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Research Paper

Improving mathematical ability and student learning outcomes through realistic mathematic education (RME) approach

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Abstract

This study was conducted based on preliminary study conducted by researchers who found that students' mathematical ability is still low to solve contextual problems, this will certainly have an impact on student learning outcomes that are less than the maximum. The purpose of this research is (1) To know the application of learning using Realistic Mathematics Education (RME) learning approach, (2) To know the improvement of students' mathematical ability on the story after using Realistic Mathematics Education (RME) learning approach, (3) improving student learning outcomes after using Realistic Mathematics Education (RME) learning approach. RME is a learning approach that emphasizes experiences, events, or something close to the real situation imaginable by students as a means of providing insight into math problems. The ability of mathematization is the ability of students to identify real-world problems and then translate them into sentences (mathematical models) and solve the model to get the solution of the real problem. Classroom Action Research (CAR) is conducted in SMP Negeri 2 Lumajang class VIII A 2016/2017 subject matter opportunities. This study consists of 2 cycles. In this research, it is found that (1) Realistic Mathematics Education (RME) implementation consists of understanding contextual problem, solving problems, comparing and discussing answers, and concluding. Percentage of achievement in the first cycle 72% increased in cycle II to 92%, (2) students' mathematization ability increased from cycle I to 77% then in cycle II reached 79%, (3) Percentage of learning achievement classic in cycle I reach 62,5% increase in cycle II to 81,25%. The average learning outcome of cycle I was 78.71 increasing in cycle II to 83.21. The conclusion can be obtained is the application of learning Realistic Mathematics Education (RME) able to improve the ability of mathematization and student learning outcomes in class VIII A SMP Negeri 2 Lumajang. Therefore, teachers are expected to improve students' mathematical skills in order to maximize learning outcomes by applying Realistic Mathematics Education (RME) learning.

Keywords: *Realistic Mathematics Education (RME), Mathematization, Learning Outcomes.*

1. Introduction

Curriculum 2013 holds the view that knowledge can not be transferred from teacher to learners but is giving stimulant to learners to be able to think critically and become problem solver [1]. Learners are no longer regarded as objects, but as learning subjects who must seek and construct their own knowledge. This view leads to a paradigm shift from teacher centered to student centered. The learning process should stimulate students to explore themselves with their own learning process. the teacher must give the students freedom to express their mathematical thinking [2, 3]. Learning process takes place because the students get something that is in the environment. While the role of teachers in the learning process is not dominating but guide and direct students to gain understanding based on all information that students find from their environment. Based on the results of preliminary observations conducted by researchers in class VIII A SMP Negeri 2 Lumajang, found some obstacles in the learning process as students do not understand the use of mathematical concepts that have been studied with its application to math problems related to

daily life. In mathematics education, it is not enough for teachers to simply teach how to solve problems [4]. This can be seen from the confidence of students who are lacking in working on the problem, for example students often ask first things - things that are known and asked in the matter to the teacher and then change it into the mathematical model and solve it in accordance with the mathematical concepts that have been studied. Based on information obtained from mathematics subject teachers, students also experience difficulties when the learning process of mathematics does not practice related to the material being taught, they prefer the presentation of the material by using media or real objects that can be used as the material delivery. Therefore, the researcher conducted pre test before the implementation of the research was conducted. Pre-test results indeed show that the ability of students to model contextual questions is still relatively low, this will certainly have an impact on student learning outcomes that are less than the maximum. The material of opportunity is one of the material that has much to do with daily life. This material often presents stories that require students to be able to make mathematical modeling and solve the problem.

One approach to mathematics learning which is the use of contextual problems as the starting point of mathematics learning is Realistic Mathematic Education (RME) [5, 6]. The use of the word "realistic" actually comes from the Dutch "zich realiseren" which means "to imagine or" to imagine " [7] . According to Gravemeijer, Realistic Mathematics Education (RME) is rooted in

Freudenthal' s view that mathematics as a human activity. If implemented, the basic philosophy of RME brings about a fundamental change in the process of teaching-learning mathematics in the classroom. The teacher in teaching and learning activities should no longer directly provide information to the students, but he/she provides a series of problems and activities that can be used by the students to build their understanding of mathematical concepts that leads to the formation of formal mathematical knowledge [8]. Using this approach, students will learn mathematical concepts based on reality or the environment around them. It certainly can emphasize process skills (of doing mathematics), discuss and collaborate, argue and communicate with classmates so that they can find themselves (student inventing) as opposed to teacher telling and ultimately students use that mathematics to solve problems both individually and in groups. The application of Realistic Mathematics Education (RME) learning consists of 4 aspects: understanding the contextual problem, solving problems, comparing and discussing answers, and finally concluding.

In language, the word mathematization comes from mathematisation or mathematization. The word mathematisation or mathematization is a noun of the verb mathematise or mathematize which means it is to replicate [7]. There are some opinions on mathematization, the child's experience will form an intuitive and basic implicit conceptual, then the child explains the idea of creating a model of daily activity with mathematical objects as a form of calculation [9], there are some opinions on mathematization process of understanding, visualizing, describing or applying certain mathematical ideas [10], focus modeling process as identification of assumptions and identification of variables [11]. From a philosophical point of view, in the process of science mathematization, including the improvement of its conceptual and categorical construct [12]. The ability of mathematization consists of horizontal mathematization and vertical mathematization. Horizontal mathematization is related to the process of identifying the information obtained from the problem and then introducing the known elements into the variables. While vertical mathematization is the process of compiling and simplifying mathematical model in accordance with the information obtained from the problem that has been understood, then using concepts and math skills to solve the problem. So mathematization is a process for translating contextual problems into mathematical models to be solved through mathematical concepts to find solutions to the contextual problems presented.

The objectives to be achieved in this research are:

1. To know the application of learning using Realistic Mathematic Education (RME) learning approach in SMP Negeri 2 Lumajang.
2. To know the improvement of students' mathematization skills on the story after using Realistic Mathematic Education (RME) learning approach in SMP Negeri 2 Lumajang.
3. To know the improvement of student learning outcomes after applying Realistic Mathematic Education (RME) learning approach in SMP Negeri 2 Lumajang.

2. Research methods

A Type of this research is Classroom Action Research (CAR), intended to overcome the problems of mathematical ability and student learning outcomes through the application of Realistic Mathematic Education (RME) learning approach. The phases of implementation of the research consisted of four components. The four components were planning, action, observation, and reflection. Furthermore, the four components were linked in a cycle of activity [12] [6] The subjects of this study were all students of class VIII A SMP Negeri 2 Lumajang academic year 2016/2017 which amounted to 32 students, consisting of 16 male students and 16 female students. There are 3 instruments of data collection in this research, namely 1) Observation sheet of Realistic Mathematic Education (RME), 2) Student mathematical observation observation sheet, 3) Late test cycle test. The data analyzed are 1) data analysis of instructional application, 2) data analysis of student's mathematical ability, 3) data analysis of student learning result consisting of individual student's completeness, classical completeness of learning result, and average of learning result.

3. Results and discussion

The data collection of observation result of Realistic Mathematic Education (RME) implementation at each meeting, the result data of mathematization ability capability in each workmanship in cycle end test, and student learning result data in the form of classical average and the percentage of completeness in cycle 1 and cycle 2 The following is a classroom action research result that has been implemented.

Table 1: Percentage of Improving Realistic Mathematic Education (RME) Implementation in Cycle I and Cycle II

Indicator	Cycle I	Cycle II
Understand the contextual problems within each group.	67 %	88 %
Motivate students to solve contextual problems.	75 %	88 %
Discuss, contribute ideas and solve realistic problems with the group.	79 %	94 %
Presenting the results of group work .	75 %	94 %
Mobilize and control the course of discussion	71 %	100 %
Make a conclusion about what has been done.	71 %	94 %
Conducting evaluation through question and answer	67 %	88 %
Average	72 %	92 %

Table 2: Qualitative Data of Realistic Mathematics Education (RME) Implementation in Cycle I and Cycle II

Cycle I	Cycle II
1. There are some students who are not disciplined when learning takes place, such as talking to other group members when group discussions take place so the class becomes a bit rowdy.	1. Students are getting orderly and enthusiastic to discuss with the group, solving the problems presented in the Student Work Sheet (SWS).
2. Students are less interested in the phases of understanding the contextual problem, because the teaching aids are still only limited to be exhibited by the teacher in front of class	2. Students are more interested in understanding the contextual problem because the props are used by each group to solve the problems presented.
3. There are still members of the group who are shy to present their group discussion results in front of the class.	3. Presentation activities are more interesting because of the interaction of question and answer between groups.
Conclusion: Overall application of Realistic Mathematics Education (RME) learning cycle II is better than cycle I.	

Table 3: Improving Student Mathematization Ability in Cycle I and Cycle II

Mathematical Ability	Cycle I	Cycle II
HorizontalMathematization	83 %	87 %
VerticalMathematization	70 %	71 %
Average	77%	79 %

Table 4: Qualitative Data Student Mathematical Ability in Cycle I and Cycle II

Cycle I	Cycle II
1. There are still students with less mathematical ability category.	1. There are no students with less mathematical ability category.
2. There are still students who have not been able to give information that is known from the problem into the variable.	2. Students are able to give elements that are known from the matter into the variable exactly.
3. There are still less precise students in preparing mathematical modeling in accordance with the information obtained in the problem, so it is not appropriate also in the process of solving the problem.	3. Most students have been able to arrange mathematical models in accordance with the information obtained in the problem and solve them with mathematical concepts and skills.
Conclusion: Overall students' mathematical ability of cycle II is better than cycle I.	

Table 5: Percentage Completion of Student Results Class VIII A in Cycle I and Cycle II

Learning Completion	Cycle I	Cycle II
Complete Study	62,5 %	81,25 %
Incomplete Study	37,5 %	18,75 %

Table 6: Classical Increase of Classical Learning Outcomes of Class VIII A Students in Cycle I and Cycle II

Average Learning Outcomes	Cycle I	Cycle II
	78,71	83,21

Table 7: Qualitative Data Student Results Class VIII A in Cycle I and Cycle II

Cycle I	Cycle II
1. Students have been able to determine the value of theoretical opportunities on simple issues.	1. Students are able to know the relationship of theoretical opportunities and empirical opportunities.
2. Students are still many who do not understand the solution of problems related to the material opportunities in everyday life.	2. Students have begun to understand the techniques of working on issues related to daily life.
3. The number of students who completed 20 students while the unfinished 12 students.	3. The number of students who completed 26 students while 6 students who have not completed.
Conclusion: Overall learning outcomes of students in cycle II is better than cycle I	

4. Conclusion

Classroom action research has been conducted in class VIII A SMP Negeri 2 Lumajang academic year 2016/2017. Research that seeks to improve mathematical skills and student learning outcomes on this opportunity material applying Realistic Mathematics Education (RME) learning approach. Here are some conclusions that can be drawn from the results of these studies.

1. The application of Realistic Mathematics Education (RME) learning consists of 4 aspects: understanding the contextual problem, solving problems, comparing and discussing answers, and finally concluding. Percentage of achievement obtained from the observation of the application of learning in cycle I is 72% has increase by 20% in cycle II become 92%.
2. Classically the percentage of achievement of students' mathematical ability cycle I reached 77% with good category has increased by 2% in cycle II become 79% with good category.
3. On the learning outcomes that use the application of learning Realistic Mathematics Education (RME) is also able to improve student learning outcomes. This is evident from the average value of students in classical cycle I in the first 78.71 increased in cycle II become 83.21. The percentage of classical completeness also increased from the first cycle of 62.5% to 81.25% in cycle II.

This study has achieved a predetermined success indicator, although there are still some things that need to be improved in order to get maximum results. The researcher's suggestions are as follows.

a. For mathematics teachers, to improve students' mathematical skills, one of them is by applying Realistic Mathematic Education (RME) approach to assist students' difficulties in mathematical modeling on contextual issues so that students' learning outcomes are maximized.

b. For students it is advisable to continue to deepen their mathematical skills by continuously learning and practicing contextual questions, as these skills continue to be used to the higher levels of education.

c. For researchers who will do similar research is suggested to improve and implement better learning in order to improve the ability of mathematics and student learning outcomes can be more increased.

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