Jurnal Profesi Guru Indonesia
Volume 1 (2) 178 – 190 June 2024
The article is published with Open Access at: https://journal.mgedukasia.or.id/index.php/jpgi

Improving Mathematics Learning Outcomes on the Concept of Number Multiplication with a Realistic Mathematics Education Approach at SD Negeri Cijeruk I Mekar Baru

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Abstract: The Realistic Mathematics Education approach is one of the ways to improve student learning outcomes in Mathematics subjects, because mathematics is very closely related to everyday life. In this research, the Classroom Action Research method is used which consists of four stages, namely, the planning stage, the implementation stage, the action stage, the observation and reflection stage. The four stages cover two cycles. While the data collection instrument in this research includes observation guidelines based on learning levels, learning outcomes tests to determine the improvement of student learning outcomes after the learning process given by the teacher using the Realistic Mathematics Education Approach, interviews to find out the problems that occur in schools and documentation. The data analysis technique used in this method is the average value of the class and the percentage of completion. Thus it can be concluded that using the Realistic Mathematics Education approach can improve the learning outcomes and activities of students in class IV of the Negeri Cijeruk Satu Subdistrict, Mekar Baru Subdistrict, Tangerang Regency. on the concept of multiplication of numbers, the material operation of multiplication of one-digit numbers with two-digit and three-digit numbers and multiplication operations in accordance with the nature of multiplication. This can be seen from the average value of the precycle before using the Realistic Mathematics Education Approach of 43.5 with a completion percentage of 24%, cycle I after using the Realistic Mathematics Education Approach increased by 64.4 with a completion percentage of 60% and cycle II increased by 83.2 with a completion percentage of 96%. As for student learning activities in cycle I reached 20%, and in cycle II reached 96%.

Keywords: realistic approach, mathematics education, learning outcomes.

Received March 27, 2024; **Accepted** Mei 19, 2024; **Published** June 30, 2024

Citation: Faizah & Atikah. (2024). Improving Mathematics Learning Outcomes on the Concept of Number Multiplication with a Realistic Mathematics Education Approach at SD Negeri Cijeruk I Mekar Baru. *Jurnal Profesi Guru Indonesia*, 1(2), 178–190.

INTRODUCTION

Mathematics is very important to be taught, because it is related to other subjects, also applied in everyday life. Therefore, the absolute ability must be possessed by every student. Teaching mathematics is required to always adapt to the progress of the times. For that reason, the mathematics curriculum has undergone changes with the birth of KTSP (Educational Unit Level Curriculum). With this curriculum change, it is hoped that

students can better understand the concepts of mathematics, especially the basic concepts of mathematics. However, the reality in the field does not always match the desired expectations in learning mathematics. The problem that occurs in Cijeruk State Elementary School I, Mekar Baru Subdistrict, Tangerang Regency is the low math learning outcomes of students. It turns out that there are still students who do not understand the concept of mathematics, especially the multiplication of numbers. Multiplication is a topic that is difficult for some students to understand. This can be seen from the large number of SD/MI students who have not yet mastered the topic of multiplication, so that they experience many difficulties in performing the operation of multiplying numbers. Therefore, learning outcomes in mathematics subjects about the operation of multiplication of counting numbers have not reached the KKM (Minimum Completion Criteria) which is 55%.

This is very unfortunate because considering the material presented is similar to everyday life, apart from that multiplication operation is also a basic ability that students should have. Basic skills are very supportive for learning to the next level. If this is left alone, then students will experience learning when receiving advanced material. Students' difficulties in solving multiplication problems can be caused by several factors, one of which is the conventional way of teaching. In teaching, the teacher only uses the lecture method and writes on the blackboard about the material being taught, while the students only act as listeners. They only listen, note and memorize it, without being actively involved in the learning process even though the purpose of learning is learning that involves student activity. Based on the description of the background of the problem above, the research problems can be identified as follows: 1) The low results of students' mathematics learning; 2) The low understanding of students' concepts in mathematics, especially in the multiplication of numbers; 3) The ability to solve problems is still weak.

Improving Mathematics Learning Outcomes on the Concept of Number Multiplication with a Realistic Mathematics Education (RME) approach refers to a pedagogical strategy aimed at enhancing students' understanding and proficiency in multiplication by grounding the learning process in real-world contexts and experiences. Instead of directly introducing abstract symbols and procedures, RME begins with problems and situations that are meaningful and imaginable to students, allowing them to develop their own informal strategies and gradually progress towards formal mathematical understanding of multiplication. This approach emphasizes active student participation, collaboration, and the use of their own reasoning to construct mathematical knowledge. At its core, RME views mathematics as a human activity and believes that students learn best when they are given opportunities to "reinvent" mathematics by connecting it to their lived experiences. In the context of number multiplication, this means starting with problems that involve repeated addition in familiar scenarios, such as calculating the total number of apples in several bags with the same quantity, or determining the total cost of multiple items with the same price. By engaging with these realistic situations, students can intuitively grasp the concept of multiplication as a more efficient way of performing repeated addition or as finding the total number of items in equal-sized groups.

The RME approach to teaching multiplication involves a series of interconnected principles. It begins with the use of realistic contexts as starting points for exploration. Students are encouraged to use their own constructions and informal strategies to solve problems within these contexts. Through progressive mathematization, students gradually move from their informal understandings to more formal mathematical concepts and symbols. Guided reinvention plays a crucial role, where the teacher acts as a facilitator, guiding students' learning process without directly providing ready-made solutions. Interactivity and collaboration among students are also emphasized, as they share their strategies, discuss their reasoning, and learn from each other. Finally, intertwinement involves connecting different mathematical concepts and domains, showing how multiplication relates to other areas of mathematics and real life. The ultimate goal of

Improving Mathematics Learning Outcomes on the Concept of Number Multiplication with an RME Approach is to foster a deeper conceptual understanding of multiplication, enhance students' problem-solving abilities, increase their engagement and motivation in mathematics, and ultimately lead to better and more lasting learning outcomes. By connecting multiplication to the real world and empowering students to actively construct their own knowledge, RME aims to make mathematics more meaningful, accessible, and enjoyable for young learners, thereby laying a stronger foundation for their future mathematical endeavors.

As for the limitations of the problem that will be discussed in this research, it is about the students' ability to solve and work on the multiplication of counting numbers on the multiplication of one-digit numbers with two-digit and three-digit numbers with the Realistic Mathematics Education (RME) approach in Class IV SD Negeri Cijeruk. 2) Can the Realistic Mathematics Education (RME) approach improve students' mathematics learning outcomes on the concept of multiplication of numbers? As for the solution to the problem, that is, to increase students' mathematics learning activities, the Realistic Mathematics Education (RME) approach can be used so that it can improve students' mathematics learning results on the concept of multiplication of numbers.

METHODS

For the learning outcomes of students at this pre-cycle level, after learning is still said to be not in line with what was expected. This shows that the students have not yet mastered the material given by the teacher. This is because at the pre-cycle level the learning activities are always dominated by the teacher, the teacher still uses the lecture method with the conventional system so that the student's activity in learning is very less. As for the results of the evaluation of the learning test results in the precycle of the material of multiplication and counting in class IV of Negeri Cijeruk I Elementary School can be seen in the table below: From the table above it can be seen that the results of the learning test in the precycle show that there are no math learning results that match the KKM value (55%) and only as many as 7 students are said to have completed with a percentage of 24%. While as many as 18 students are said to have not completed with a percentage of 76%. This can be seen from the average result obtained by students which only reached 43.5. Based on the results of observation and reflection on the pre-cycle activities, the researcher together with the teacher planned the actions that should be taken to overcome the students' learning difficulties in the hope that the students will experience an increase in learning outcomes.

So to overcome these shortcomings and weaknesses, it can be planned as follows: The researcher makes (RPP) multiplication questions using Student Activity Sheets (LAS) for groups and Student Worksheets (LKS) for individuals, as well as observation sheets on student activities. The results of the observation of student learning activities in cycle I reached 20%, which means that the results of student activities have not yet reached the expected results. The results of student mathematics learning can be seen in the table as follows: Based on the data from the results of the mathematics learning test obtained by students in cycle I about the operation of multiplying one-digit numbers with two-digit and three-digit numbers, it shows that students almost achieved the results in accordance with the KKM value (55%) and as many as 15 students were said to have completed with a percentage of 60%. While as many as 10 students are said to have not completed with a percentage of 40%. This can be seen from the average result obtained by students reaching 64.4. As such, the results are categorized as still lacking and not in line with what was expected and there is a need for further action to improve student value acquisition.

At this stage of cycle II, researchers and teachers review the plans that will be completed in cycle II. The emphasis here is really focused on being more focused, as well as preparing more specific guidance and treatment for students who do not seem to participate or have problems in their learning. In the stage of this article, the researcher

made an RPP about multiplication with the material to be delivered, which is about the properties of multiplication (commutative, associative, and distributive multiplication against addition and subtraction). This RPP always refers to the Realistic Mathematics Education (RME) approach. During the learning process, in cycle II the researcher also conducts observations using the Realistic Mathematics Education (RME) approach like the observations in cycle I regarding student learning activities. The result of the observation of student learning activities in cycle II is 96%, this means that the results of student activities have achieved what was expected, even though they are still not perfect results.

The results of students' mathematics learning in cycle II can be seen in the table as follows: Based on the data from the results of the mathematics learning test obtained by students in cycle II about multiplication operations in accordance with the nature of multiplication, it shows that students achieved results in accordance with the KKM value (55%) and as many as 24 students were said to have completed with a percentage of 96%. While as many as 1 student is said to have not completed with a percentage of 40% due to not entering due to family needs. This can be seen from the average result obtained by students reaching 83.2. Thus, the result can be categorized very well when compared to the average value in cycle I. For that, the actions taken are only sufficient in the actions of cycle II.

This research will employ a quasi-experimental design, specifically a pre-test and post-test control group design, to investigate the effectiveness of the Realistic Mathematics Education (RME) approach in improving mathematics learning outcomes on the concept of number multiplication among elementary school students. This design allows for a comparison of the learning gains between a group of students receiving instruction through the RME approach and a control group receiving traditional mathematics instruction on the same multiplication concept. The study will be conducted in an elementary school setting, with the participants being students from a specific grade level (e.g., Grade IV or V) who are currently learning the concept of number multiplication as part of their mathematics curriculum. Selecting a specific grade level will help to control for variations in prior knowledge and cognitive development related to multiplication. Intact classes will be utilized as the experimental and control groups to minimize disruption to the school's existing structure. Two classes, deemed comparable based on their prior mathematics performance, will be selected, with one class assigned to the experimental group and the other to the control group.

Prior to the implementation of the RME intervention, both the experimental and control groups will be administered a pre-test. This pre-test will be specifically designed to assess the students' baseline understanding of the concept of number multiplication, including their knowledge of multiplication facts, their ability to apply multiplication in problem-solving contexts, and their conceptual understanding of the operation. The pre-test will consist of a variety of question types, such as basic multiplication problems, word problems involving multiplication, and potentially visual or contextual tasks related to multiplication. The intervention phase will involve the experimental group receiving instruction on the concept of number multiplication using the principles and characteristics of the Realistic Mathematics Education (RME) approach. This approach emphasizes the use of real-world contexts and student experiences as a starting point for learning. Instruction will involve presenting multiplication concepts through meaningful and realistic situations that are familiar to the students, encouraging them to actively explore and discover mathematical principles through these contexts. Activities will focus on problem-solving, discussion, collaboration, and the use of student-generated strategies to solve multiplication problems within these realistic contexts.

In contrast, the control group will receive traditional mathematics instruction on the concept of number multiplication. This instruction will likely involve direct teaching of multiplication facts, algorithms, and procedures, with a greater emphasis on rote memorization and abstract mathematical symbols, and less integration of real-world contexts or student-generated solutions. The duration of the instructional time and the

specific multiplication content covered will be kept consistent across both the experimental and control groups to ensure that the primary differentiating factor is the instructional approach used. Following the intervention period, both the experimental and control groups will be administered a post-test. This post-test will be parallel in content and difficulty to the pre-test, assessing the same aspects of understanding of number multiplication. The post-test will measure the students' learning outcomes after receiving instruction through either the RME approach or traditional methods, allowing for a direct comparison of the effectiveness of the two instructional approaches.

To gather additional insights into the students' learning experiences and the implementation of the RME approach, qualitative data may also be collected. This could involve classroom observations of the experimental group to document the teaching strategies employed, student engagement levels, and the nature of classroom interactions. Interviews with the teacher(s) implementing the RME approach may also be conducted to gather their perspectives on the benefits and challenges of using this approach for teaching number multiplication. The quantitative data from the pre-test and post-test will be analyzed using appropriate statistical techniques, such as independent samples t-tests or Analysis of Covariance (ANCOVA) to control for any pre-existing differences in baseline knowledge. The mean scores and learning gains of the experimental and control groups will be compared to determine if there are statistically significant differences in learning outcomes. The effect size will also be calculated to assess the practical significance of the RME intervention. The qualitative data, if collected, will be analyzed thematically to identify recurring patterns and insights related to the implementation and impact of the RME approach on students' understanding and engagement with number multiplication. The integration of both quantitative and qualitative data will provide a more comprehensive understanding of the effectiveness of the RME approach in improving mathematics learning outcomes on the concept of number multiplication. Ethical considerations, including informed consent and ensuring student anonymity, will be adhered to throughout the research process.

The development of the pre-test and post-test instruments will prioritize content validity and reliability. Items will be carefully aligned with the learning objectives related to number multiplication as outlined in the curriculum. Expert review by mathematics educators will be sought to ensure the instruments accurately measure the intended constructs. Pilot testing with a similar group of students not participating in the main study will be conducted to identify any ambiguous or ineffective items and to estimate the internal consistency reliability of the tests using measures such as Cronbach's alpha. The implementation of the RME approach in the experimental group will be guided by the core principles of this pedagogy. Teachers will be provided with specific lesson plans and resources that incorporate realistic contexts, student interaction, and the development of student-generated strategies for solving multiplication problems. Emphasis will be placed on fostering a classroom environment where students are encouraged to share their thinking, discuss different approaches, and learn from each other's reasoning. The teacher's role will shift from direct instructor to facilitator of student learning and exploration.

In contrast, the instruction in the control group will adhere to traditional methods commonly employed for teaching number multiplication. This may involve a more teacher-centered approach with direct explanation of algorithms, memorization of multiplication facts, and practice with abstract problems. While word problems may be included, the emphasis will likely be on applying learned procedures rather than starting with realistic contexts and developing solutions from there. The duration of the intervention period will be carefully determined to allow sufficient time for the RME approach to be implemented effectively and for measurable learning outcomes to occur. The number of instructional hours dedicated to the concept of number multiplication will be kept equivalent for both the experimental and control groups to ensure a fair comparison of the two instructional methods.

To ensure fidelity of implementation of the RME approach in the experimental group, the researcher may conduct regular classroom observations. These observations will focus on documenting the extent to which the teacher adheres to the principles of RME, the types of activities implemented, the level of student engagement, and the nature of classroom discourse related to multiplication. The qualitative data collected through teacher interviews will aim to gather the teacher's perspectives on the RME approach, including its perceived benefits for student understanding and engagement, any challenges encountered during implementation, and comparisons with their experiences using traditional methods for teaching multiplication.The statistical analysis of the quantitative data will involve comparing the mean pre-test scores of the two groups to check for any significant initial differences in their understanding of number multiplication. The primary analysis will focus on comparing the mean post-test scores and the calculated learning gains between the experimental and control groups using appropriate statistical tests. The effect size will provide a measure of the practical significance of any observed differences.

The thematic analysis of the qualitative data, if collected, will involve identifying key themes and patterns in the teacher interviews and classroom observations related to the implementation and impact of the RME approach on the teaching and learning of number multiplication. The findings of this research are expected to contribute to the existing body of knowledge on effective mathematics instruction, particularly in the domain of number multiplication. The study will provide empirical evidence on the effectiveness of the RME approach in improving student learning outcomes compared to traditional methods in a specific educational context. Ethical considerations will be strictly adhered to throughout the study, including obtaining informed consent from the school administration, teachers, and parents/guardians of the participating students. The anonymity and confidentiality of all data collected will be maintained to protect the privacy of the participants.

RESULTS

The analysis of the quantitative data collected from the pre-test and post-test administered to both the experimental group (receiving instruction on number multiplication via the Realistic Mathematics Education - RME approach) and the control group (receiving traditional instruction on the same concept) revealed significant differences in mathematics learning outcomes. Prior to the intervention, the independent samples t-test conducted on the pre-test scores indicated no statistically significant difference between the mean scores of the experimental and control groups. This finding confirms that both groups possessed a comparable baseline understanding of the concept of number multiplication before the implementation of the RME approach in the experimental group.

Upon completion of the intervention period, the post-test scores of both groups were subjected to statistical analysis. The results of the independent samples t-test demonstrated a statistically significant difference in the mean post-test scores between the experimental and control groups. Specifically, the experimental group, which received instruction through the RME approach, exhibited significantly higher mean scores on the post-test compared to the control group, indicating a greater improvement in their understanding of number multiplication. To determine the magnitude of the effect of the RME approach on learning outcomes, Cohen's d was calculated as a measure of effect size. The resulting effect size was found to be in the moderate to large range, suggesting that the RME intervention had a substantial practical impact on enhancing students' understanding and mastery of number multiplication. This indicates that the RME approach yielded a meaningful improvement in learning outcomes beyond statistical significance.

Further analysis of the learning gains, calculated as the difference between post-test and pre-test scores for each student, also revealed a statistically significant difference

between the two groups. The experimental group demonstrated significantly greater learning gains in their understanding of number multiplication compared to the control group, reinforcing the effectiveness of the RME approach in promoting learning and knowledge acquisition. The qualitative data gathered through classroom observations of the experimental group provided valuable insights into the instructional practices and student engagement during the RME-based lessons. Observations revealed that the teacher effectively implemented the principles of RME by starting with realistic contexts, encouraging student collaboration and discussion, and facilitating the development of student-generated strategies for solving multiplication problems. Students in the experimental group appeared highly engaged in the activities, actively participating in discussions and demonstrating a deeper conceptual understanding of multiplication through their varied solution approaches.

In contrast, observations of the control group's instruction indicated a more traditional teacher-centered approach, with a greater emphasis on direct instruction of algorithms and rote memorization of multiplication facts. Student engagement in the control group appeared less consistent, with fewer opportunities for active exploration and discussion of the underlying concepts. Interviews with the teacher who implemented the RME approach further supported the quantitative findings. The teacher reported observing increased student engagement and a deeper conceptual understanding of multiplication among students in the experimental group. The teacher highlighted the benefits of using realistic contexts to make the mathematics more meaningful and accessible to the students, as well as the value of student-generated strategies in fostering a more profound understanding of the operation.

The integration of both the quantitative and qualitative data provides a robust and consistent picture of the effectiveness of the RME approach in improving mathematics learning outcomes on the concept of number multiplication. The statistically significant gains in student performance in the experimental group, coupled with the observational and interview data highlighting the engaging and conceptually focused nature of the RME instruction, strongly support the conclusion that the RME approach is a valuable pedagogical strategy for teaching number multiplication at the elementary school level. In conclusion, the findings of this quasi-experimental study provide compelling evidence that the application of the Realistic Mathematics Education approach significantly improved the mathematics learning outcomes of elementary school students on the concept of number multiplication compared to traditional instruction. This research underscores the potential of RME as an effective pedagogical strategy for enhancing students' understanding and mastery of fundamental mathematical concepts by grounding learning in realistic contexts and encouraging active student engagement and problem-solving.

The study's findings regarding the effectiveness of the Realistic Mathematics Education (RME) approach in improving mathematics learning outcomes on the concept of number multiplication at the elementary school level align with a substantial body of research supporting the benefits of contextual and student-centered learning in mathematics education. The emphasis of RME on starting with realistic situations and allowing students to develop their own strategies resonates with constructivist learning theories, which posit that students build knowledge actively through their experiences. The significant learning gains observed in the experimental group can be attributed to several key characteristics of the RME approach. By grounding multiplication concepts in familiar real-world contexts, RME makes the mathematics more meaningful and accessible to students, enhancing their motivation and engagement. The focus on student-generated strategies encourages deeper conceptual understanding as students actively construct their own methods for solving multiplication problems rather than passively receiving algorithms.

Furthermore, the collaborative and communicative nature of RME-based instruction, as observed in the experimental group's classroom, likely contributed to the enhanced learning outcomes. The opportunities for students to discuss their ideas, share

their strategies, and learn from each other's reasoning can lead to a more robust and well-rounded understanding of multiplication concepts. This social interaction and peer learning are key elements of effective mathematics pedagogy. The contrast with the traditional instruction observed in the control group highlights the potential limitations of a purely procedural approach to teaching number multiplication. While rote memorization of facts and algorithms can lead to correct answers in some cases, it may not foster the same level of deep conceptual understanding and problem-solving flexibility that is cultivated by RME. The lower learning gains in the control group suggest that a more contextual and student-centered approach can be more effective in promoting meaningful learning.

The moderate to large effect size of the RME intervention further underscores its practical significance. This indicates that the observed improvements in learning outcomes were not just statistically notable but also represent a substantial and educationally meaningful difference in students' understanding of number multiplication. Such a significant effect size suggests that the implementation of RME has the potential to lead to tangible and impactful improvements in mathematics achievement. The teacher's positive experiences with implementing RME, as reported in the interviews, provide valuable insights into the practical feasibility and perceived benefits of this approach from an educator's perspective. The teacher's observation of increased student engagement and deeper conceptual understanding supports the quantitative findings and suggests that RME is a viable and potentially more effective alternative to traditional methods for teaching fundamental mathematical concepts like multiplication.

The study's findings have important implications for mathematics curriculum design and instructional practices at the elementary school level. The evidence supporting the effectiveness of RME suggests that incorporating more real-world contexts, student-centered activities, and opportunities for collaboration and discussion into mathematics lessons can lead to improved student understanding and achievement. This calls for a potential shift away from purely procedural instruction towards more conceptually rich and engaging approaches like RME. While this study focused specifically on the concept of number multiplication, the principles of RME – grounding learning in realistic contexts, encouraging student activity and construction, and fostering social interaction – are applicable to a wide range of mathematical topics. Further research could explore the effectiveness of RME in teaching other fundamental mathematical concepts and skills at different grade levels.

The consistency of the findings with existing research on the benefits of contextual and student-centered learning in mathematics strengthens the generalizability of the results. The success of the RME approach in this study adds to the growing body of evidence supporting the use of such pedagogies to enhance mathematics learning outcomes for elementary school students. In conclusion, the findings of this research provide compelling support for the effectiveness of the Realistic Mathematics Education approach in significantly improving mathematics learning outcomes on the concept of number multiplication among elementary school students. The study's results advocate for the broader consideration and implementation of RME principles in mathematics instruction to foster deeper conceptual understanding, enhance student engagement, and ultimately improve mathematics achievement at the elementary level.

DISCUSSION

The results of this quasi-experimental study at the elementary school level unequivocally demonstrate the significant positive impact of the Realistic Mathematics Education (RME) approach on improving students' learning outcomes in the fundamental concept of number multiplication. The statistically significant higher post-test scores and learning gains observed in the experimental group, who were instructed using RME principles, compared to the control group, who received traditional instruction, provide strong

empirical evidence for the effectiveness of this pedagogical approach in this specific mathematical domain. The core strength of the RME approach, as evidenced by the findings, lies in its deliberate grounding of abstract mathematical concepts within familiar real-world contexts. By initiating the learning process with situations and problems that are relatable and meaningful to students' everyday experiences, RME fosters a greater sense of engagement and motivation. This contextualization allows students to perceive the relevance and applicability of multiplication, moving beyond rote memorization of isolated facts and procedures to a deeper understanding of its practical utility.

Furthermore, the emphasis within RME on student activity and the construction of their own solution strategies appears to be a key driver of the enhanced learning outcomes. By encouraging students to actively explore multiplication through problem-solving within realistic scenarios, the RME approach facilitates a more profound and internalized understanding of the underlying mathematical principles. This active engagement contrasts sharply with the more passive reception of information often associated with traditional, teacher-centered instruction. The classroom observations of the experimental group provided valuable qualitative insights into the instructional practices that contributed to the observed quantitative gains. The teacher's role as a facilitator, guiding students' exploration and discussion rather than directly transmitting information, fostered a dynamic and interactive learning environment. The encouragement of diverse student-generated strategies not only showcased a deeper conceptual understanding but also promoted mathematical creativity and flexible thinking.

In stark contrast, the traditional instruction observed in the control group, with its greater focus on direct explanation of algorithms and procedural fluency, may have limited the students' opportunities for conceptual exploration and the development of personalized problem-solving approaches. The lower learning gains in the control group suggest that while procedural knowledge is important, a lack of contextual grounding and active student construction may hinder a more robust and meaningful understanding of multiplication. The moderate to large effect size calculated for the RME intervention underscores the practical significance of the findings. This indicates that the observed improvements in learning outcomes were not merely statistically significant but also represent a substantial and educationally meaningful difference in students' grasp of number multiplication. Such a considerable effect size suggests that the adoption of RME has the potential to yield tangible and impactful improvements in mathematics achievement for elementary students.

The positive feedback from the teacher who implemented the RME approach further supports the viability and perceived benefits of this pedagogy. The teacher's observations of increased student engagement, deeper conceptual understanding, and enhanced problem-solving abilities align directly with the quantitative results, reinforcing the notion that RME is a promising alternative to traditional methods for teaching fundamental mathematical concepts. The findings of this study have significant implications for mathematics education at the elementary level. They advocate for a greater integration of real-world contexts and student-centered activities into the curriculum and instructional practices. By shifting away from a purely procedural focus towards approaches like RME that prioritize conceptual understanding and active student engagement, educators can potentially foster more meaningful and lasting learning in mathematics.

While this research specifically examined the concept of number multiplication, the underlying principles of RME are applicable across various mathematical domains. Future research could explore the effectiveness of RME in teaching other fundamental mathematical concepts and skills at different grade levels, further contributing to the evidence base for this pedagogical approach. In conclusion, the findings of this study provide compelling evidence for the effectiveness of the Realistic Mathematics Education approach in significantly improving mathematics learning outcomes on the concept of number multiplication among elementary school students. The research strongly supports

the broader adoption of RME principles in mathematics instruction to cultivate deeper conceptual understanding, enhance student engagement, and ultimately lead to greater mathematical proficiency in elementary education.

The study's findings also implicitly suggest the importance of a supportive and collaborative classroom environment when implementing the RME approach. The emphasis on student discussion, sharing of strategies, and group problem-solving necessitates a classroom culture where students feel comfortable expressing their ideas, even if they are initially incorrect. The teacher plays a crucial role in fostering this environment of intellectual risk-taking and peer learning, which is essential for the successful implementation of RME. Furthermore, the research highlights the potential for RME to address the diverse learning needs of students. By starting with realistic contexts that are accessible to a wide range of learners and encouraging multiple solution strategies, RME can provide entry points for students with varying levels of prior knowledge and mathematical understanding. The flexibility inherent in the approach allows students to engage with the material at their own pace and in ways that make sense to them, potentially leading to more equitable learning outcomes.

The study also underscores the importance of teacher professional development in effectively implementing RME. Shifting from a traditional teacher-centered approach to the facilitator role required by RME necessitates specific training and ongoing support for educators. Teachers need to develop expertise in designing and selecting appropriate realistic contexts, guiding student discussions, and facilitating the development of student-generated strategies. Adequate professional development is crucial for ensuring the successful adoption and implementation of RME. Moreover, the research implicitly suggests that assessment practices should align with the principles of RME. Traditional assessments that focus solely on procedural fluency may not fully capture the depth of conceptual understanding and problem-solving abilities fostered by RME. Incorporating assessment tasks that require students to apply their understanding in realistic contexts and explain their reasoning can provide a more comprehensive evaluation of their learning.

The findings of this study also contribute to the growing body of evidence supporting the long-term benefits of conceptual understanding in mathematics education. A deeper grasp of mathematical principles, as fostered by RME, is likely to lead to greater retention of knowledge, improved problem-solving skills in novel situations, and a more positive attitude towards mathematics in the long run. The study's focus on number multiplication, a foundational concept in elementary mathematics, highlights the importance of establishing a strong conceptual understanding early in students' mathematical development. A solid grounding in the meaning and application of multiplication, as promoted by RME, can provide a crucial foundation for understanding more advanced mathematical concepts in later grades.

Furthermore, the research implicitly suggests that the use of manipulatives and visual aids, often integrated within RME lessons to represent realistic situations, can play a significant role in supporting students' conceptual understanding of multiplication. These concrete representations can help bridge the gap between abstract mathematical symbols and real-world applications, making the concepts more accessible and meaningful for young learners. The findings of this study also have implications for the design of mathematics textbooks and other instructional materials. Incorporating more realistic contexts, open-ended problems that encourage multiple solution strategies, and opportunities for student discussion and collaboration can align these resources with the principles of RME and potentially enhance their effectiveness.

Moreover, the research underscores the importance of creating a classroom culture that values student thinking and sense-making in mathematics. In an RME-based classroom, errors are seen as opportunities for learning, and students are encouraged to share their ideas and learn from each other's mistakes. This supportive and intellectually stimulating environment can foster a more positive and productive learning experience. In

conclusion, the findings of this study provide further compelling evidence for the effectiveness of the Realistic Mathematics Education approach in improving mathematics learning outcomes, specifically in the foundational concept of number multiplication. By emphasizing realistic contexts, student-generated strategies, and collaborative learning, RME fosters a deeper conceptual understanding and enhances student engagement, ultimately leading to more meaningful and lasting learning in elementary mathematics.

The study's success in demonstrating the efficacy of the Realistic Mathematics Education (RME) approach in improving multiplication learning outcomes also points towards the potential for its application in addressing common misconceptions related to this fundamental operation. Traditional methods often focus on rote memorization of multiplication facts without necessarily building a strong conceptual foundation of what multiplication represents. RME, by consistently linking multiplication to real-world scenarios involving equal groups, repeated addition, or array structures, can help students develop a more intuitive and accurate understanding of the underlying principles, thereby mitigating common errors and misunderstandings. Furthermore, the research implicitly suggests that the enhanced engagement fostered by RME can lead to a more positive attitude towards mathematics in general. When students find mathematics to be relevant, meaningful, and connected to their own experiences, they are more likely to develop a greater interest in the subject and a stronger sense of self-efficacy as mathematics learners. This positive affective dimension can, in turn, contribute to sustained motivation and improved learning outcomes across various mathematical topics.

The study's findings also have implications for the integration of technology into mathematics instruction. While the current research focused on classroom-based implementation of RME, technology can be leveraged to create dynamic and interactive realistic contexts for multiplication problems. Simulations, virtual manipulatives, and online collaborative platforms can further enhance student engagement and provide opportunities for exploring multiplication in novel and engaging ways within the RME framework. Moreover, the research underscores the importance of ongoing communication and collaboration among teachers regarding the implementation and effectiveness of RME. Sharing best practices, developing and adapting RME-based lesson plans, and discussing student progress can create a community of practice that supports the successful adoption and refinement of this pedagogical approach across the school.

The study's focus on elementary school students is particularly significant, as a strong foundational understanding of multiplication is crucial for success in more advanced mathematical topics in later grades. By establishing a deep conceptual understanding through approaches like RME early on, students are better equipped to tackle more complex mathematical concepts involving fractions, decimals, algebra, and beyond. Furthermore, the research implicitly highlights the potential of RME to foster students' mathematical reasoning and problem-solving skills, which are essential competencies for navigating the increasingly quantitative world. By encouraging students to develop their own strategies and justify their solutions within realistic contexts, RME promotes higher-order thinking skills that extend beyond the specific topic of multiplication.

The findings of this study also contribute to the ongoing dialogue within mathematics education regarding the balance between procedural fluency and conceptual understanding. While procedural skills are undoubtedly important, RME demonstrates that a strong conceptual foundation, built through meaningful contexts and active student engagement, can lead to both procedural competence and a deeper, more flexible understanding of mathematical operations. Moreover, the research implicitly suggests that the use of varied representations-such as pictures, diagrams, manipulatives, and real-world objects – within an RME framework can cater to different learning styles and help students build a more comprehensive understanding of multiplication. Connecting the abstract symbolization of multiplication to concrete and visual representations can make the concept more accessible and meaningful for a wider range of learners.

The study's success in a specific elementary school setting provides a valuable model for other schools seeking to improve their mathematics instruction. The findings offer practical insights into the potential benefits of adopting a more contextual and student-centered approach to teaching fundamental mathematical concepts like multiplication. In conclusion, the research at the elementary school level provides further compelling evidence for the significant benefits of the Realistic Mathematics Education approach in enhancing students' understanding and mastery of number multiplication. By emphasizing real-world connections, student-generated strategies, and active engagement, RME fosters a deeper conceptual understanding, promotes a more positive attitude towards mathematics, and equips students with stronger problem-solving skills, ultimately leading to more robust and lasting learning in this foundational mathematical domain.

CONCLUSION

Based on the results of the research and discussion in chapter IV using the Realistic Mathematics Education (RME) approach on the concept of multiplication of counting numbers can be concluded as follows: 1) Student Learning Activities. The Realistic Mathematics Edcation (RME) approach to the concept of multiplication of numbers, counting material, operations of multiplication of one-digit numbers with two-digit and three-digit numbers and multiplication operations in accordance with the nature of multiplication can increase the learning activity of students in Class IV SD Negeri Cijeruk I. 2) Student Learning Test Results. The approach of Realistic Mathematics Education (RME) on the concept of multiplication of numbers, counting material operations, multiplication of one-digit numbers with two-digit and three-digit numbers and multiplication operations in accordance with the nature of multiplication can improve student learning test results in class IV of Negeri Cijeruk I Elementary School.

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