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The Effect of Realistic Mathematics Education to Overcome Students' Mathematical Misconceptions about Fractions in SDN 327 Sinunukan

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Abstract

Misconception is one of the things that teachers and students need to avoid in learning mathematics. The reality in the field shows that there are still many students who experience misconceptions in learning mathematics. One of the efforts to overcome this problem while making learning in the classroom more impactful is the Realistic Mathematics Education (RME) learning approach. This study aims to see the improvement of student learning outcomes through learning mathematics with the RME approach. This research method uses action research (PTK) method. This study examined the topic of fractions in the third grade of State Elementary School 327 Sinunukan. The population of this study amounted to 42 people. Data collection techniques used observation methods, interviews, questionnaires, giving learning outcome tests, and discussions with subject teachers. Data analysis was done quantitatively with descriptive statistics on test results. The results showed that (1) the application of Realistic Mathematics Learning in cycle I increased to 80.55% (sufficient category), (2) in cycle II increased to 85.60% (good category). The average increase of the cycle in RME learning was 35.4%. This research shows that learning with the RME approach can improve the learning outcomes of third grade students of State Elementary School 327 Sinunukan on fraction material.

Keywords: Fractions Concept; Misconceptions; Realistic Mathematics Education.

Abstrak

Miskonsepsi menjadi salah satu hal yang perlu dihindari guru dan siswa dalam pembelajaran matematika. Kenyataan di lapangan menunjukkan bahwa masih banyak siswa yang mengalami miskonsepsi dalam pembelajaran matematika. Salah satu upaya untuk mengatasi masalah ini sekaligus membuat pembelajaran di kelas lebih berdampak yaitu dengan pendekatan pembelajaran *Realistic Mathematics Education* (RME). Penelitian ini bertujuan untuk melihat peningkatan hasil belajar siswa melalui pembelajaran matematika dengan pendekatan RME. Metode penelitian ini menggunakan metode action research (PTK). Penelitian ini mengkaji topik pecahan di kelas tiga SDN 327 Sinunukan. Adapun populasi penelitian ini berjumlah 42 orang. Teknik pengumpulan data menggunakan metode observasi, wawancara, angket, pemberian tes hasil belajar, dan diskusi dengan guru mata pelajaran. Analisis data dilakukan secara kuantitatif dengan statistik deskriptif terhadap hasil tes. Hasil penelitian menunjukan bahwa (1) penerapan Pembelajaran Matematika Realistik siklus I meningkat menjadi 80,55% (kategori cukup), (2) pada siklus II meningkat menjadi 85,60% (kategori baik). Peningkatan rata-rata siklus dalam pembelajaran RME sebesar 35.4%. Penelitian ini menunjukkan bahwa pembelajaran dengan pendekatan RME dapat meningkatkan hasil belajar siswa kelas tiga SDN 327 Sinunukan pada materi pecahan.

Kata kunci: Konsep Pecahan; Miskonsepsi; Pendidikan Matematika Realistik.

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INTRODUCTION

Education is a systemic entity comprising interrelated components that function collectively toward achieving specific goals. Each subsystem within the educational system consists of interconnected elements that operate dynamically as a unified whole (Kioupi & Voulvoulis, 2019). In the context of Indonesia, the educational system has shown significant progress, aligning with the nation’s evolving needs and the rapid advancement of technology in recent years (Kemendikbud, 2017;

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Mulyani, 2019). However, while such developments offer new opportunities, they also demand continuous adaptation in curriculum design, teacher competencies, and educational policies to ensure that the quality of learning keeps pace with global standards.

Mathematics is the basis of science and technology, so it needs to be understood, taught, and mastered so that it can be applied in everyday life (Rangkuti et al., 2020). Fraction is one of the essential topics in mathematics (Ariani, 2010), which requires a good concept to understand it. Inadequate conceptual understanding in mathematics can hinder students' ability to grasp more advanced or related concepts (Goos, 2002). One of the causes of misconceptions is the lack of understanding of students in receiving explanations from teachers during the learning process (Afriansyah, 2022). This condition is due to the learning made by the teacher making students bored during the teaching and learning process. Therefore, it is necessary to identify what misconceptions students have and their causes to determine alternative solutions.

Misconceptions are confusion in using and connecting concepts in solving appropriate problems (Biber et al., 2013). This usually happens because students misunderstand the basic concepts at the beginning, and from that, they build their own (but incorrect) understanding based on what they've experienced, which causes them to repeat the same mistakes (Corradini et al., 2017). In learning mathematics, misconceptions can show up at different levels of education (Hamzah et al., 2021). One example is in elementary school, especially in the topic of fractions.

Fractions are one of the math topics that are often difficult to teach. This difficulty can be seen from the lack of meaningful learning activities provided by teachers, as well as the challenge of finding learning media that match what the teacher wants to deliver (Kurniawan et al., 2018; Sari, 2010). Therefore, it's important for teachers to understand and use appropriate learning media that suit the characteristics of fraction material. This shows that the concept of fractions has its own level of difficulty for elementary school students.

Difficulties in understanding fraction material are not only described by Kurniawan et al. (2018), researchers also conducted a preliminary study at Sinunukan State Elementary School 327. The results showed that the average value of the mathematics formative test on the subject of fractions in the third grade of Primary School 327 Sinunukan in the 2022/2023 academic year was 60. On the other hand, the Minimum Completeness Criteria (KKM) set for the field of mathematics is 70. This shows that the average value of students' formative tests in mathematics with the subject of fractions in the third grade of Primary School 327 Sinunukan is declared incomplete.

The results of the preliminary study show that there are difficulties for students in understanding fractions. If this is left unchecked, it will have a side effect on students, namely difficulties in understanding rational, irrational, and other numbers (Kurniawan et al., 2018). In the long run, this will hinder the formation of competent future generations. Therefore, a teacher's ability to provide understanding to students, especially fraction material, is important.

On the other hand, many efforts have been made by teachers to improve students' math learning

outcomes. Among them are providing textbooks, teacher training and certification, discussions at the Subject Teacher Consultation (MGMP) forum, and curriculum improvements to achieve success in learning mathematics (Herawati et al., 2023; Hudojo, 1988; Patahuddin et al., 2019). In addition, the teacher's ability to choose a relevant learning model for the material being taught also affects the level of student ability (Joyce & Calhoun, 2014). Therefore, one of the efforts in improving students' understanding of mathematics is by choosing the right learning approach.

One of the relevant approaches in learning mathematics is Realistic Mathematics Education (RME). The RME approach is interpreted as learning that brings mathematics to be close to students' lives (Gökbulut & Yiğit, 2022; Suardipa & Handayani, 2021). In addition, the RME approach also plays a role in overcoming students' misconceptions in understanding a mathematical concept (Purna et al., 2021; Rangkuti et al., 2020). The RME approach is seen as changing students' perceptions to like math more and be able to use it to solve everyday problems (Puspitasari & Airlanda, 2021; Suryati & Krisna, 2021; Zanten & Heuvel-Panhuizen, 2021). Thus, it is expected that the RME approach can improve and help students in learning mathematical concepts, especially on the subject of fractions.

Based on the description that has been presented, the concept of fractions is one of the scourges for students. On the other hand, the RME approach is one of the 'tools' that can overcome students' misconceptions. Therefore, the author intends to conduct a practical study through a classroom action research involving the RME approach on fraction material. Thus, this research is entitled the effect of using Realistic Mathematics Education to overcome students' mathematical misconceptions on fraction materials in the third grade of State Elementary School 327 Sinunukan.

METHODS

This research was conducted at State Elementary School 327 Sinunukan. This research was conducted for about 3 months, namely July to September 2022. The method used in this research is classroom action research (PTK) (Arikunto, 2013). Classroom action research (PTK) is research that identifies student problems and then determines an action by the researcher to solve the problem. The population in this study were all third grade students of State Elementary School 327 Sinunukan, East Angkola sub-district, 2022/2023 academic year, totaling 42 people consisting of 2 classes, namely class 3-A which numbered 20 people and class 3-B 22 students. In this study, researchers determined the population as well as the research sample. The research was conducted with one preparation stage (pre-cycle) and two cycles. This research applied realistic mathematics education approach on fraction material. Data analysis was done quantitatively with descriptive statistics on student learning outcomes during both cycles.

RESULTS AND DISCUSSION

Initial condition (pre-cycle), first cycle, dan second cycle.

At the initial condition stage, researchers made preparations by preparing lesson plans and providing student assignment sheets. The instruments used included student activity sheets and

observation sheets. The material taught was fraction material. At this stage, the researcher planned the fraction material to be taught with the Realistic Mathematics Education approach. The application of the RME approach aims to minimize students' misconceptions and bring mathematics closer to students' lives.

At the cycle 1 stage, researchers applied fraction learning in Sinunukan State Elementary School 327 students with the realistic mathematics education approach. This RME approach was applied in both classes, namely class 3-A and class 3-B. The results of the cycle 1 stage showed that the application of Realistic Mathematics Learning was at a percentage of 70.55%. In other words, the cycle 1 stage showed positive results in making students understand the concept of fractions. In addition, the results in cycle 1 showed a sufficient category. Nevertheless, the researcher continued at the cycle 2 stage in applying RME on fraction material.

At the cycle 2 stage, researchers applied fraction learning with a similar approach, namely realistic mathematics education. The results of the cycle 2 stage showed remarkable progress. Cycle 2 showed the application of the RME approach which reached 85.60%. This means that the RME approach can be applied in learning fractions. This result also shows that students' misconceptions about fractions can be overcome through the RME approach.

The results of the application of the RME approach in fraction material.

Based on the classroom action research that has been conducted, the researcher presents the progress of student learning outcomes in learning with the RME approach to fraction material in Table 1 below:

Table 1. Student learning outcomes in learning with the RME approach

Initial condition (pre-cycle)	First cycle	Second cycle	Average improvement
50,20	70,55	85,60	35,4

The application of the Realistic Mathematics Education (RME) approach in learning mathematics fraction material at State Elementary School 327 Sinunukan showed a significant improvement in student learning outcomes. Based on classroom action research (PTK) conducted over two cycles, students' average scores increased from 50.20 in the pre-cycle to 70.55 in the first cycle, and then to 85.60 in the second cycle. This shows an increase of 35.4 points from the initial condition. These quantitative results show that the RME approach not only succeeded in improving mathematical understanding, but also involved mathematics with students' daily lives. So that the RME approach helps students in understanding abstract mathematical concepts such as fractions.

In addition, the RME approach also contributed positively to changes in student behavior during mathematics lessons. Students feel enthusiastic, active, and confident in solving fraction problems

related to real-life situations. This is a sign that a relevant learning context can increase students' motivation and interest (Pratiwi & Wiarta, 2021; Puspitasari & Airlanda, 2021). The RME approach also allows students to connect their mathematical knowledge with their experiences, thus helping to reduce misconceptions, especially in operations involving fractions (Warsito et al., 2019).

The stages in RME, which start from contextual problems, informal strategies, to formal mathematical concepts have helped students in constructing their own understanding (Afriansyah, 2022; Hidayah et al., 2019). Students do not only receive information from the teacher, but also participate in exploring and understanding the fraction concepts learned. The researcher observed that most students were actively involved and able to communicate their understanding during learning. This is in line with the research of Hidayah et al. (2019) and Warsito et al. (2019) who found that students taught through RME became more active and their learning outcomes improved significantly. The RME approach makes the classroom atmosphere interactive while fostering students' curiosity in solving problems that are close to their lives (Pratiwi & Wiarta, 2021).

The findings of this study also showed an increase in students' ability to solve fraction problems. When students were given the opportunity to analyze contextual fraction problems, they tried to solve them with their logic and experience. This finding is consistent with Hasibuan et al. (2019) and Setiawan & Wijaya (2022), who concluded that learning tools based on RME principles are effective, practical, and valid in improving student performance. In addition, the RME approach taken by teachers also facilitates students to move from contextual examples to formal mathematical forms such as fractions (Warsito et al., 2019). This helps students in understanding fractions and reduces the risk of memorization.

Although the RME approach shows positive results, it also has its own challenges. The RME approach requires teachers to be more creative and innovative, especially in preparing the right learning media (Puspitasari & Airlanda, 2021; Suryati & Krisna, 2021). Teachers must be able to design and select problem contexts that are close to students and ensure that the problem context meets the mathematical concepts discussed (Purna et al., 2021). Some studies even use visual and manipulative media in the RME approach, such as fraction strips, contextual story problems, or interactive games (Puspitasari & Airlanda, 2021; Warsito et al., 2019). In other words, the role of the teacher in RME is not as a source of knowledge, but as a facilitator who guides student discovery and supports concept formation.

This research also shows that students' math skills and learning independence in learning fractions have improved after the implementation of learning with a realistic mathematics approach. This finding is supported by the results of research conducted by Hasibuan et al. (2019) who in their research that the realistic mathematics learning approach makes the learning tools they developed are on effective, practical and also valid criteria. Likewise, Afriansyah (2022) explained that the RME approach helps students understand flat geometry material.

Finally, the findings of this research are expected to provide practical insights for mathematics educators, particularly at the elementary level. Teachers and prospective teachers are encouraged to adopt and integrate RME into their instructional practices, especially when teaching complex topics like fractions that are often misunderstood by students. The use of realistic contexts not only improves comprehension but also helps reduce learning anxiety and promotes student confidence (Pratiwi & Wiarta, 2021; Puspitasari & Airlanda, 2021). By integrating RME into the curriculum, educators can foster a more meaningful, student-centered learning experience (Zanten & Heuvel-Panhuizen, 2021). This study highlights the importance of ongoing professional development for teachers in designing lessons that align with the principles of RME and address students' learning needs effectively.

CONCLUSION

Based on the results and discussion, it can be concluded that the application of realistic mathematics approach for fraction material in the third grade of Primary School 327 Sinunukan is in the good category. In addition, learning with the RME approach for two cycles was able to improve student learning outcomes, from 50.20% to 85.60%, with an average increase of 35.4%. This means that the increase in learning outcomes with the RME approach is in the good category. In addition, the researcher concluded that there was a good impact of the RME approach in overcoming students' misconceptions in learning fraction materials. Hopefully, this research can be an inspiration for teachers to apply RME in the classroom and become a reference for academics and other researchers to develop RME in various learning tools.

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