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by Hendra Erik Rudyanto

Submission date: 20-Jul-2023 11:16AM (UTC+0700)
Submission ID: 2133887720
File name: reviu_hendra_19_Juli_2023.pdf (990.48K)
Word count: 2901
Character count: 16572

Jurnal Bidang Pendidikan Dasar
Vol 4 No 1, Januari 2020, pp 1-9
Available at:
http://ejournal.unikama.ac.id/index.php/JBPD

The Implementation of RME Approach Using Concrete Objects Media to Improve the Mathematical Connection Skill of Fifth-grade Elementary School Students

Hendra Erik Rudyanto*, Destia
Universitas PGRI Madiun, Indonesia
*hendra@unipma.ac.id**

Abstract: *Mathematical connection skill needs to be mastered. Therefore, students can relate to the mathematical concepts they learn daily. This study aims to determine: 1) implementing a realistic approach to enhance mathematical connection skills using concrete objects as media and 2) improving the mathematical connection skill by applying the Realistic Mathematics Education approach using concrete objects as media in fifth-grade elementary school students. The research subjects consisted of 17 students. The method of this study is Classroom Action Research. The data collection method is by tests, using mathematical connection questions as the instrument. The research results show that in Cycle I, eleven students (64.7%) passed the minimum score, while six students (35.3%) did not, with a classical average of 73.83. In Cycle II, 14 students (82.35%) passed, and three (17.65%) did not, with a classical average of 82.65. These findings indicate that applying the Realistic Mathematics Education (RME) approach with concrete objects as media can improve the mathematical.*

Keywords: *RME approach; concrete objects media; mathematical connections*

Introduction

Mathematics needs to be taught to students early, starting from elementary school. Learning mathematics in elementary school is beneficial for long-term life goals (Kenedi et al., 2019). Mathematics is beneficial in budgeting, understanding numerical data, trading, and other everyday activities (Hennessey et al., 2012). Furthermore, NCTM states that mathematics is taught to students to develop reasoning, connection, problem-solving, communication, and representation skills (Rickard, 2005). Therefore, learning mathematics is essential for students to be prepared to face problems in their lives.

The ability to solve mathematical problems in life can only be achieved if students have the skill of mathematical connection. Students can connect mathematical concepts with other skills in their daily lives with this skill (Bahr & DeGarcia, 2008). Mathematical connection is an important skill to be learned and developed because it will help students understand the application of various mathematical concepts in their daily lives (Siagian, 2016). With mathematical connections, students will experience the benefits of learning mathematics, and their understanding of the mathematical concepts they learn will last longer.

https://doi.org/10.21067/jbpd.v4i1.3949

The importance of mathematical connections is challenging. Initial observations show that fifth-grade elementary school student's mathematical connection skills are low. Out of 17 students given mathematical connection problems, only three (17.65%) passed the predetermined minimum score or passing grade. It means that 14 students (82.35%) did not pass, with a classical average of 69.24. Various factors cause this problem. Based on the teacher's reflection, it is due to the inadequacy of the applied teaching model and the lack of appropriate teaching media, as the teachers solely rely on worksheets. Learning should be conducted effectively and engagingly. Teachers should also use effective and efficient learning strategies that align with the curriculum and the student's learning mindset (Herzamzam, 2018). Inappropriate media implementation and a constant focus on drill tests by the teacher can affect student learning outcomes (Indiati et al., 2021).

This low mathematical connection skill problem in elementary school students must be solved. Suitable mathematics learning methods, such as Realistic Mathematics Education (RME), can help develop mathematical connections and bridge the gap between abstract mathematical characteristics and children's concrete cognitive development. Gravemeijer (2010) states that RME is a learning and teaching approach that uses reality as a starting point in the learning process to support students in constructing and rediscovering mathematics through contextual problems. Thus, RME learning begins with familiar contextual problems so students can easily understand the mathematical concepts being taught. In addition, to maximize learning outcomes and support the learning process, using concrete media can help concretize abstract concepts (Ardhiyah & Radia, 2020). Concrete object usage in mathematics learning is one of the methods which has many advantages in solving mathematical problems for elementary school-age children.

Studies about implementing a realistic approach with concrete media show improved learning outcomes, such as a study by Setyawan which showed an increase in learning outcomes from 73.68% in cycle 1 to 100% in cycle 2 (Setyawan, 2020). Another study on RME application with concrete media, such as with an intelligent clock, significantly impacted elementary school students' mathematics learning outcomes (Ananda, 2018; Hasibuan et al., 2022). Implementing RME can also improve the learning outcomes of elementary school students (Shandy, 2016). Therefore, this study aims to find how applying a realistic mathematics approach with concrete media can improve elementary school students' learning quality and mathematical connection skills.

Methods

The research method used in this study is Collaborative Classroom Action Research (CAR). CAR is self-reflective research conducted to improve the learning process during the implementation of teaching (Ritonga et al., 2020). The study is carried out in an elementary school located in Madiun Regency. The subjects taken for this study are 17 students of class V or fifth graders, which consists of twelve female students and five male students.

This study is conducted for four months. The Collaborative Classroom Action Research (CAR) is held in two cycles, where each cycle consists of four stages of activities in accordance with Mac Kemmis and Taggart model, namely: 1) planning, 2) action, 3) observation, and 4) reflection (Mulyati & Evendi, 2020). The technique of data collection in this study is through the usage of tests. The instrument used is a mathematical connection test. The test results are then identified by calculating the average score. Subsequently, the average score is a guideline for determining the study's success.

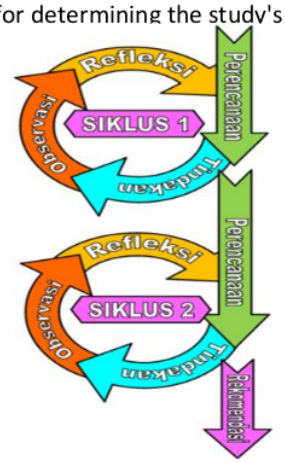

Figure 1. Classroom action research cyrcle chart

The indicator of success in this study is when students can achieve a learning completeness of ≥ 75%. Classical completeness can be considered successful if the average score is ≥ 75, according to the predetermined minimum score. If the students' mathematical connection skill meets the indicator of success, the cycle will stop.

Results and Discussions

This study is conducted based on the initial condition (pre-cycle) in learning about the volume of rectangular prisms through word problems. In the pre-cycle condition, the planning process for learning about the volume of rectangular prisms through word problems involves creating a lesson implementation plan and preparing evaluation sheets. After planning the learning activities, the teacher implements the lesson and assesses the students' mathematical connection skills. Out of 17 students, only three students (17.65%) achieved the predetermined minimum score. It means that 14 students (82.35%) did not achieve the standard score, with a classical average score of 69.24. The percentage of students who meet the score is classified as very low. Therefore, the teacher needs to reflect on the pre-cycle learning. Based on the observations made during the pre-cycle, the teacher analyzes that the low mathematical connection skill of the students is due to their lack of practice in understanding mathematical word problems and their lack of interest in the applied teaching method. Hence, the learning process in Cycle I needs to be improved by implementing a realistic mathematics approach with the support of concrete media.

The learning process improvement in Cycle I was carried out at the end of 2022 in the elementary school. The planning of learning process improvement for Cycle I starts with creating a learning design, including an implementation plan for the improvement and mathematical connection questions. Thus, it was expected that the Cycle I learning process improvement would proceed well according to the prepared plan—however, the result of the learning process improvement of Cycle I was not considered successful yet. The result shows that in Cycle I, 11 students (64.7%) pass the minimum score, while six students (35.3%) do not, with a classical average score of 73.83. Therefore, further improvement needs to be carried out in the learning process of Cycle II.

Table 1. Success rate of students' mathematical connection ability

No	Data	Percentage	Everage
1	Pre-cycle	17,65 %	69,24
2	Cycle I	64,7%	73,83

After the improvement process in Cycle I is complete, a reflection on the strengths and weaknesses of the improvement in the learning process of Cycle I is conducted. The strengths of the improvement process in Cycle I are: (1) Excellent time management, (2) Excellent interaction with students, (3) The teacher can explain the use of the realistic

mathematics approach with concrete media effectively, (4) Actions are carried out as planned, and (5) All students are actively engaged in the learning process. However, the weakness identified is the teacher has not presented the material by relating it to everyday life (context). Additionally, the student's groups in applying concrete media are not heterogeneous, so in Cycle II, the groups are rearranged.

The result of the improvement in the learning process of Cycle II is successful. The study shows that 14 students (82.35%) pass the minimum score, while 3 students (17.65%) do not, with a classical average score of 82.65. Therefore, study is stopped because it has already achieved the indicator of success that had been set.

Table 2. Success rate of students' mathematical connection ability

No	Data	Percentage	Everage
1	Pre-cycle	17,65 %	69,24
2	Cycle I	64,7%	73,83
3	Cycle II	82,35%	82,65

After the improvement process in Cycle II is complete, a reflection on the strengths and weaknesses of the improvement in the learning process of Cycle II is conducted. The strengths of the improvement process in Cycle I are: (1) Excellent time management, (2) Excellent interaction with students, (3) The teacher can explain the use of the realistic mathematics approach with concrete media effectively, (4) Actions are carried out as planned, and (5) All students are actively engaged in the learning process.

Based on the data, it is evident that the use of the realistic mathematics approach (RME) with the support of concrete media can improve the completeness of students' mathematical connection abilities in the topic of rectangular prisms volume through mathematical connection questions. In this process, students gained several learning experiences, including: (1) Experiences of working together, (2) Experiences of calculating objects directly, (3) Active involvement in every learning activity, especially in discovering volume and solving problems using concrete objects, (4) Improving students' mathematical connection skill. These results confirm that RME is an approach that links mathematical concepts to everyday life so that learning is more meaningful (Tandililing, 2010). besides that RME learning also provides a wide space for students, while the teacher acts as a motivator and facilitator (Handayani, 2015). Implementing the Realistic Mathematics

Education (RME) approach with concrete media support, especially for mathematics subjects, can positively impact learning outcomes.

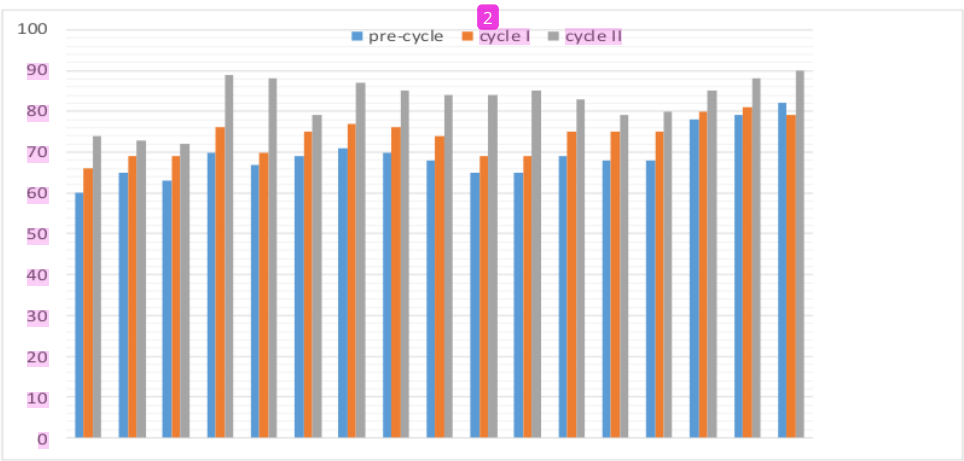

Figure 2. Students' mathematics connection skill on Pre-cycle, Cycle I, and Cycle II

Based on the result of the student's mathematical connection skills in the pre-cycle, Cycle I, and Cycle II, it can be concluded that out of the minimum passing score of 75, only three (17.65%) out of 17 students passed it. This means that 14 students (82.35%) did not pass, with a classical average score of 69.24. In Cycle I, 11 (64.7%) passed, and 6 (35.3%) did not, with a classical average score of 73.83. In Cycle II, 14 students (82.35%) passed, and three students (17.65%) did not pass, with a classical average score of 82.65.

based on these results indicators of success in achieving targets that have been set. This proves that the use of the RME approach with concrete media has an impact on increasing students' mathematical connection abilities. RME learning can improve mathematical connection skills because RME allows students to carry out problem solving activities (Bunga et al., 2016). the characteristics of the RME approach also include intertwining which allows students to link the concepts learned with mathematical problems in life (Maulana, 2009). the RME approach with concrete object media makes it easier for students to understand the material presented by the teacher (Setyawan, 2020). the RME approach with media of concrete objects also improves students' abilities in solving real-world problems (Noviyana, H dan Fitriani, 2018; Rosyada et al., 2019).

Conclusion

The implementation of RME approach with the support of concrete objects in mathematics learning can improve the mathematical connection skill of elementary school students in grade V. Through the RME approach, students are provided with the opportunity to engage in meaningful learning. Therefore, the learning process should allow students to engage in problem-solving activities so they can relate the concepts they have learned to their everyday life.

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