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Utilization of manual calculation media in realistic mathematics education to increase students' learning motivation

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Abstract

This research focuses on the influence of learning models; the study's main aim is to determine whether a realistic mathematical education learning model using manual calculation media can influence the motivation of class I students at SDN Temuroso 03. The research method used was a quantitative experimental type, a Pre-Experimental Design with One Group Pretest-Posttest type, and a saturated sample technique of 20 students. Data analysis techniques use prerequisite tests and condition tests. The SPSS research produced results, namely that the data was normally distributed, and the t-test calculations produced that Lower and Upper had negative values or sig (2-tailed) < a, so H0 was rejected, and H1 was accepted. Then, it was strengthened by the gain test results, which showed an increase in the average value of 0.47. So, it can be said that the Realistic Mathematic Education learning model using manual calculation media can influence and increase student motivation

INTRODUCTION

Background of the Study

It is essential to apply learning models to improve the quality of learning. Therefore, there is a need for a learning model that is a solution so that it is accessible and able to achieve learning goals. Apart from that, the choice of learning model must be based on the conditions experienced in learning so that the objectives of the learning model can run as they should and can be used as a solution to existing problems in learning. According to (Ayundhita & Soedjoko, 2014; Lilis Saniah & Pujiastuti, 2021; Sundari, 2015), a learning model is "a set of strategies based on certain theoretical and research foundations which include background,

learning procedures, support systems, and learning evaluations that are shown for teachers and students to achieve certain measurable learning goals."

Various learning models can be selected and used in the learning process, but not all models suit the demand (Lin, 2017; Moneo-Marín et al., 2017). So, it must be adjusted to the existing problems. For example, the Realistic Mathematic Education learning model is suitable for overcoming the problem of students who are inactive when studying so that the process is not monotonous; besides that, it can also hone students' skills in expressing opinions or arguing because it is more focused and student-centred. In line with the thoughts of (Sukri & Widjajanti, 2015 Tanjung, 2019) stated that "The Realistic Mathematic Education (RME) learning model is a learning model that is more student-centered because this learning requires students to be more active than teachers."

Realistic Mathematic Education (RME) is a theory that emerged and developed in Amsterdam, the Netherlands, specifically in the 1970s by Hans Freudhental, focusing on creating meaningful mathematical concepts (Primasari et al., 2021). This concept applies something abstract to concrete by connecting it with real situations to be readily accepted and understood. In line with the (Tanjung, 2019) statement, "Realistic Mathematics Learning is the use of reality and the environment that students understand to facilitate the mathematics learning process." Therefore, this learning model not only makes it easier for students to understand but also makes students active in class so that they focus on the material that will be given.

The Problem of The Study

Based on the results of observations, initial observations, and interviews with a first-grade teacher at SD Temuroso 03, information was obtained that the teacher was still unable to control the class, so the teaching and learning process was not running optimally and had an impact on low cognitive learning outcomes and was still below the standard value Minimum Completeness Criteria. Apart from that, students' lack of interest in learning coupled with the lack of parental support or motivation to study is also a factor in students needing to understand the material being taught. This is magnified by a learning model that is monotonous and less interesting because learning is less focused on students and requires students to continuously pay attention to the teacher without being allowed to express opinions (speak). So, students feel bored, and in the end, their focus is diverted to other activities considered exciting and fun.

First-grade teachers also said that most students lived with their grandmothers because both parents worked or had migrated outside the city, so they needed more study support. The role of parents is significant in encouraging motivation, especially in learning, because parents are the first center of education for children. This is in line with the opinion of (Hero & Sni, 2018; Maida et al., 2023) regarding "The role of parents is the first educational environment and at the same time as the foundation for laying the foundations of education so that they have an important role in determining and fostering the child's development process." (Marini et al., 2017; Rumbewas et al., 2018; Suparlan, 2020) added that "The level of education, income, comfort, parental attention and guidance for children, as well as relationships or situations at home, can all be factors that influence student learning outcomes." Therefore, the relationship between the two influences students' learning motivation; if the relationship is good, motivation is also good, and the impact is that students' cognitive learning outcomes are also good and vice versa.

Research's State of the Art

There needs to be an attractive, fun learning model that can hone students' abilities regarding the material provided. The appropriate solution to this problem is to apply the Realistic Mathematic Education (RME) learning model because this learning model applies actual conditions so that students are active and focused on finding meaningful learning activities for themselves, so that it can be used as a solution to existing problems, especially in first grade.

Apart from that, to support understanding and attract students' interest to focus more on the material being taught. Learning media in the form of manual calculation media can be a solution. This media will strengthen students' understanding and memory in capturing the lessons' content because students can see it directly and implement it in everyday life. This is in line with the opinion of (Ulia, 2018), namely, "Interesting and interactive media can make students enthusiastic in learning so that the material presented can be well absorbed." Learning media itself functions to make it easier for teachers to explain while making it easier for students to understand what is being conveyed (Suhaemi et al., 2020; Wulandari et al., 2023). When students understand and master the material obtained, it will automatically influence learning outcomes. If learning outcomes are reasonable, it can be concluded that student motivation is also good.

The research above emphasizes the use of realistic mathematical education in mathematics learning. The emphasis made in this research is realistic mathematical

education using manual calculation media. Realistic mathematical education in learning implements mathematics into the real world of students. So that students get a clear understanding of solving existing problems or questions; if students can overcome and answer existing issues correctly, it can be concluded that students understand the problem or material being taught. When students' interest in learning increases, students' learning motivation also increases, so it can be concluded that realistic mathematical education also influences student motivation. Based on this explanation, the realistic mathematical education learning model can influence cognitive learning outcomes and student motivation.

Mathematics is essential to every individual, especially in everyday life. Mathematics is not only a subject at school, but mathematics also has benefits for people's daily lives, including first, practicing patience where in teaching mathematics, we need patience in solving mathematical problems that students consider complicated; secondly, practice precision and accuracy in working on mathematical problems, we must be careful so that we can determine the appropriate solution to the problem; third, train how to think, by working on math problems, we can teach how to feel because by doing math problems we are required to find the correct and correct answer; fourth, practice self-discipline; When working on mathematics problems, a person must be systematic based on a regular sequence or steps. So, by working on math problems, everyone can learn to do things in an orderly and structured manner.

Realistic mathematical education has strategic steps in its implementation (Muncarno & Astuti, 2018). First, understand contextual problems. In this step, students try to understand a contextual problem related to mathematics, learning about everyday life. Second, explain contextual issues. After students understand the contextual problem given by the master, in this step, students are allowed to describe the contextual problem and then develop or create a strategy to solve the problem; third, solve the contextual problem. Students, individually and in groups, solve contextual issues in their way. Different solutions and answers are preferred. Fourth, compare and discuss answers. The master provides time and opportunity for students to reach or discuss answers in groups and then check or improve by discussing in class. Fifth, Concluding: The master directs students to conclude a concept or procedure from a problem that has been solved.

Novelty, Research Gap, & Objective

Research conducted by (Suprayogo et al., 2019), namely, "Students with high, medium and low motivation categories, with the RME (Realistic Mathematic Education) learning approach provides better learning achievements compared to conventional learning approaches." From this explanation, it can be concluded that RME can influence learning activities, which leads to cognitive learning outcomes and student motivation. This can be shown from the behavior of students who initially did not pay attention or ignored the material provided but became focused on the lesson and had the opportunity to express and deliver opinions—and obtained from the results of student worksheets taken from previous research.

Research (Muncarno & Astuti, 2018) on the Influence of the Realistic Mathematics Education Approach on Motivation and Learning Results for Elementary Mathematics Material. This research uses a quasi-experimental method, and the conclusion is that RME can increase student learning motivation. Using concrete media in the Realistic Mathematics Education (RME) learning model significantly influences student learning outcomes. In writing, applying Realistic Mathematical Education (RME) increases student learning motivation.

This research has a good view of using the Realistic Mathematic Education (RME) learning model. However, it has not emphasized the use of manual counting media. Learning media can help teachers learn (Jupriyanto & Turahmat, 2018; Nurhayati et al., 2019). The latest research is on using manual counting media in Realistic mathematical education (RME) learning.

METHOD

Type and Design

This research uses a quantitative experimental method, with a Pre-Experimental Design of One Group Pretest-Posttest where the sample is 20 students. Data collection was carried out by distributing questionnaire instruments, then analyzed using prerequisite and prerequisite tests, including data normality tests, t-tests, and gain tests.

The type of experiment used is a pre-experimental design in the form of a one-group pretest-posttest design, with a pretest before the experiment. Quantitative research methods are a type of research whose specifications are systematic, planned, and structured from the start until the creation of the research design. Quantitative research pays more attention to collecting and analyzing data in

numerical and objective form (Baykara & Yakar, 2020). Meanwhile, the experimental method is a research method that aims to explain the cause-and-effect relationship (causality) between one variable and another (variable X and variable Y).

Data and Data Sources

The questionnaire used in this research to obtain student motivation data is a closed questionnaire with a Likert scale model. A total of 20 students were sampled in this research. This completed questionnaire is presented as a table designed so that respondents only need to put a cross in the column provided (Sari & Jupriyanto, 2023). According to (Sundayana, 2020), the Likert scale usually consists of five categories: strongly agree, agree, neutral, disagree, and strongly disagree. Each category has a different score. The table is as follows:

Table 1. Student Motivation Questionnaire Instrument

Aspects	Indicators	Number of Statements
Perseverance	Perseverance in learning	4
Persistence	Tenacious in facing difficulties	3
Interest	Interest and sharp attention to learning	3

Data Collection Technique

In this research, researchers used data collection techniques by giving questionnaires to students. A questionnaire is a way of collecting data by distributing a list of questions to respondents with the hope that they will respond to the list of questions. The questionnaire used is a closed type of questionnaire where respondents choose the answers that have been provided. It contains questions that respondents fill in by ticking in the column provided.

Data Analysis

To analyze the data, the tool used is the t-test on two correlated samples because the samples come from the same subject but have experienced different treatments. Before carrying out the t-test, you must carry out a data normality test as a condition that must be met. The normality test in this study used the Lilliefors test with the help of SPSS.

This research hypothesizes that realistic mathematical education with manual calculation media can influence the motivation of first-grade students at SDN Temuroso 3. Before experimenting, the data instruments were tested for validity, reliability, distinguishability, and difficulty level. So that the data used is genuinely appropriate and of good quality. Then, the data was analyzed using the t-test and gain test. The aim is to find out whether there is an effect and improvement from the experiments that have been carried out. Of course, before this test, a data normality test was carried out, which stated that it was normally distributed.

RESULTS

From the data testing process, it is known that there are differences in results between the pretest and posttest data. Student motivation has changed after implementing the Realistic Mathematic Education learning model using manual calculation media. Then, it is explained with the graphic results below.

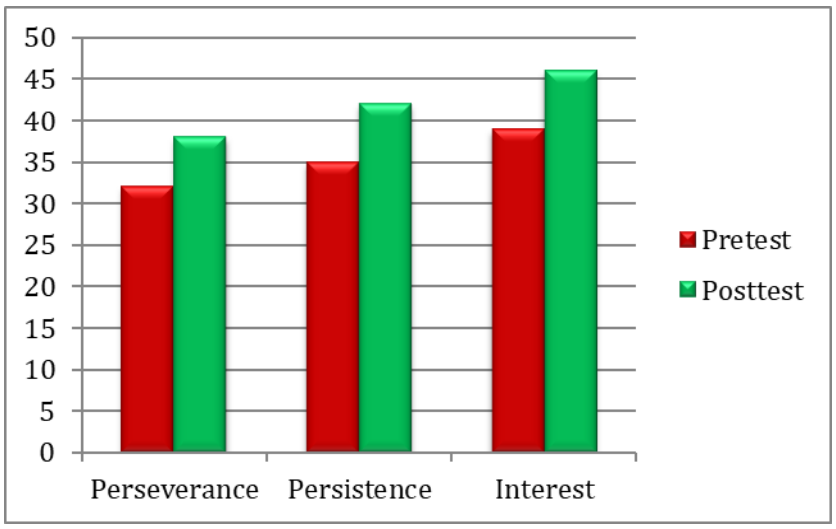

Figure 1. Graph of Average Student Motivation Results

Based on the figure above, it can be seen that there was an increase between the pretest results marked with a red line of 32 (Perseverance), 35 (Persistence), and 39 (Interest) and the posttest with a green line of 38 (Perseverance), 42 (Persistence), 46 (Interest). So, there is a difference in results before and after implementing the Realistic Mathematic Education learning model with manual calculation media on student motivation.

These results were then strengthened by t-test analysis and gain test using SPSS and EXCEL tools; the results were sig values. (2-tailed) = 0.000 or Lower and Upper are negative. Where the criterion is that Ho is rejected if sig. (2-tailed) < α, meaning it can be seen that 0.000 < 0.05 and Lower - Upper is negative. Therefore, Ho is rejected, and H1 is accepted, so it can be said that the Realistic Mathematic Education learning model influences student motivation at SDN Temuroso 3. The following are the results of the analysis using SPSS:

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Pretest - Posttest	-7.050	2.523	.564	-8.231	-5.869	-12.496	19	.000

Figure 2. Paired Sample Test Analysis

For the gain test using a formula calculation, the average result was 0.47. Thus, according to the established criteria, these results fall into the moderate improvement category. So, there has also been an increase in student motivation using the Realistic Mathematic Education learning model.

DISCUSSIONS

The results of this research are in line with the results of research stated by (Fakhriyah et al., 2019), saying, "Motivation is a desire, encouragement or reason that is the basis of a person's enthusiasm for learning so that students get rewards and find interesting things in the learning process so that learning goals are achieved." (Rumbewas et al., 2018) added, "Learning motivation is the overall driving force both from within and outside the student." So, if students are motivated by the learning model, the teaching and learning process will run well and actively, and the goals will also be achieved.

This research is also strengthened by previous research (Oktaviani, 2020) on the Application of Realistic Mathematic Education (RME) Based Teaching Materials

to Increase Student Learning Motivation. This research uses a library study research method, where data collection techniques involve reviewing books, literature, notes, and various reports related to the problem to be solved. This research concludes that applying realistic mathematical education (RME) tends to increase student learning motivation in writing.

This realistic mathematical education learning model can encourage and provide new experiences in learning so that students are enthusiastic and active in learning. This is in line with the opinion of (Suprayogo et al., 2019), who states that "realistic mathematical education can encourage students' activeness and interest in learning to discover mathematical concepts for themselves by using phenomena in everyday life." According to (Oktaviani, 2020), "Realistic mathematical education is enjoyable because students can explore their understanding through the contextual problems presented in it." So, students are given the freedom to find and solve existing problems; this will enable them to think critically and creatively.

Realistic mathematical education has advantages in the learning process. According to (Widana, 2021), the benefit of the realistic mathematical education learning model is that the learning links mathematics to students' daily lives so that the knowledge built by students will continue to be remembered. Meanwhile, the weakness of the realistic mathematical education learning model is that in solving problems, not all students can find various ways to solve the problems given.

CONCLUSION

Based on the results and discussion above, a clear line can be drawn that applying the Realistic Mathematic Education learning model significantly influences the motivation of class I students at SDN Temuroso 3. This is proven by the results of the influence test, namely the Sig. (2-Tailed) = 0.000 < α = 0.05 or Lower - Upper is negative, so H0 is rejected. It was also confirmed that the gain test results had increased by 0.47. Learning using manual counting media influences student learning motivation. Manual counting media can be an alternative learning method that is carried out innovatively. Combining concrete learning media with innovative learning models can motivate children to learn. Based on the results of the research that has been carried out, there is a limitation that this learning model needs to be carried out repeatedly to get used to the process. Moreover, this learning model is new for teachers, especially first-grade elementary school teachers. Apart from that, the results of this research can still be further specified to produce more precise and

better-detailed research. Many other things must be explored regarding the influence of realistic mathematical education learning models on student learning outcomes and motivation.

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