Realistic Mathematics Education (RME) Model to Improve Mathematics Learning Outcomes for MI Muhammadiyah Sriwedari Students, Magelang Regency

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Abstract. Learning outcomes in integer operations among sixth-grade students at MI Muhammadiyah Sriwedari are notably low. This issue is attributed to teachers employing a direct learning model, leading to passive student engagement and boredom. The study aims to identify the learning model used at MI Muhammadiyah Sriwedari and assess the impact of implementing the Realistic Mathematics Education (RME) model on improving mathematics learning outcomes. The research is quantitative and experimental, involving all sixth-grade students at MI Muhammadiyah Sriwedari. Data was collected through student learning outcomes tests, including pretest and posttest results. Data analysis involved normality tests and hypothesis testing using the t-test. Pretest results showed that only 9 out of 28 students (32%) scored above the KKM threshold of 70. After employing the RME model and conducting a posttest with the same questions, 26 students (93%) scored above the KKM 70. SPSS version 26 analysis revealed a t-value of 11.112, which is greater than the t-table value of 2.05183, indicating that the RME model significantly improves learning outcomes in integer operations.

Keywords: Realistic mathematics education model, Mathematics learning outcomes, Elementary school

1 Introduction

Technological developments can be used as a solution to innovate in the field of learning, especially in developing learning models [1]. Learning models are instructions in the form of teaching strategies or programs designed to achieve learning [2]. Learning models have many functions ranging from learning planning and curriculum planning to planning learning materials [3]. In the learning process the teacher has a very important role. Therefore, teachers are required to have various kinds of learning models in order to achieve a good learning process and attract students to participate in learning, especially in learning mathematics.

Mathematics education needs to be provided to all students from elementary school to university. Mathematics can improve critical, systematic, analytical, logical, creative

thinking skills and the ability to collaborate. Thus, mathematics education is able to produce quality students who are characterized by utilizing information, having the ability to obtain and manage it according to the demands of their needs. Therefore, mathematics subjects need to be taught to all students starting from elementary school [4]. Students view mathematics as very boring and difficult, resulting in many students not liking this subject, even as a scourge that must be avoided [5]. This creates a challenge for teachers, especially mathematics teachers. Lack of teacher competence must also be considered because it will cause students to be unhappy with their lessons, which will affect learning outcomes. If a teacher teaches mathematics correctly, it will influence the desires and interests of students [6].

Based on the results of pre-observation at MI Muhammadiyah Sriwedari in mathematics subjects, it was found that students were less able to practice their problem solving skills. Then you can only solve math problems by being guided and the solution requires memorizing mathematical formulas. Students have not been able to understand concepts, sharpen skills and knowledge to solve simple mathematics problems and story problems. The learning activities carried out do not use problem-based matters and students do not solve problems in their own way but imitate the examples given by the teacher. Meanwhile, based on the results of a pre-interview with one of the sixth grade students, the students' perspective on learning mathematics is very difficult. Thus it can be concluded that children have not mastered the concept of whole numbers. However, the learning process still applies a direct learning model in the form of a lecture method, giving assignments and asking questions with students directly. This is proven by the students' learning results when the daily class VI tests with whole number material have not yet reached the KKM. Of the 28 students, only 5 students achieved the KKM score, while the minimum passing criteria in mathematics was 70. This shows that student learning outcomes are still relatively low.

In order to overcome the obstacles experienced during the learning process, the influence of a healthy and good environment can encourage students to have enthusiasm and desire to learn. Apart from that, the learning model can also influence students' conditions when following the learning process, if the conditions they face are less supportive, students will usually tend to be less interested in learning or less concentrated in following each lesson given, especially in mathematics lessons. Based on the facts of this problem, efforts are needed to improve and improve the quality of mathematics learning. One effort that can be implemented is by using the Realistic Mathematics Education (RME) model. This is based on the characteristics of sixth grade elementary school students who are at the concrete operational stage so that learning must be linked to real things. One effort is to use the RME model [7].

The RME model is a learning theory in the field of mathematics, learning to apply various activities (learning to doing) as an effort to rediscover mathematical concepts in real life [8]. The RME model provides students with a clear understanding of its application in everyday life, a field of study that is constructed and developed, how to solve problems in their own way [9]. The RME model aims to make mathematics learning more meaningful and interesting for students by using contextual problems in learning where the problems are appropriate to the students' experiences and knowledge. So this research aims to determine the learning model at MI Muhammadiyah Sriwedari,

the implementation and application of the Realistic Mathematics Education (RME) model to improve mathematics learning outcomes at MI Muhammadiyah Sriwedari.

2   Method

The research method used is a pre-experimental research design. Pre-experimental is a design that is not truly experimental, because external variables influence the formation of the independent variable, this design is useful for obtaining initial information about the research question. This design can occur because there are no control variables, and the sample was not chosen randomly [10].

The design of this research uses the Pre-experimental design One Group Pretest-Post Test method (single group initial test) with a quantitative approach. One Group Pretest-Post Test design is a design that gives a Pretest before being given treatment, then after being given treatment then gives a Post Test [11]. From the results of experimental research with a quantitative approach, it is intended to explain, describe and test the results of learning mathematics in integer material before and after applying the RME model.

The population in this study were all class VI students at MI Muhammadiyah Sriwedari Magelang Regency with a total of 28 students for the 2022/2023 academic year. The sample in this research was class VI students with a total of 28 students. In this research, the technique used to take samples is non-probability sampling in the form of saturated sampling, where the entire population becomes the research sample.

The data collection tools include observation, interviews, documentation and learning outcomes tests. Observations in this research used Participant Observation which was carried out in class VI regarding the implementation of the RME model. An interview was conducted with one of the sixth grade students regarding the steps in implementing the RME model. Documentation is taken from the results of class VI integer material tests. Meanwhile, the test used in this research is an objective test in the form of multiple choice in the form of a Pretest and Post Test. As well as data analysis techniques using the normality test and continued with hypothesis testing using the t test.

3   Result and Discussion

3.1   Research Results

Mathematics learning at MI Muhammadiyah Sriwedari Muntilan, Magelang Regency before implementing the RME Model. Mathematics learning at MI Muhammadiyah Sriwedari Magelang Regency still applies a direct learning model in the form of a lecture method, giving assignments and asking questions with students directly. This learning model has several advantages and disadvantages. In practice, in this model, teachers do not prepare too many extra things. Teachers only need to prepare lesson plans that are in accordance with existing SK and KD and also sound as the main media.

However, in this case it has an impact on class VI students at MI Muhammadiyah Sriwedari. So students tend to be less able to practice their problem solving skills. Then you can only solve math problems by being guided and the solution requires memorizing mathematical formulas. This is proven by the students' learning results during the daily class VI tests with whole number material which have not yet fully reached the KKM.

From the results of the daily tests above, it can be concluded that of the 28 students who were given questions, there were 5 students who got scores above the KKM and were declared passed or 18%, while the remaining 23 students or 82% of class VI MI Muhammadiyah Sriwedari students got scores above below KKM 70. Other information from the table above is that the average student score is 47.68, with the highest score being 95 and the lowest score being 20. This shows that the direct learning model applied has not been able to improve student learning outcomes in the material. class VI integer and is still relatively low.

Application of the Realistic Mathematics Education (RME) Learning Model. The steps for implementing the RME Model in mathematics learning at MI Muhammadiyah Sriwedari are starting with preliminary activities such as opening the lesson by greeting and asking students how they are, students are invited to pray together before learning begins, researchers check student attendance, ice breaking, students pay attention to the teacher's explanation about the objectives, benefits and learning activities that will be carried out.

Furthermore, the core activities include 1) Understanding contextual problems, namely showing and directing students to observe video shows of learning material regarding various integers, then the researcher displays short stimulus shows of problems related to integer material through image displays on the LCD screen, 2) Explaining contextual problems, namely providing opportunity for students to respond and identify problems in the broadcast, 3) Resolving contextual problems, namely students solving problems individually, students can solve them using effective strategies with the help of teaching aids, 4) Comparing and discussing answers, namely students discussing with friends sitting next to him, the researcher accompanies the students during discussions and provides necessary assistance if there are students who do not understand, the student representatives come forward to present the results of their answers and the others pay attention and compare their answers. 5) Summarizing the results of the discussion, namely the teacher and students conclude the lesson material that has been discussed today, after discussing the students play games with props.

Next, the final activity is the closing, namely the teacher and students together conclude today's learning, students listen to the teacher's explanation about learning activities at the next meeting, the teacher closes today's learning by praying together and saying greetings.

The Influence of the Realistic Mathematics Education (RME) Learning Model. Hypothesis testing in the form of a t test in this research uses the Paired Sample Test

which is part of the comparative hypothesis test or comparison test. For the Pretest score, an average score of 61.96 was obtained. Meanwhile, for the Post Test scores, the average learning outcome score was 85.89. Based on the results of the Pretest and Post Test correlation tests, the correlation coefficient value is 0.715 with a significance value (Sig.) of 0.000 so the Sig. 0.000 < probability 0.05 then the data says that there is a relationship between the Pretest variable and the Post Test variable. Meanwhile, from the results of the "Paired Sample Test", it is known that the t count is negative, namely -13,112. The t count has a negative value because the average value of the Pretest results is lower than the average value of the Post Test results. In this context, a negative t value can have a positive meaning. So the calculated t value becomes 13.112. Then it is known that the df value is 27 and the value 0.05/2 is the same as 0.025. This value is used as a reference in looking for the t table in the distribution of statistical t table values, so that the t table value is found to be 2.05183. Thus, because the calculated t value is 13.112 > t table 2.05183, it can be concluded that the RME Model can improve mathematics learning outcomes in integer material.

3.2   Discussion

Realistic mathematics learning is a model that starts from things that are 'real' for students, emphasizing the skills of the 'process of doing mathematics', discussing and collaborating, arguing with peers or classmates. This model aims to encourage students to learn through various real problems in everyday life that are linked to the knowledge they have learned or will learn. The problems posed in the RME model use a real world context. The focus is that students can find and solve their own problems, both individually and in groups, which are related to real events according to students' experiences and are relevant to society.

Mathematics learning at MI Muhammadiyah Sriwedari Muntilan, Magelang Regency before implementing the RME Model. The research results show that mathematics learning at MI Muhammadiyah Sriwedari has not used innovative and creative models. Learning with the right model will certainly help teachers in the learning process. The model applied by the researchers was a direct learning model in the form of giving assignments, questions and answers and the lecture method. This model is deemed not fully suitable to be applied in learning in class VI integer material, because students cannot think critically, which has an impact on student learning outcomes.

This is in accordance with Rosyada's statement in the introductory chapter that by changing students' thinking patterns, teachers need an innovative model in learning that can increase students' abilities in solving problems in mathematics [12]. This is also in line with Haqina's statement that considering the importance of mathematics learning in elementary schools, teachers can apply various models and relate mathematics learning to the world of elementary school students, so that active, creative, effective and fun learning emerges [13].

Application of the Realistic Mathematics Education (RME) Learning Model.
Learning The first step in this research is to provide pretest questions, namely before implementing the RME approach to find out how far students understand the material regarding integer operations. Researchers saw that students still experienced confusion when working on questions. This shows that students do not understand the concepts and material being tested.

The second step is that the researcher provides treatment in the form of learning material on integer operations using the RME model. In the learning process, researchers use educational teaching aids to make it easier for students to understand contextual problems in everyday life. In the final step, the researcher gave post test questions to compare the results between the students' pretest and post test scores.

The results of the research show that the application of the RME model applied by researchers is appropriate and appropriate for use in Mathematics subjects regarding integer operations. Students even participate actively and enthusiastically during the learning process, so that student learning outcomes increase.

This is in accordance with the statement of Fathul and et al mentioned in the results and discussion that the results of test data analysis of student mathematics learning outcomes in the material taught experienced an increase after applying the RME model [14]. This statement is also in line with Ardina and et al that students' learning mastery individually and classically has increased, as can be seen from the post-test learning result data which is better than the pretest [15].

From the results of observations during learning using the RME model at MI Muhammadiyah Sriwedari in the mathematics subject material integers, it was found that class VI students were able to carry out according to the stages or procedures, including visual, verbal, listening, writing, motoric, mental and emotional activity. in learning.

This is in line with the statement of Ardina and et al in the results and discussion that the success of implementing the RME model can be seen through the syntax of the RME model that has been achieved, namely creating an enjoyable class by the way the teacher explains and helps students understand the material presented [15]. This statement is also in line with Artika that the pattern of student interaction during teaching and learning activities during the research was very good. Students are very enthusiastic in participating in learning, students are more active, reactive and students have a high level of curiosity [16].

The Influence of the Realistic Mathematics Education (RME) Learning Model.
RME is a learning model that focuses on using the real world or context and students' experiences as a starting point for mathematics learning [17]. RME is connected to reality, remains close to children's experiences and is relevant, mathematics should not be seen as a closed system but should be seen as a process of mathematization [18]. RME has five principles that are able to restore wrong thinking about learning mathematics and see how important studying mathematics is in human daily activities. There are five principles in RME, namely 1) Use of context, 2) Use of models for progressive mathematization, 3) Utilization of students' construction results, 4) Interactivity, 5) Linkages. Mathematics learning using RME can help students make more sense of mathematics learning classes at school [19].

Based on the research results, the calculated t value is 13.112 > t table 2.05183, so research using the RME Model can improve mathematics learning outcomes in integer material. The results of this research are also in line with relevant research which concludes that the results of the research state that the RME learning model is influential and can be applied in the classroom to improve mathematics learning outcomes [13]. Apart from that, there is a change in student attitudes towards a positive direction in the data from observations in each cycle [20].

The use of the RME model in mathematics learning in elementary schools has benefits such as students will understand mathematical concepts more easily because it is taught in a way that is more realistic and relevant to everyday life, can improve students' critical thinking skills, students will also be better able to formulate clear arguments. and logically in answering mathematics questions, increasing interest in learning mathematics because it is taught in a more active, creative and fun way, and increasing the ability to solve mathematical problems effectively and efficiently, and students will be better able to apply mathematical concepts in everyday life situations days [21–23].

4   Conclusion

Mathematics learning at MI Muhammadiyah Sriwedari Magelang Regency still applies a direct learning model in the form of a lecture method, giving assignments and asking questions with students directly. The direct learning model applied has not been able to improve student learning outcomes in class VI integer material and is still relatively low. To minimize these problems, the RME model is applied. Application of the RME Model can improve Mathematics learning outcomes for class VI students in integer material. This is shown in the analysis of data obtained by researchers, namely the Pretest and Post Test results which have been tested for normality and analyzed using the t test, obtained a calculated t value of 13.112 > t table 2.05183. For further research, research should be carried out on the application of the RME model and other learning models and apply them to various subjects, so that varied learning models will increase students' interest and enthusiasm in learning.

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