The view above can be stated that mathematics plays a very important role in life. Mathematics can determine the personality and the way of student think. The development of mathematics plays an important role as a solution to life's problems and develops thinking skills which are presented systematically to mathematics students (Suandito, 2017). Broadly speaking, mathematics can be stated as the initial foundation of a person's critical thinking as a way of solving problems.

According to NCTM, understanding mathematics is an important skill for everyone (Putra et al., 2018). Understanding mathematics is the ability to restate concepts and be able to use procedures as needed, this is one of the goals of every learning activity. In addition, students are expected to be able to clearly understand what they have learned. Students with good math skills will easily understand math concepts and improve their learning outcomes.

Mathematical understanding as a goal is the ability to understand concepts, identify many independent concepts, and make meaningful calculations about broader situations and problems. According to Sharifah (2017). understanding mathematics is the goal of learning mathematics. Many of mathematical understandings have attracted the attention of researchers and educators. The process of understanding good mathematics is not only memorizing the material taught as a guide in learning, but students must be able to understand every concept that will be applied in solving problems and understanding the procedures that will be carried out.

Research from Putra et al (2018) shows that students forget the concepts of the material being taught, have difficulty of calculating the formulas they use, and lack concentration, so they more focus on solving problems which results in students tending to find it difficult in learning mathematics. The expression from the research above requires a solution to overcome those problems. As for how to

overcome this, we need to design a learning approach, where we need to guide our students to understand mathematical concepts, the procedures to be taken, and how to apply them to solving problems. Associating concepts in problem solving is intended to make it easier for students to understand the concepts and material we teach. Teachers also need to ensure that students understand how they learn. This is because the initial information about learning styles can be used by teachers to identify appropriate learning models or approaches (Jahring and Nasruddin, 2019). It will be easier for the teacher to convey material by understanding how students learn, so that the teacher can adjust the needs of students, so that the material presented is easier for students to accept and understand.

Based on observations at SMPN 1 SUKOSEWU Bojonegoro, on October 13 2021 Mrs. Kh Sri Retno Prasilirum S.S, S.Pd was a class VII mathematics teacher. It was obtained that the ability to understand mathematics in class VII students was relatively low, as seen from students who scored less out of 65, students are still under the completeness of student learning. In addition, it can also be found that most students have difficulty on solving problems, where if given a problem given that is different from the example given before, they will also have difficulty solving it. Most students also could not answer questions about mathematical concepts at the previous meeting related to the material being taught. Based on an interview with Mrs. Sri Retno Prasilirum S.S, S.Pd regarding the problem above, stated that it is true and often occurs in mathematics lessons because students do not read the material, understand the material, so students tend to concentrate more on the examples provided by the teacher.

Creating a student-centered learning process, especially when teaching mathematics, can use an approach that requires students to participate. Approaches that can be chosen include a realistic approach and a contextual approach. Both approaches offer opportunities for students to actively build knowledge, because both are based on the same learning theory, namely constructivism (Hidayat et al., 2020). Where students are encouraged to actively build their knowledge and understanding so that the focus of learning is more on the process rather than on the results.

Both of these methods are student-centered methods, but there are differences between the two, namely the Realistic Mathematics Education approach, which is a realistic mathematics teaching approach where the method of teaching mathematics is a human activity and needs to be related to the real world. Students are also not considered as passive recipients. Teachers here are required to try to take advantage of different situations and opportunities so that students can reinvent ideas and concepts for themselves (Sari and Yuniati, 2018). The second contextual approach, namely Contextual Teaching and Learning (CTL), is the aim of the learning process to help students understand what they are learning by connecting it with daily practice. The concept of this contextual approach aims to make learning outcomes more meaningful for students. In short, the contextual approach emphasizes two skills: (1) the ability to relate learning material to real life and (2) the ability to apply it in real life.

Teaching methods need to be developed to improve students' mathematical understanding. Students may be asked where they can find conceptual references that provide good explanatory definitions. This is to reveal the importance of the RME approach and the student experience as a starting point for learning, where students have the opportunity to develop their own formal mathematical knowledge through real-world problems. Sariningsih (2014) shows that using a learning context with a practical approach can increase understanding compared to traditional learning. The learning method used in the learning process is the Realistic Mathematics Education (RME) approach, which is known as a problem solving method in mathematics.

According to Yudhanegara (2017) mathematical understanding is the ability to assimilate and understand mathematical ideas. Mathematical understanding involves the ability to understand mathematical concepts, operations, and connection between mathematical concepts and others. Wiharno's view argues that the ability to understand mathematics is a force that must be considered in the mathematical process, especially to obtain meaningful mathematical information (Hendrian, 2017). Therefore, the ability to understand mathematics in the process

of learning mathematics is very important to facilitate learning mathematics that is more complex and in-depth.

Developing students' mathematical understanding skills requires designing teaching methods. Ask students to find concept references that illustrate a good explanation. This shows that the contextual method is a method used in student activities by connecting material with everyday activities around students so that these concepts can be easily understood by students. Mathematical understanding is the ability to absorb and understand mathematical ideas. The performance indicators for understanding mathematics are: (1) restating a concept; (2) classifying something according to its nature; (3) identify examples and non-examples; (4) using, utilizing and selecting procedures according to the concept, and (5) applying algorithms to solve problems (Yudhanegara, 2017).

Gravemeijer (1994) emphasized that the RME approach is a student-centered learning approach in learning, the teacher is only a facilitator in learning by paying attention to student performance from the aspects of conceptual understanding, reasoning and problem solving aspects. This approach aims to accustom students to think more critically, to define concepts and principles in mathematics for practical problem solving and to help students understand various mathematical problems. Learning begins with concrete things that are better understood by students than abstract things.

According to Hidayat et al (2020), practical mathematics education can improve learning optimization through real learning innovations. The Realistic Mathematical Education (RME) approach is a learning approach that requires students to use their skills as knowledge builders in dynamic learning activities. The Realistic Mathematical Education (RME) learning approach obtains a learning process by using the reality experienced by students as a reference point for learning mathematics, thus enabling students to find real problems from previous experiences. there are three principles in the RME approach Gravemeijer (1994), namely:

a. Guided Reinvention and Progressive Mathematization

Students are given the opportunity to find their own mathematical concepts through the topics that have been presented to solve their own mathematical concepts.

b. Didactial Phenomenology

Mathematical topics are presented as two considerations for the development of further mathematical concepts seen from their application and students' contributions.

c. Self Developed Models

The role of the model he creates is the initial bridge for students to solve problems from real mathematical situations to more concrete situations.

These three principles are applied in the learning process. According to Hidayat et al (2020)., the characteristics of the Realistic Mathematical Education (RME) approach are (1) the use of contextual problems, (2) the use of a variety of learning models, (3) student contributions, (4) interactions, (5) affiliations. Based on these five characteristics, a practical approach in mathematics education shows that mathematics is a teaching method that must be related to the real world in human activity itself. The teacher must try to use the opportunities from situations that will be related to the material to allow students to explore ideas or concepts independently.

Learning Efforts Realistic mathematics education here teaches students to learn mathematics by integrating mathematical problems into everyday life as a formal source of mathematical ideas, concepts and knowledge, making it easier for students to accept material and find solutions to various mathematical problems related to mathematics. In accordance with the concept being taught The aspects that exist in the RME learning approach include Gravemeijer (1994):

1. Begin lessons by asking experiential questions and engage students in learning
2. The problems given must be solved in accordance with the learning objectives.
3. Students develop or create models that represent problems informally.
4. Interactive Teaching, where students must explain the reasons for their answers and understand the answers from friends, if they do not agree with their friends'

answers they must find solutions, alternatives and review each step by stating the truth.

By applying the RME learning approach in the learning process, it aims to encourage students to be more active in learning, and will give the impression that learning mathematics is more interesting, students also do not feel bored in learning mathematics and motivate students in learning mathematics, so they do not think mathematics is difficult and boring.

METHOD

This research method uses mixed methods. Cresswell (2010) says that this mixed research method combines qualitative and quantitative research. This research uses the method (Concurrent mixed method), which is a research method that combines qualitative and quantitative methods at one time simultaneously. The location of this research is SMP Negeri 1 Sukosewu Bojonegoro. The subjects of this study were students in class VII B, there were 32 students at SMP Negeri 1 Sukosewu Bojonegoro for the 2021/2022 academic year.

SMP Negeri 1 Sukosewu Bojonegoro is a junior high school that has the goal of increasing students' knowledge to achieve glorious achievements. To increase students' knowledge, all teacher councils must be able to explore various models and approaches in learning so that the material presented is easily accepted by students. Thus the researchers then offered to school principals regarding the application of the RME approach as an increase in understanding abilities in mathematics. After the principal accepted it, the mathematics teacher suggested research for class VII, who at this time their mathematics scores were still below the mastery level.

Data collection in this study used written test questions, observations, interviews and documentation to determine the level of students' mathematical understanding. The analysis technique used by researchers is qualitative and quantitative. Qualitative data through observation and documentation. Meanwhile, what can be measured through formative tests are the results that test students' ability to understand mathematics.

As for qualitative data, the first step is data collection, the activity here is to find the data needed to achieve the research objectives. Secondly there is data reduction, in this technique the researcher examines all data from various data collection methods and various data sources, then the researcher tries to draw conclusions from each aspect of the research. The third step is the presentation of data where the researcher collects the results of the written test, and observations which will later be drawn conclusions based on the data obtained. Data analysis is used to see how well students understand mathematics in the learning process. Student learning test results will be analyzed, then presented in percentages. Then the next step is to draw conclusions. Where the results of this work are the definitions of the subjects studied and the results of the entire research process.

RESULTS AND DISCUSSION

This research was conducted at SMPN 1 Sukosewu Bojoegoro Class VII B with a total of 32 students. This study did not have experimental and control classes, researchers only used classes between pre-test and posttest from the same research subject, because in this study they only wanted to know about increasing students' mathematical understanding using the Realistic Mathematics Education (RME) learning approach. The Realistic Mathematics Education (RME) learning approach is applied to improve students' mathematical understanding abilities.

Before the researcher conducted the research, the steps taken were to apply for a research permit from the university, then submit it to the school principal and then meet the mathematics teacher concerned. Then, the questions on the Mathematical Comprehension Test (TKPM) were validated by 1 mathematics lecturer who was not a supervisor and thesis examiner to find out the grammar and correcting questions that had been made by the researcher before being submitted to the mathematics teacher at SMPN 1 Sukosewu and by 1 teacher mathematics at SMPN 1 Sukosewu to find out the feasibility of questions that will be given to SMPN Sukosewu students. After the questions (TKPM) were approved, the researcher distributed the questions (TKPM), and got scores to determine research subjects.

After the validity test was carried out, the results became clear and it was continued with data collection on the initial results (pre-test) of Class VII B students of SMPN 1 Sukosewu. Then given the learning treatment using the RME approach, adjusting to the material being taught requires 3 meetings in a row for 3 days. After the treatment, tests were carried out on class VII B students of SMPN 1 Sukosewu. This is done to determine the ultimate ability of students after being given treatment. After knowing the results of the post test scores, the researcher analyzed the differences in the ability of students' understanding of mathematics with high and low scores as students to be interviewed, while collecting interview data to strengthen data validity.

The results of the pre-test and post-test scores on the mathematical understanding ability test obtained the final total, namely the score obtained (total score on the question if it is correct) divided by 15 then multiplied by 100. The average student score can be found by adding up the test scores of all students in for lots of data. The results of the study are as follows.

Category	Mean	Value Above Aversge	
		Students	**Precentage**
Pre Test	53,5	12	37,5%
Post Test	85,2	25	78,1%
Enhancement			40,6%

Table 1. Mean and Percentage of Pre-Test and Post-Test

After the TKPM has been carried out, the next step is to analyze the average TKPM. Based on the results of the pre test, these values are still low, 62.5% below the average and 37.5% above the average. The highest pre-test score is 73.3 and the lowest is 33.3, and can be used because it is not understood. After completing the Realistic Mathematics Education (RME) approach, the average post test score is 21.9%. The highest post test score was 93.3, and the lowest score was 73.3. The meaning of these words is reachable to understand. The results of the pre test and post test understanding of mathematics according to the Realistic Mathematics

Education (RME) approach are 40.6% after education. This is the result of the pre test and post test from 37.5% to 78% which can be calculated to determine the increase in mathematical understanding.

Observations were made to determine the results of learning mathematics that can be achieved using the Realistic Mathematics Education (RME) approach. Observations were made by independent researchers and observers. Based on the results of observations, the learning process went well. The Realistic Mathematics Education (RME) approach can activate the mathematics learning process and make students more involved in learning, and can express their experiences according to the topic of material being studied by students. The teacher also moderates the discussion and at the end of the lesson the teacher does not forget to review the material being studied. Learning with the RME approach focuses students on understanding concepts, not just obtaining information (Hidayat et al., 2020: 112). Therefore, mathematics learning activities go well with the RME approach and make learning activities more focused and directed.

After analyzing the data on mathematical understanding ability by applying the Realistic Mathematics Education (RME) approach to the learning process, the results of the Mathematical Understanding Ability Test (TKPM) and interview transcript data from each subject obtained the following data.

KPM Indicator	TKPM SNR	TKPM SNT
Restate a concept	Can repeat concepts that are already known, but not yet appropriate.	Can express his thoughts with concepts correctly and accurately
Clarify objects according to concepts	Can solve problems based on concepts and ideas but wrong in the calculations	Able to work on questions according to the concept correctly and accurately
Give examples and non-examples of a concept	Able to differentiate (gross, net, tare) but unable to provide examples and non-examples according to the concept	Able to differentiate (gross, net, tare) and able to provide examples and non-examples according to the concept
Using, utilizing and selecting certain procedures or operations	Not able to use, utilize and select the procedures or operations needed and difficulties in calculating the final result in the form of %	Able to use, utilize and select the procedures or operations needed but difficulties in calculating the final result in the form of %
Applying concepts in problem solving	Inability to apply reasoning and problem solving correctly and accurately	Able to apply reasoning and problem solving correctly and precisely
Total Value	**33.3 to 73.3**	**73.3 to 93.3**

Table 2. Results of students' Mathematical Understanding Ability

After analyzing the mathematical understanding data using the Realistic Mathematics Education (RME) approach in learning, it can be concluded from the results of the Mathematical Understanding Ability Test (TKPM) and panel data interview scores for each subject that masters all indicators of mathematical understanding ability. Meanwhile, SNT students were able to fulfill all indicators of understanding mathematics in this study. While SNR subjects were only able to fulfill some of the indicators well, other indicators were still not able to be fulfilled by SNR subjects.

Based on the results of this study and the results of post-implementation data analysis, it can be concluded that the Realistic Mathematics Education (RME)

learning method can improve students' mathematical understanding in SNR and SNT subjects (Ramadhanty and Marlina, 2019). Problem-based learning that students can imagine as real world problems is a realistic method of learning mathematics. Such an RME approach can be applied to all aspects of learning. When this approach is also aligned with the problems faced by students, it becomes difficult to understand mathematics. Therefore, the RME approach is an effective effort to improve learning, especially to improve mathematical understanding, such as learning to help students understand a problem with visible help in everyday life, so they can solve problems in their own way. An approach that can be developed as a student approach to mathematics is the Realistic Mathematics Education approach (Mashuri et al., 2020). Students will feel connected to mathematics because the real world makes learning mathematics necessary and meaningful in their daily lives.

CONCLUSIONS

The conclusion of this study is that students experience an increase in their understanding of mathematics which can be seen from the results of the students' GPA from 53.5 to 85.2. After applying the learning method with the Realistic Mathematics Education (RME) approach, the effect was very good, as can be seen from the students' scores before and after the test which were initially higher than the average of 37.5-78.1%, causing SMPN 1 Sukosewu Class VII Bojonegoro students to showed an increase in understanding of mathematics by 40.6% after applying the Realistic Mathematics Education (RME) learning approach. Practical mathematics education using the Realistic Mathematics Education (RME) learning approach approaches an effective teaching style for increasing students' understanding of mathematics and has a positive impact on the satisfaction of various indicators of mathematical understanding abilities in learning. The RME approach also results in students being more active in learning and being more assertive in expressing different experiences with learning material, but for groups of students who have difficulty solving problems related to math learning skills that can be difficult to understand, it can be done without using structured conceptual

skills. However for the full application of the Realistic Mathematics Education (RME) approach, this teaching approach can improve students' understanding of mathematics.

We suggest that now teachers need to pay attention to students in solving contextual problems so that students with low abilities can get used to solving contextual problems with mathematical concepts correctly. The teacher should also be given more mathematical understanding questions so that students' creativity can be seen and more accustomed to, so that students do not experience confusion and are more systematic in solving problems. For other researchers who want to do similar research, it is recommended to pay more attention to students in working on the questions so that there is no cooperation or cheating because the test of mathematical understanding ability must be done by the students themselves. Also better understand the indicators of mathematical understanding, so that it is easier to compile test questions for the ability to understand mathematics and better prepare assessment indicators, answer keys, so that you don't experience difficulties when correcting or giving grades. Furthermore, it is necessary to carry out research to improve the ability of students' understanding of mathematics which are still under mastery learning by using the RME learning approach as a learning process strategy that can support the improvement of the ability of understanding mathematics for each individual.

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