



EFFECTIVENESS OF THE REALISTIC MATHEMATICS EDUCATION APPROACH TO THE ABILITY TO SOLVE MATHEMATICAL PROBLEMS

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Abstract

The purpose of this study is to find out how effective the Realistic Mathematics Education (RME) approach is. The research method used in this study is the experimental method. The sampling technique uses simple random sampling technique. The instrument for collecting data in this study is an essay test consisting of 8 items. The data analysis technique used is the t-test, and based on the t-test calculation shows $t\text{-count} = 10,098$ and $t\text{-table} = 2,002$ at the significant level of 5% or ($\alpha = 0,05$) and the degree of freedom ($dk = 58$) which means $t\text{-count} > t\text{-table}$ ($10,098 > 2,002$) then H_0 is rejected and H_1 is accepted. The conclusion is that the average mathematical problem solving ability of students given the Realistic Mathematics Education (RME) approach is higher than the mathematical problem solving abilities of students who are given an expository approach. And the effectiveness calculation for the Realistic Mathematics Education (RME) approach is quite high, which is 2,605. Thus, there is an influence and effectiveness of the Realistic Mathematics Education (RME) approach in the teaching and learning process.

Keywords: Realistic Mathematics Education Approach, RME, Problem Solving

A. Introduction

Mathematics is one part of science that has an important role in life, especially in solving problems in everyday life. According to Permendiknas Number 22 Year 2006 concerning Mathematics Subject Content Standards for all levels of primary and secondary education it is stated that the aim of mathematics in schools is for students to be able to understand mathematical concepts, explain the linkages between concepts and apply concepts or algorithms, flexibly, accurately efficient and appropriate in solving problems. Agree with

Permendiknas, Cockroft (Putri and Rusgiantoheri, 2015: 262) suggest that the need for mathematics is taught to students because it is used in life and is needed in all other fields of study.

And according to Rosdianwinata (Wulandari, 2017: 326) argues that mathematics also affects the structuring of ways of thinking, especially in the formation of the ability to analyze, make synthesis, conduct evaluations to the ability to solve problems and apply them in everyday life. From the above opinion, one of the important roles of mathematics is to solve problems. Therefore, students must have mathematical problem solving abilities. Problem solving ability is a basic ability that must be possessed by students and this ability must be improved.

With the increase in problem solving capabilities, it is expected to help students solve mathematical problems and daily life in any situation. But in reality students' mathematical problem solving abilities in Indonesia are still low. Based on observations of researchers during the practice of field experience (PPL) found that students' problem solving abilities were still low. The low problem solving ability is shown from the table of results of the average daily test scores and midterm tests of class X students at Amaliyah Vocational School.

Table 1. Rata – Rata Nilai Matematika Siswa SMK Amaliyah

Kelas	UH ke 1	UH ke 2	UH ke 3	UTS	KKM
X – AK	73,84	69,10	57,97	63,63	75
X – PM	39,35	72,58	70,94	57,32	75
X - KP	64,21	70,22	70,83	68,11	75

(Source: mathematics teacher value data at Amaliyah Vocational School)

In addition to the results of the survey or observation during PPL there are also results from research conducted by Fakhruddin (Nataliasari, 2014) on junior high school students, in general the results of junior high school mathematical problem solving abilities have not been satisfying around 30.67% of ideal scores. Just as Fakhruddin, Hastuti Febrianti et al (2013) conducted observations conducted in class VIII of SMP N 9 Padang on 24-27 September 2012, it was seen that students were less able to solve questions in the form of problem solving, especially those related to students' real lives. Only about 25% of students are able to finish well.

The weak mathematical problem solving abilities of students in Indonesia are also shown in the results of a survey conducted by the JICA Technical Cooperation Project for Development of Science and Mathematics in 2000 in the city of Bandung which found that one of the activities in mathematics that are considered difficult by students in learning and teachers in teaching are mathematical problem solving. In line with that, Yeo (Arviani and Tatag, 2014: 150) in his research found that the difficulties experienced by students in solving problems were the lack of students' ability to choose the right procedures or strategies to solve the problems they faced. Based on the facts and results of previous studies, a learning approach is needed in the hope that students' mathematical problem solving abilities can grow and develop better.

One approach that can be used is the Realistic Mathematics Education (RME) approach. RME is a learning approach that places real/real problems that are known and experienced by students and can also be imagined by students as the starting point of learning. A realistic approach provides a clear understanding of the relevance of mathematics to everyday life. This is clearly seen in the questions or problems presented relating to real world life in the learning process. From the characteristics of the Realistic Mathematics Education approach, it is expected to direct students to solve mathematical problem solving in their daily lives. So the authors are interested in conducting research on realistic mathematics learning, with the title "Effectiveness of the Realistic Mathematics Education (RME) Approach on Mathematical Problem Solving Abilities".

B. Literature Review

Mathematical Problem Solving Ability

Problem solving ability is an ability in which a person chooses a way or strategy in solving the problem at hand. According to Polya (Taufik, 2014: 58), defines problem solving (problem solving) as a conscious effort to find a way out of a difficulty, but that goal is not immediately achievable. Furthermore, NCTM (Husna et al., 2013: 81) suggests that problem solving is the process of applying the knowledge previously obtained to new and different situations. According to Kesumawati (Mawwadah and Hana, 2015: 166) states mathematical problem solving ability is the ability to identify the elements that are known, asked, and the adequacy of

the elements needed, able to make or compile mathematical models, can choose and develop strategies for solving, able to explain verify the answers obtained.

Meanwhile, According to Sudjimat (Aini, 2016: 29) states that learning problem solving in essence is learning to think or learning to reason, which is thinking or reasoning applying the knowledge previously obtained to solve new problems. And according to Dahar (Netriwati, 2016: 181) problem solving is a human activity that combines concepts and rules that have been obtained previously, and is not a generic skill that can be obtained instantly. Furthermore, according to Polya (Juanda, 2014) in solving problems there are four aspects of problem solving skills, namely by understanding the problem, making a problem solving plan, implementing a problem solving plan and seeing (checking) again.

Realistic Mathematics Education (RME) Approach

Definition of Realistic Mathematics Education (RME)

The first RME was introduced by mathematicians from the Freudenthal Institute at Utrecht University in the Netherlands for over thirty years ago, right in 1973. According to Frudenthal (Wijaya, 2012: 20) mathematics is a form of human activity. This idea shows that RME does not place mathematics as a finished product, but rather a process often referred to as guided reinvention. Therefore, RME becomes an alternative in learning mathematics in this study.

Besides that, one of the reasons for taking this approach is that the mathematics subject matter is abstract, so mathematics learning should start from concrete to abstract. This explanation supports RME as a specific learning approach to mathematics that bases learning starting from concrete things. According to De Lange and Den Heuvel Panhuizen (Fathurrohman, 2015: 189) RME is learning that refers to social constructivists and is devoted only to mathematics education. Meanwhile, according to Zulkardi (Fathurrohman, 2015: 189) Realistic Mathematics Education is a mathematical learning theory which one of the learning approaches uses real world context.

Another opinion, Bennu said that the realistic approach is an approach that uses real-world situations or concepts as a starting point in teaching and learning. Realistic or Realistic Mathematics Education (RME) approach can also be interpreted as a way of teaching by providing opportunities for students to investigate and understand mathematical concepts through a problem in real situations or in everyday life. This is meant so that learning is meaningful for students.

RME theory emphasizes process skills (Of Doing Mathematics) discussing and collaborating, arguing with classmates so that they find themselves solving problems given to the teacher, so that eventually students use mathematics to solve problems both individually and in groups. The realistic approach to context with the real world, what is meant by the real world is the student experience that can be imagined by the students themselves not necessarily with real objects. Based on the opinion above, it can be interpreted that the Realistic Mathematics Education (RME) approach is an approach that starts from the real things and experiences of the students themselves. This learning students are invited to shape their own knowledge based on the experiences they have had before.

Characteristics of the Realistic Approach to Mathematics Education (RME)

According to Traffers (Wijaya 2012: 21), there are five characteristics of the RME learning model, namely first, using contextual problems or realistic problems. Through the use of context, students are actively involved in carrying out exploration activities. Another benefit of using contextual problems at the beginning of learning is to increase students' motivation and interest in learning Mathematics. The second, uses a model for progressive mathematicians. The use of a model functions as a bridge (bridge) from a concrete level of mathematical knowledge to formal mathematical knowledge.

Furthermore, the third is to use the results and construction of the students themselves. In learning activities, students are given the opportunity by the teacher to find mathematical concepts in their own way. The fourth characteristic, there is interaction between students and teachers. And the last characteristic is linkages. In mathematics learning it does not consist of stand-alone parts, but mathematical material interrelated with each other. So the previous material taught will be useful for future material.

Steps of the RME Approach

Referring to the principles and characteristics of the RME learning model above, according to Riawati (2012: 1) the steps in the core activities of the realistic Mathematics learning process

are as follows: First step, understanding contextual problems. The teacher gives contextual problems to students. Next, students are asked to understand the problem first. The second step, explains the contextual problem. The teacher explains the situation and condition of the problem by giving instructions / suggestions as needed (limited) to certain parts that have not been understood by students. The third step, resolving contextual problems. Students individually solve contextual problems in their own way. The teacher motivates students to solve problems in their way by giving instructions / suggestions. The fourth step, comparing and discussing answers. The final step is to conclude or draw conclusions about a procedure or problem solving concept that has been built together.

C. Methodology

The research method used in this study is the experimental research method. According to Setyosari (2016: 48), "experimental research is a research activity that aims to assess the influence / action / treatment of education on student behavior about the presence or absence of the influence of the action when compared with other actions". The general objective of experimental research is to examine the effect of a particular treatment on the symptoms of a particular group compared to other groups that use different treatments.

Experimental research is a fairly typical research approach, namely experimental research directly testing the effect of a variable on other variables, and testing the cause and effect hypothesis. In this method two classes were used, namely the control class and the experimental class. The control class was treated using conventional learning models and the experimental class used the Realistic Mathematics Education (RME) approach. The independent variable in this study is the Realistic Mathematics Education (RME) (X) approach, while the dependent variable in this study is the mathematical problem solving ability (Y).

The study design was compiled to compare the results of mathematical problem solving abilities of the students of the two groups after being given different treatments. The research design that will be used is to divide the subjects into two groups, namely the control group and the experimental group. Next is the research design table used.

Table 2. Research Design

X_1	X_2
Y_1	Y_2

Information :

X_1 : Students taught with the RME learning approach

X_2 : Students taught with an expository approach

Y_1 : Mathematical problem solving abilities of students taught using the RME approach

Y_2 : The ability to solve mathematical problems is taught using the expository approach

D. Findings and Discussion

This research was carried out approximately two months at Amaliyah Vocational School in class X where students were placed in class evenly with the same abilities without any class classification (superior and ordinary classes). During the learning process carried out in this study, researchers used two classes as the experimental class and the control class. In the experimental class learning about trigonometric comparisons using the Realistic Mathematics Education (RME) learning approach, while in the control class using the expository learning approach.

Based on the results of the study, it was found that the Realistic Mathematics Education (RME) learning approach applied in the learning process showed that the level of mathematical problem solving ability had an average value of 84,967. Whereas in the expository learning approach, students are seen from the level of mathematical problem solving ability having a value with an average of 75,667. This shows that the mathematical problem solving ability of the experimental class students is better than the control class students.

And then the researchers tested the effectiveness of the teaching and learning process using the Realistic Mathematics Education (RME) approach. The results of testing the teaching and learning process using the Realistic Mathematics Education (RME) approach that there is effectiveness of problem solving abilities on mathematical problem solving abilities of 2.605 which are high. Then from the results of the statistical hypothesis test the value of $t_{count} = 10.098$ and $t_{table} = 2.002$ at a significant level of 0.05 means that $t_{count} > t_{table}$. The

following results show that H_0 is rejected and H_1 is accepted, thus the average findings of mathematical problem solving abilities in the experimental class are higher than the average mathematical problem solving abilities of students in the control class.

E. Conclusion

Based on the results of research on the effectiveness of the Realistic Mathematics Education (RME) approach to Mathematical Problem Solving Ability 2017/2018 academic year, it was concluded that the value of students' mathematical problem solving abilities on trigonometry in the experimental class was taught using the Realistic Mathematics Education (RME) approach in the high category. This is evidenced by the average value of the experimental class higher than the average value of the control class.

Meanwhile, students' mathematical problem solving abilities on trigonometry in the control class that were not taught using the Realistic Mathematics Education (RME) approach, but were taught an expository approach, were in the low category compared to the results of the experimental class mathematical problem solving abilities. This is evidenced by the lower average value of the control class. The results of the hypothesis indicate that there is a significant influence on the application of the Realistic Mathematics Education (RME) approach to students' mathematical problem solving abilities and the Realistic Mathematics Education (RME) approach including an effective approach in the learning process.

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