

The Effectiveness of Mathematics Learning Through the Application of Realistic Mathematics Education (RME) Approach from Numeric Intelligence in Class VII Students of SMP Negeri 3 Pallangga, Gowa Regency

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ABSTRACT

This study aims to determine the effectiveness of learning mathematics by applying the Realistic Mathematics Education (RME) approach in numerical intelligence in seventh-grade students of SMP Negeri 3 Pallangga. This study refers to three indicators of learning effectiveness: completeness of student learning outcomes, student activities, and students' positive responses to the implementation of the Realistic Mathematics Education (RME) approach, using the one-shot case study technique namely pre-experimental research. The sample used is the number of students as many as 20 people as the experimental group. The t-test was used in the data analysis of this study. One sample test t-test obtained P-value $< \alpha$ that is $0.000 < 0.05$ then H_0 is rejected, (2) The average percentage of the frequency of activities of students who are actively involved in learning was 78.39% had reached good criteria, (3) had average percentage of students' positive responses to learning mathematics was 96.88%, and only 3.12% of responses negative, (4) the implementation of learning is in the very good category with an average score of was 3.63. Based on the results, it can be concluded that learning mathematics is effective through applying the Realistic Mathematics Education (RME) approach in terms of numerical intelligence in class VII students of SMP Negeri 3 Pallangga, Gowa Regency.

Keywords: *Effectiveness, Realistic Mathematics Education Approach.*

1. INTRODUCTION

Education is one of the important aspects that will determine the quality of life of a person and a nation. Likewise, Indonesia places education as something important and main. This can be seen from the contents of the Preamble to the 1945 Constitution, paragraph IV, which emphasizes that one of the national goals of the Indonesian nation is to educate the nation's life. Students can show success in learning through attitudes and behavior on what is taught in school.

This is the basis for applying a realistic learning approach to overcome the above problems. The Realistic Mathematics Approach is a learning approach that prioritizes meaningfulness or real learning [1]. In the Realistic Mathematics Approach, learning must start from something real to meaningfully involved in the learning process [2].

Learning mathematics by applying the Realistic Mathematics Education (RME) approach is one way to show students the relationship between mathematics and life. Mathematics learning is

designed to start from solving problems that students can imagine. Such learning is expected to make students more interested and motivated in the learning process because they know the usefulness of studying the material in life.

Freudenthal in [3] states that The Realistic Mathematics Education, the student learning process will only occur if the knowledge learned is meaningful to students. Knowledge will be significant for students if the learning process is carried out in a context (CORD in [3]) or learning using realistic problems.

A realistic problem does not always have to be a problem in the real world (real-world problem) but can be found in students' daily lives. A problem is called "realistic" if the problem can be imagined (imaginable) or real in students' minds.

2. LITERATURE REVIEW

2.1. Mathematics Learning Effectiveness

Effectiveness comes from the root word "effective." According to the Indonesian Dictionary (2017: 77), effective means: (1) there is an effect (consequent, effect, impression), (2) efficacious or efficacious, (3) can bring results, be effective. While the word effectiveness has the meaning: (1) compelling circumstances: memorable things, (2) efficacy, (3) the success of a business or action.

According to Mott [4], Effectiveness is an effort to integrate product quantity and quality, efficiency, adaptation, and flexibility in achieving a goal. According to Emulyasa (Susilo, 2013), Effectiveness is a measure that states the extent to which goals or objectives (quantity, quality, and time) have been achieved. The essence of effective learning is a teaching and learning process that focuses on the learning outcomes obtained and pays more attention to the ongoing learning process. The effectiveness of teaching depends on students who do learning and on educators who can make an effective learning process [5].

Based on the definition of effectiveness above, what is meant by effectiveness in this research is the level of success in achieving its goals and

objectives. Learning comes from the basic word "learn." Learning is a relatively continuous change in behavior thanks to practice and experience. [6] suggests that learning is a process of change, namely changes in behavior due to interaction with the environment in meeting the needs of life.

2.2. Realistic Mathematics Education (RME)

Realistic Mathematics Education (RME) or Realistic Mathematics Education (PMR) cannot be separated from the Freudenthal Institute. The Institute was founded in 1971 under the auspices of the University of Utrecht, Netherlands. The institute's name is taken from the name of its founder, Professor Hans Freudenthal (1905-1990), a German/Dutch writer, educator, and mathematician. [7].

RME refers to Freudenthal's opinion that mathematics must be related to reality and mathematics is a human activity. Mathematics as a human activity means that humans must be allowed to rediscover mathematical ideas and concepts. [8].

RME is a theory of teaching and learning in mathematics education that must be linked to reality because mathematics is a human activity [9]. In line with this, [2] In PMR, learning must start from something real to be involved in the learning process meaningfully. In this process, the teacher's role is only as a guide and facilitator for students in reconstructing mathematical ideas and concepts.

2.3. Characteristics of Realistic Mathematics Education (RME) Approach

Treffers [3] formulated five characteristics of the Realistic Mathematics Education (RME) approach, namely:

2.3.1. Context use

Realistic contexts or problems in learning mathematics are intended to instill concepts, train students, and measure or evaluate.

2.3.2. Use of models for progressive mathematization

The use of the model serves as a bridge from a concrete level of mathematical knowledge to an elevated level of mathematical knowledge. "Model"

is a "vertical" tool in mathematics that cannot be separated from the mathematization process (i.e., horizontal mathematization and vertical mathematization).

2.3.3. Utilization of student construction results

Referring to Freudenthal's opinion [3] that mathematics is not given to students as a product ready to be used. Still, as a concept built by students, students are placed as learning subjects in the Realistic Mathematics Education (RME) approach.

2.3.4. Interactivity

A person's learning process is not only individual but also simultaneously a social process.

2.3.5. Linkages

Concepts in mathematics are not partial but many mathematical concepts that are related. Therefore, mathematical concepts are not introduced to students separately.

2.4 Steps to Learning Mathematics through Realistic Mathematics Education (RME) Approach

The steps for learning mathematics through the Realistic Mathematics Education (RME) approach are as follows [8].

Step 1: Understanding contextual problems

The teacher gives a contextual problem (question), and students are asked to understand the problem. The teacher explains the problem or problem by providing necessary (limited) instructions/suggestions to specific parts that students understand. In this step, the characteristic of Realistic Mathematics Education (RME) applied is the use of context. This context is seen in the presentation of contextual problems as a starting point for learning activities.

Step 2: Solving contextual problems

Students are asked to solve contextual problems in the Student Book or LKS in their own way. Different ways of solving and answering problems are preferred.

In this step, all the principles of Realistic Mathematics Education (RME) appear, while the characteristics that can be raised are the use of models.

Step 3: Compare and discuss answers

Students are asked to compare and discuss their answers in small groups. After that, the results of the discussion were compared to a class discussion led by the teacher. At this stage, students can practice the courage to express opinions, even though they are different from other friends or even with their teachers.

The characteristic of the Realistic Mathematics Education (RME) approach that appears at this is the use of ideas or student contributions to activate students through optimizing interactions between students and students, between teachers and students, and between students and learning resources.

Step 4: Conclude.

Based on the results of group discussions and class discussions, the teacher directs students to conclude concepts, definitions, theorems, principles, or mathematical procedures related to contextual problems that have just been solved. The characteristic of Realistic Mathematics Education (RME) that appears in this step is the interaction between teachers and students.

3. RESEARCH METHOD

It is experimental research involving one class known as pre-experimental design. The variables of this research are (1) student learning outcomes in mathematics, (2) student activities while participating in learning, (3) student responses to learning.

The design of this research is The One-Shot Case Study. This design form begins with the determination of the subject as an experimental sample. Then the subject was given treatment and finally given a test to see whether or not there was an effect of treatment [10].

3.1. Descriptive Statistical Analysis

Descriptive analysis is a statistical analysis whose level of work includes ways of collecting, compiling, or organizing, managing, presenting, and analyzing numerical data, to provide an orderly, concise and clear picture of a symptom, event, or situation.

3.2. Learning Implementation Data Analysis

The data analysis technique on the implementation of learning is used the average analysis. This means that the implementation of learning is calculated by adding up the value of each aspect and then dividing it by the number of aspects assessed. The categorization of the implementation of learning is presented in the following table.

3.3. Student Learning Outcomes

Student learning outcomes were analyzed using descriptive analysis to describe students' understanding of mathematical material after learning mathematics through the Realistic Mathematics Education (RME) approach.

The student learning outcomes referred to in this study are the final grades obtained after carrying out the learning tests given after receiving material teaching through the application of the Realistic Mathematics Education (RME) approach.

Table 1. Categorization of Completeness Standards for Mathematics Learning Outcomes for Class VII Students of SMP Negeri 3 Pallangga, Gowa

The value of learning outcomes	Category
$0 \times < 55$	Very Low
$55 \times < 75$	Low
$75 \times < 80$	Average
$80 \times < 90$	High
90×100	Very high

3.4. Standard Categorization Techniques Based on Decrees of the Ministry of Education and Culture

3.4.1. Student response

The student response referred to in this study is the student's response to mathematics learning which is carried out through the Realistic

Mathematics Education (RME) approach. A good and effective learning approach makes students respond positively after they take part in math learning activities.

3.4.2. Research Hypothesis

Based on the literature review and the framework of thought that has been put forward, the research hypothesis is formulated as follows.

1. Effective mathematics learning through applying Realistic Mathematics Education (RME) in class VII.5 students of SMP Negeri 3 Pallangga, Gowa Regency”.

The effective indicators are as follows:

- a. Student mathematics learning outcomes
 - b. Student activities
 - c. Student response
2. Grade students' mathematics learning outcomes VII.5 SMP Negeri 3 Pallangga, Gowa Regency after applied the Realistic Mathematics Education (RME) approach:

- a. The average score of students' mathematics learning outcomes VII.5 SMP Negeri 3 Pallangga Gowa Regency after using the Realistic Mathematics Education (RME) approach > 69.9 (KKM 70).

$H_0 : \leq 69.9$ oppose $H_1 : > 69.9$

Where:

μ = Parameters of mathematics learning outcomes after the approach is applied Realistic Mathematics Education (RME).

- b. Mastery of learning mathematics class students VII.5 SMP Negeri 3 Pallangga, Gowa Regency after applying the classical Realistic Mathematics Education (RME) approach $> 79.9\%$.

$H_0 : \pi \leq 79.9\%$ oppose $H_1 : > 79.9\%$

Where :

= The proportion of classical mastery of mathematics learning outcomes.

Mode	95.24
Standard Deviation	8.67
Variance	75.11

4. RESEARCH RESULTS AND DISCUSSION

4.1. Research Result

The research data were analyzed using descriptive analysis and inferential analysis.

4.2. Descriptive Statistical Analysis

Descriptive statistical analysis is intended to describe the characteristics of research subjects in mathematics learning by looking at the implementation of Mathematics learning, student learning outcomes, student activities during the learning process, and student responses to mathematics learning by applying the Realistic Mathematics Education (RME) approach. in class VII.5 SMPN 3 Pallangga Kab. Gowa.

4.2.1. Description of the Implementation of Mathematics Learning by Applying a Realistic Mathematics Education (RME) Approach on Class Students VII.5 SMP Negeri 3 Pallangga, Gowa Regency

Aspects observed in the implementation of mathematics learning apply the Realistic Mathematics Education (RME) approach to class students VII.5 SMP Negeri 3 Pallangga, Gowa Regency, covers several aspects. The observer observed these aspects during the learning process, which was followed by meetings I, II, III, and IV.

4.2.2. Description of Student Learning Outcomes by Applying Realistic Mathematics Education (RME) Approach

Table 2. Grade Students' Mathematics Learning Results Scores

Statistics	Statistical Value
Sample Size	20
Highest Score	97.62
Lowest Score	64.29
Ideal Score	100
Score Range	33.33
Average Score	88.69
median	90.4762

The following is a description and percentage of class students' mathematics learning outcomes VII.5 SMP Negeri 3 Pallangga, Gowa Regency after treatment.

Table 3. Grade Students' Mathematics Learning Results Scores

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Table Description of Achievement of Mathematics Learning Outcomes for Students class VII.5 SMP Negeri 3 Pallangga, Gowa Regency

Table 4. Grade Students' Mathematics Learning Results Scores

Mark	Criteria	f	(%)
$x < 70$	Not Complete	1	5
$70 < x < 100$	Complete	19	95
Amount		20	100

Table 5. Distribution of Frequency and Percentage of Students' Mathematics Learning Outcomes Score

The value of learning outcomes	Category	f	Percentage (%)
$x < 55$	Very low	0	0
$55 < x < 70$	Low	1	5
$70 < x < 80$	Currently	1	5
$80 < x < 90$	High	6	30
$90 < x < 100$	Very high	12	60
Amount		20	100

Distribution of Frequency and Percentage of Students' Mathematics Learning Outcomes Score class VII.5 SMP Negeri 3 Pallangga, Gowa Regency after being given treatment.

This observation sheet was made to obtain one type of data to support learning effectiveness criteria. This instrument contains instructions and 8 indicators of observed student activity. Observations were carried out by observing students' activities during four meetings. The data obtained from the instrument are summarized at the end of each meeting.

4.2.3. Description of Student Activities during Mathematics Learning by Applying Realistic Mathematics Education (RME) Approach

The success of student activities in this study is good if at least 75% of students are actively involved in positive activities during learning. This can be seen from the average percentage of students' positive activity, which is 78.39% active in learning mathematics. From the table, it can also be seen that from the four meetings observed, only 6.25% of students carried out other activities during the learning process. This is because students sometimes tell stories with their group friends and ignore learning.

4.2.4. Description of Student Response to Mathematics Learning by Applying Realistic Mathematics Education (RME) Approach

The results of data analysis on student responses to the implementation of mathematics learning by applying the Realistic Mathematics Education (RME) approach filled by 20 students are briefly shown as follows:

Student responses to learning mathematics by applying the Realistic Mathematics Education (RME) approach to all meetings is positive. The average score of the answers to the positive aspects of students reached 96.88%. The student's response is positive if a minimum percentage of 70% obtains the average student's answer to the positive aspect statement. Thus, applying the approach of Realistic Mathematics Education (RME) received a positive response from students.

4.2.5. Inferential Statistical Analysis

Normality test

Normality tests aim to determine whether the average score of student learning outcomes is normally distributed. The test criteria are:

If $P\text{-value} = 0.05$ then the distribution is normal.

If $P\text{-value} < = 0.05$ then the distribution is not normal.

Using the help of a computer program with the Statistical Product and Service Solutions (SPSS) version 20 program with the Kolmogorov-Smirnov Test.

5. DISCUSSION OF RESEARCH RESULTS

Based on the analysis results described in the previous section, the Realistic Mathematics Education (RME) approach in class students VII.5 SMP Negeri 3 Pallangga, Gowa Regency can improve students' mathematics learning outcomes. This can be seen from the table of descriptive and inferential statistical analysis results. The achievement of the effectiveness of implementing the Realistic Mathematics Education (RME) approach can be seen in the following table:

5.1. Learning Implementation

The analysis of observational data on the implementation of learning with mathematics learning through the application of the Realistic Mathematics Education (RME) approach for 4 meetings showed that the level of teacher ability in managing learning reached an average score of 3.63 (in the very good category).

5.2. Student Mathematics Learning Outcomes After Learning by Applying Realistic Mathematics Education (RME) approach

The results of the data analysis of students' mathematics learning outcomes after being applied The Realistic Mathematics Education (RME) approach is in the high category, with an average score of 88.69 out of 20 students, there is 1 student who does not achieve individual completeness of 5%. Twenty students have achieved individual completeness of 95%. This means that students in class VII. 5 of SMP Negeri 3 Pallangga, Gowa Regency, achieve classical mastery because classical

mastery is achieved if at least 80% of students in the class have reached the minimum completeness score set by the school.

5.3. Student activities during mathematics learning by applying the Realistic Mathematics Education (RME) approach

The results of observing student activities during mathematics learning by applying the Realistic Mathematics Education (RME) approach to Class VII.5 students of SMP Negeri 3 Pallangga, Gowa Regency, show that students are active in learning and have met the active criteria because according to the indicators of student activity, student activities are said to be involved. Successful/effective if at least 75% of students are actively engaged in the learning process. While the results of the analysis of student activity observation data show the average percentage of the frequency of student activities by applying the Realistic Mathematics Education (RME) approach, namely 78.39% of student activity which increases every meeting. It can be concluded that students have actively participated in the mathematics learning process by applying the Realistic Mathematics Education (RME) approach.

5.4. Student responses to mathematics learning by applying the Realistic Mathematics Education (RME) approach

From the results of the analysis of student responses, it was found that 96.88% of students gave a positive response to the implementation of mathematics learning through the application of the Realistic Mathematics Education (RME) approach.

The results of the inferential analysis indicate that the posttest data has met the normality test, which is a prerequisite test before testing the hypothesis. The posttest data were normally distributed because the value of $p > = 0.05$. α

6. CONCLUSION

Based on the results of data analysis and discussion, it can be concluded that:

1. The implementation of learning through applying the Realistic Mathematics Education (RME) approach in the category with an average.
2. The results of the descriptive analysis show that the students' mathematics learning outcomes

after learning through the application of the Realistic Mathematics Education (RME) approach is included in the high category with an average value of 88.69 and a standard deviation 8.67. These results also show that 19 students or 95% reach the KKM and 1 student or 5% who do not reach the KKM (scores below 70), so it can be said that the student learning outcomes have reached the classical completeness criteria.

3. Inferential analysis results using the proportion test with a significant level of 5%, the Z count = 1.685 Z table = 1.645 then H_0 is rejected, meaning that the proportion of students who reach the classical completeness criteria (KKM = 70). So, it can be concluded that inferentially the students' mathematics learning outcomes after being taught with $>> 79,9\%$ apply The Realistic Mathematics Education (RME) approach meets the criteria for effectiveness.

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