Realistic mathematics education assisted interactive multimedia

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Abstract. This study aims to improve student achievement through the application of realistic mathematical education assisted interactive multimedia. This research used classroom action research, carried out in two cycles. Each cycle consists of planning, action, observing, evaluating and reflecting. The stages of implementing learning begin with the delivery of concrete examples of integer problems, making concrete models up to formal forms of mathematics about integers. The results showed the percentage of students who met the minimum completeness criteria of 71.87%. After improving learning in cycle 2, there was an increase in student achievement of 28.13%. The percentage of students’ achievement in cycle 2 has reached 100%.

1. Introduction

In everyday life, students often relate to problems related to mathematics. The problem that is often found is arithmetic that requires numeracy. Students will have difficulty in understanding the concept if taught by the teacher using an abstract approach, but by giving illustrations and examples of real objects that are around students, the abstract concept becomes easier for students to understand. Therefore the teacher must develop an approach that can link mathematical material to the daily lives of students [1].

The fact that there is still a lot of learning in primary school is still not optimal. The learning process is still going on conventionally and the teacher is central to learning [2]. Conventional makes learning meaningless [3]. Teachers often associate mathematical material in student daily lives, causing students to be less motivated to understand mathematical concepts and have difficulties in applying them to daily life. As a result, mathematics is considered a difficult subject in elementary school and student achievement is less than optimal, including student achievement in integer material.

Some problems of addition or subtraction of integers, often students have difficulty determining the results of addition or subtraction involving negative integers. This is because negative integers are abstract material for primary school students. The location of the abstract is that negative integers are rarely used by students in their lives, so they tend to be mistaken in determining the addition or subtraction of integers [4]. Addition and subtraction are the basis for understanding the next mathematical material. Many mathematical material are related to the concept of addition and subtraction [5].

Student achievement in integer material is still below the minimum completeness criteria. The results of interviews with teacher at grade 4 in SDN 1 Poasia obtained the following data: (1) students who met the minimum completeness criteria were 65.63%; (2) students paid less attention to the
explanations from the teacher and preferred to play alone or talk to their friends during the learning process; (3) the low motivation of student learning, characterized by low student participation in responding to the questions given by the teacher; (4) the teacher low ability to associate mathematical material with students' daily lives; and (5) low media use in mathematics learning.

The application of a learning approach that starts from contextual problems is considered to be able to solve the above problems. Realistic mathematics education (RME) is designed from problems that are around and based on the knowledge that students already have, so students are expected to understand the material better mathematical [6]. The same thing [7] by associating RME with student experience can facilitate the learning process so that learning objectives can be achieved optimally. RME invites students to like mathematics and create contextual conditions that can develop students' mindsets from concrete things to abstract things [8]

Similarly, the use of media is very important in learning mathematics. Without media, communication will not occur and the learning process will not be optimal [9]. Using media can facilitate interactions between teachers, students and learning resources [10]. Current technological developments make it possible to produce technology-based media products that can be utilized in learning. Interactive multimedia offers new things in learning [11]. Using interactive multimedia allows direct interaction with students so that it can foster understanding and improve their memory [12]. Implementing RME assisted interactive multimedia is expected to be able to visualize mathematical objects, especially integer material, into real objects that students often use in their lives.

Previous research has shown that utilizing interactive multimedia in realistic mathematics education can improve student achievement. [13] Developing interactive multimedia in contextual learning can improve students' understanding of concepts. It is seen that classical learning completeness for experimental class is 88% and control class is 66,67%. Other research, [14] apply the 5E learning cycle model (LC5E) assisted by interactive multimedia. Students' achievements with LC5E models assisted interactive multimedia better than conventional models. So as [15] produce RME-based geogebra that provides new experiences so students are more active in fun learning. The novelty of this research is the application of realistic mathematics education assisted interactive multimedia can improve student achievement integer material in grade 4 SDN 1 Poasia.

2. Methodology
This classroom action research is collaborative between teachers and researchers to carry out certain actions. Aim to improve the quality of learning. Implemented at SDN 1 Poasia at Kendari City with subject teachers and grade 4 students.

Model used is Mc. Taggart with four components: (1) planing; (2) actions; (3) observation and evaluation; (4) reflection the impact of actions based indicators of success [16]. Qualitative data from observations of teacher activities and student activities in integer material learning. Quantitative data from student test results. The student achievement referred to in this study is student achievement in the cognitive domain. Descriptive statistics are used to calculate average score, percentage of classical completeness, percentage of teaching teachers and percentage of student learning achieved after learning process takes place in each cycle.

This study determined two indicators of success. Percentage of success using realistic mathematical education assisted interactive multimedia is 85% according to the lesson plan. Percentage of student achievement increase is 80% has obtained a score of 70.

3. Result and Discussion
3.1. Actions
This research was conducted in two cycles. Each cycle consists of two meetings. Researcher collaborates with teacher grade 4. Researcher acts as an observer and teacher acts as executor of action. Actions follows steps of realistic mathematical education assisted interactive multimedia.

Material in cycle 1 focuses on addition of integers and cycle 2 focuses on subtraction of integers. For example realistic mathematical education assisted interactive multimedia on addition of integers.
3.1.1. **Concrete stage.** Teacher gives an example of a problem related to student life about addition of integers. For example: "Andi walked forward six meters. Then he retreated three meters. And where is Andi now?" Students answer these questions with different answers. Learning at this stage is in line with Bruner's theory which explains that learning begins with linking material to student life.

3.1.2. **Concrete model stage.** Students must understand rules for modeling addition of integer. If integer is positive, students forward. If integer is negative then students retreated. After understanding rules, teacher guides students to demonstrate addition of positive and negative integers. Students forward six meters then retreat three meters. Now student's position is three meters. This demonstration serves as a liaison for students' thinking from concrete to semi abstract.

![Figure 1](image1.png) Students demonstrate addition of $(6) + (-3)$.

![Figure 2](image2.png) Students forward six unit then retreat three unit.

![Figure 3](image3.png) Results show $(6) + (-3) = 3$.

3.1.3. **Formal model stage.** Students work task with aided formal media in interactive multimedia. Through teacher guidance, students solve problems related to addition of integer.

3.1.4. **Formal mathematics stage.** Students change their work from formal media models into mathematical symbols. Example $(6) + (-3) = 3$. Then students present their work assisted of interactive multimedia alternately.

3.2. **Observation**

During realistic mathematic education, researchers conducted observations using observation sheet. Observation sheet contains teacher teaching and student during learning process. The results of observations on teacher teaching and student learning presented in table 1.

| Activity       | Percentage (%) | Cycle 1 | Cycle 2 |
|----------------|----------------|---------|---------|
| Teacher teaching | 80,50          | 92,60   |
| Student learning  | 72,42          | 88,64   |

Table 1. Observation results on realistic mathematic education.
Table 1 shows increase teacher teaching from cycle 1 to cycle 2 with percentage of 12%. Similarly, student learning activities increased by 16.22%. This increase indicates that teacher has corrected weaknesses arise in cycle 1. These weaknesses include: (1) teacher has not been skilled in managing class and learning time so that application of realistic mathematics education added interactive multimedia has not been maximized. Teacher fixes it by preparing learning resources needed students before starting learning; (2) students do not focus attention teacher in performing the "direction and movement student" to solve problems integer material, making it difficult for them do re-demonstration. Teacher fixes it by using more varied and enjoyfull learning methods; (3) students not skilled at using interactive multimedia. Teacher giving more intensive guidance and direction groups who have difficulty using interactive multimedia; (4) in one group there five students so that learning in concrete model stage and formal models becomes less effective. Teacher dividing groups of 3-4 children and; (5) students having difficulty doing test. Teacher giving additional activities with submitting questions and answer practice questions packaged in interactive multimedia. This research activity is able to improve ability teachers to apply realistic mathematics education.

3.3. Evaluation

Student achievement tests are carried out after cycle 2 ends. Conducted to measure students' ability at integer material. Students answer as many 20 items individually. This test is packaged in interactive multimedia. Before answering test, students first read instructions in working on the problem and fill name on form provided. After that students directed in answering questions by choosing one correct answers. After test end, students can immediately find out their achievements.

Results analysis show number students who meet completeness criteria is 23 student or 71.87%. This not fulfilled success indicators, number students who meet completeness criteria of at least 80% so research continued in cycle 2. After carrying learning improvement in cycle 2, can be seen an increase in student achievement of 28.13%. Number students who met completeness criteria is 32 student or 100% so that study was stopped in cycle 2. In line with results study [17] which concluded students achievement increased through realistic mathematics education. Percentage students achievement completeness in cycle 1 is 61.90% and cycle 2 is 76.19%. Likewise results study [18] concluded that RME-based mathematics learning CDs developed able to improve students' abilities.

Systematic preparation of material and interesting packaging ranging from concrete to abstract stages can stimulate students' thinking skills gradually. Integer material presented systematically and interestingly on realistic mathematic education assisted interactive multimedia will be easy for students to learn. In addition, linking material to student life can strengthen students' memory in understanding integer material.

4. Conclusions

Application of realistic mathematic education assisted interactive multimedia on integer material can improve student achievement in grade 4 SDN 1 Poasia. This can be seen from number students who meet completeness criteria in cycle 2 an increase from cycle 1. Cycle 1 there were 23 student or 71.87% with average score of 70.63. Cycle 2 has reached 32 student or 100%.

5. References

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