**APLIKATIF**
**Journal of Research Trends in Social Sciences and Humanities**
DOI: https://doi.org/10.59110/aplikatif.v4i2.668
Vol. 4 No. 2, June 2025, pp. 164-174

# The Implementation of Realistic Mathematics Education in Third-Grade Primary School

**Samritin[1]*, Reni Astuti[1], Nita Sri Budiarti[1], Desna Sari[1], Selviana[1], Mikrahma Aopmonaim[1], Nuriyanti Arifin[1]**
[1]Universitas Muhammadiyah Buton, Baubau, Indonesia
*samritin75@gmail.com

**ABSTRACT**
This study examines the effective differences between the *Realistic Mathematics Education* (RME) approach and conventional learning in improving mathematics outcomes for integer multiplication and division. A *quasi-experimental* design with a *Post-test Control Group Design* was employed, involving 32 third-grade students from SDN 4 Wameo Baubau, divided into experimental (RME) and control (conventional) groups. Data was collected through a validated 10-item essay test and analyzed using an *Independent Sample T-Test* with SPSS. Key findings: (1) The experimental group's average score (89.38) was significantly higher than the control group's (55.94); (2) Hypothesis testing yielded *t-value* = -9.223 and *sig.* 0.000 ($p < 0.05$), confirming RME's superiority. These results advocate for RME as an alternative approach to elementary mathematics learning, particularly for context-oriented topics.

**Keywords:** *Conventional Learning; Elementary School; Mathematics Learning Outcomes; Multiplication and Division; Realistic Mathematics Education (RME).*



## INTRODUCTION

One of the aspects that needs to be considered and improved by a country is education. Enhancing the quality of Human Resources (HR) is anticipated to be accomplished through education. Education serves to improve students' capabilities, enabling them to keep pace with advancements in science and technology (Simanjuntak & Erlinawati, 2020). Therefore, various potential of students (students), both in terms of knowledge and skills, need to be developed to prepare them to face various problems and challenges of life and competition in the era of globalization.

Schools are the closest formal institutions to students in the educational process. Education in schools is packaged in the form of planned and structured learning through curricular and non-curricular activities (Bisri, 2021). Non-curricular activities, such as extracurricular and co-curricular programs, serve as a complement to develop students' potential beyond the academic aspect. Through the combination ofknowledge butols not only transfer knowledge, but also shape students' character and social skills (Purba et al., 2020; Bryzhak et al., 2024). Curricular activities are presented through various subjects that have been determined in the curriculum (Kamarga, 2021).

In Indonesia, mathematics is made a compulsory subject in the school curriculum. Mathematics is expected to provide benefits in forming positive character and good reasoning for students (Fauzan & Anshari, 2024). Mathematics can train precision and critical thinking (Sormin & Pasaribu, 2023). For this reason, through learning, students are facilitated in understanding various concepts, postulates, theorems, generalization and mathematics processes.

The success of mathematics learning is determined by factors, including the characteristics of mathematics and the learning process. Mathematics is a distinctive scientific discipline, namely abstract concepts that are arranged hierarchically and use deductive reasoning (Chamidah et al., 2023). These mathematical characteristics have an impact on learning, for example, it is very often found that students do not like mathematics lessons, because they are difficult, complicated, and scary (Purnacita et al., 2025). These attitudes and stigmas towards mathematics result in student learning outcomes (Kristia et al., 2021; Sitopu & Ika Rosenta Purba, 2021).

In elementary school, many students experience difficulties in learning mathematics (Farhan & Jumardi, 2023; Rasyid, 2021). This can be seen from the achievement of learning outcomes that are still low as well as the experience of teaching teachers. Based on the results of a survey in third-grade of State Elementary School 4 Wameo Baubau City, several pieces of information were obtained: (1) student interaction was low when teaching and learning activities took place, (2) the mathematics tests given were difficult for students to complete, even though there were several students who were able to do test questions, (3) students were not skilled in solving problem-solving problems. In the survey, it was also found that the learning process carried out is still centered on the teacher so that students tend to be in a passive position. Learning activities are still carried out conventionally so that students do not get the opportunity to build their own understanding and the learning poses carried out by students are less meaningful. The weakness of students and the learning process has implications for low student learning outcomes and at the next level, students will experience difficulties in learning mathematics material.

The results of the survey are in accordance with the results of Widiastuti (2022) research found that the problems that arise in mathematics learning are: 1) students are not trained to communicate with other students. 2) The strategies, models, or learning methods used are still not applied in the learning model. 3) mastery of learning media is still underutilized so that the mathematics learning carried out is still abstract and has not been stated. This condition needs to be improved so that students' mathematics learning outcomes improve. Mbagho (2020) explained that difficult mathematics subject matter is not the only cause of low student learning outcomes but also by the learning process applied.

Primary school students are in the stage of concrete operational cognitive development. Mathematics learning in this phase needs to consider the connectivity of learning materials with the child's world (Unaenah, Hidyah, et al., 2020; Unaenah, Sutisna, et al., 2020). The learning process carried out in schools needs to use approaches, as well as learning media, that can facilitate students' abilities based on their developmental stage (Juardi & Komariah, 2023). The use of an approach during the implementation of mathematics learning is expected to increase learning motivation and foster learning independence so that students continue to strive to understand the material and complete the tasks that have been given (Triana et al., 2023).

One of the learning approaches that can be implemented in mathematics instruction is the Realistic Mathematics Education (RME). RME is very suitable for learning mathematics in elementary school. RME facilitates learning that supports the construction of knowledge according to students' abilities through various activities carried out by students during the learning process (Muchtar et al., 2020). RME uses the idea of allowing students to reinvent mathematical concepts under the guidance of teachers or parents (Mbagho & Tupen, 2020).

The RME approach is highly suitable for mathematics education in Indonesia, as it aligns with constructivist principles (Adem et al., 2020). Unlike traditional knowledge transmission methods still prevalent among many Indonesian teachers, RME emphasizes student-centered learning, where knowledge is actively constructed through critical thinking and real-world contexts (Arisinta et al., 2019). Using this learning model, students do not only focus on the correct or wrong answers they get, but rather on the opportunity that students get to confirm their strategies in solving problems (Neag et al., 2020). Thus, students gain confidence in solving and conveying their ideas or ideas about problems in mathematics (Asdar et al., 2021) It will also train students' independence in solving problems and reduce students' dependence on teachers to convey right and wrong answers given by students (Indriyani et al., 2020).

The RME approach fosters meaningful learning by anchoring mathematics in tangible, real-life contexts (Septiana, 2023). Students engage with concepts through everyday experiences—from household tasks to local environmental observations, enabling them to construct knowledge actively. In this framework, teachers transition from traditional instruction to facilitation, supporting students' independent discovery of mathematical ideas

RME is a learning approach that relates learning materials to students' lives so that students can easily understand mathematical concepts (Sohilait, 2021). RME pays attention to two important things, namely the mathematics material studied must be connected to real conditions that are familiar to students and mathematics must be seen as a human activity where mathematics should be closely related to students and aligned with students' daily lives (Aziz et al., 2022). In RME, students are allowed to observe, depict, and model real-life situations using mathematical concepts. This approach also encourages students to think critically (Trimahesri & Hardini, 2019), collaborate, and communicate their understanding of mathematics. The presentation of contextual problems is the starting point for the implementation of RME. The contextual problems presented are real problems according to the student's experience or problems that students can imagine. With these problems, students find mathematical concepts or how to solve them. In addition, through their experience of solving problems given by teachers, students are expected to be capable of solving problems in real daily life.

The above description shows that RME provides excellent expectations in mathematics learning. Various studies that apply the RME approach in mathematics learning have been carried out, including Farida (2018), Armiyanti (2019), Trimahesri and Hardini (2019). The studies used a Class Action research design. Therefore, the effectiveness of RME implementation needs to be tested from time to time at each school level with various variants of subject matter and various research designs. In contrast to previous studies, this research uses a quasi-experiment with a comparative group. This study aims to examine the comparative effectiveness of RME implementation and conventional learning in third-grade elementary schools. The results of this study are expected to make a positive contribution to improving the quality of mathematics learning in Indonesia

## METHOD

### *Research Type and Design*

This study employs a quasi-experimental method with a control group design. The experiment engaged two groups: a control group and an experimental group, whose test results were subsequently compared. The experimental group received instruction using the RME approach, whereas the control group received instruction using conventional learning methods.

**Table 1.** Research Design

| Group | Treatment | Result |
|---|---|---|
| Control | X | O1 |
| Experimental | Y | O2 |

with:

X = Conventional Learning

Y = RME Approach Learning

O1 = Control Group Test Result

O2 = Experimental Group Test Results

The treatment given to both groups uses different learning methods but uses the same teaching material, namely multiplication and division of numbers. To avoid bias in the ability to master the teaching material, learning is carried out by the same teacher. This research was carried out in the third grade of SDN 4 Wameo. The sample of this study consists of 32 students, divided into two groups, each group consisting of 16 students. The two treatment groups were known to have relatively equal abilities, so the determination of the control group and the experimental group was carried out randomly.

**Table 2.** Research Sample

| Gender | Control Group | Experimental Group |
|---|---|---|
| Woman | 8 | 9 |
| Man | 8 | 7 |
| Total | 16 | 16 |

### *Data Collection and Analysis*

The method of data collection in this research utilized testing procedures. These procedures were implemented to gather information regarding students' academic performance following the application of the treatment. The instrument employed in this study consisted of 10 descriptive or essay-type questions. The test questions refer to the test grid prepared based on the 2013 Curriculum in Mathematics. In the test questions made, tests are carried out first by experts to produce good questions. The score for student test results is obtained following the assessment rubric, where the full score of each question item is worth 10 points.

The data obtained in the study were examined using both quantitative and qualitative approaches. Learning outcome data were analyzed through parametric statistical methods with the assistance of the SPSS software, whereas data from observations of student and teacher activities were interpreted using a descriptive qualitative approach. To determine the fulfillment of the parametric test requirements, before being analyzed, the learning outcome data was tested for normality and data homogeneity testing.

Normality testing is used to ensure that the data meets the normal distribution criteria. The test of the normality of the data using the Shapiro-Wilk indicator at a significance level of 5%. The data is said to be normally distributed if the sig. > 0.05. Homogeneity testing is used to determine the fulfillment of data homogeneity requirements. The homogeneity test of the data in this study uses a 95% confidence level applied to the Levene Test for Equality of Variance technique. Data is considered homogeneous when the significance (Sig) value exceeds 0.05.

After testing the analysis requirements in the form of normality testing and homogeneity testing, it continues to the hypothesis test stage using the mean value difference test. Hypothesis testing was carried out using a significance level of 5%. If the 2-sided significance value was ≥ 0.05, Ho was accepted; otherwise, it was rejected. Mathematically, the hypothesis formulation of this research is as follows:

Ho: $\mu1 - \mu2 = 0$

Ha: $\mu1 - \mu2 \neq 0$

with:

$\mu1$ = the control group's average test results

$\mu2$ = the experimental group's average test results

## RESULT

The implementation of learning in this study uses different lesson plans in each sample class. Learning in the experimental class used a lesson plan that applied the RME approach, and conventional learning lesson plans for the control class. After the implementation of learning, students from two classes were given tests. Based on the test results, data are obtained in Table 3.

**Table 3.** Test Results

| Groups | N | Min. | Max. | Average |
|---|---|---|---|---|
| Experimental | 16 | 70 | 100 | 89,38 |
| Control | 16 | 40 | 70 | 55,94 |

Descriptively, Table 3 provides some information, namely, all students in both sample classes took the test (N=16 each). The maximum score obtained in the control group was no more than the experimental group. Likewise, the minimum score in the control group was also below the minimum score recorded in the experimental group. The gap between the average scores of the two groups reached 33.44, with the control group showing a lower mean score than the experimental group. Subsequently, the test results from both groups were subjected to normality and homogeneity analyses. Details of the normal test outcomes are presented in Table 4.

**Table 4.** Normal Test Results

| Group | Shapiro-Wilk Test | | |
|---|---|---|---|
| | Statistic | df | Sig. |
| Control | .901 | 16 | .084 |
| Experimental | .892 | 16 | .061 |

Referring to the Shapiro-Wilk test results in Table 4, the experimental group obtained a significance value of 0.061, while the control group achieved a significance value of 0.084. Since both values are greater than 0.05, it indicates that the data from both groups follow a normal distribution. The findings from the homogeneity test are further presented in Table 5.

**Table 5.** Homogeneity Test Results

| Levene Statistic | df1 | df2 | Sig. |
|---|---|---|---|
| 0.136 | 1 | 30 | .715 |

Table 5 presents the outcome of the homogeneity test, showing that the significance value (Sig.) for the control and experimental group variables is 0.715. Since this value is greater than 0.05, it indicates that the variance of the mathematics test results between the control and experimental groups is equal, indicating that the data are homogeneous.

The results of the normality and homogeneity tests above provide confidence that the data of the test results can be further analyzed to test the research hypothesis. The test will prove whether the difference in test results from the two groups, as shown descriptively by Table 3, is significant or not. The hypothesis testing in this study, the Independent Sample T-Test. The test process was carried out using SPSS version 20. Table 6 shows the results of the hypothesis test conducted by SPSS.

**Table 6.** Independent Sample T-Test

| | T | Df | Sig. (2-tailed) | Mean Difference | Std. Error Difference | 95% CI | |
|---|---|---|---|---|---|---|---|
| | | | | | | Lower | Upper |
| Equal variances assumed | -9.223 | 30 | .000 | -33.44 | 3.626 | -40.842 | -26.033 |
| Equal variances not assumed | -9.223 | 29.916 | .000 | -33.44 | 3.626 | -40.843 | -26.032 |

Based on the SPSS output in Table 6, the average difference test results obtained a value of t = -9.223 with a significant value of 2-sided testing (sig.) = 0.000. The significance value was obtained at a confidence level of 95% at intervals [-40,842;-26,033]. This shows that the mean difference = -33.44 is significant. The negative sign shown in Table 6 results from a larger increase in the average score of the experimental class compared to that of the control class. Hence, the test results lead to the rejection of the null hypothesis (Ho) and acceptance of the alternative hypothesis (Ha), demonstrating a significant statistical difference between the scores of the control and experimental groups.

## DISCUSSION

The results of statistical testing using the mean difference test show convincingly that the achievement of student learning outcomes in the material of division and multiplication of integers is influenced by the learning approach used. The RME approach convincingly provides different and better results compared to conventional learning. The results of this study are consistent with the research of Yandiana and Ariani (2020) which found a significant influence of the use of the RME approach on student learning outcomes in elementary school. In addition, Chamidah (2023) also found that the use of the RME approach was able to improve the ability to count numbers in grade IV of elementary school.

The effectiveness of RME is underpinned by the use of real-world contexts in mathematics learning, which helps students relate mathematical concepts to their everyday experiences. This can improve students' ability to understand mathematical concepts because they can see the relevance of mathematics in their lives (Hidayat et al., 2020). In connection with this, research by Apriyanti et al. (2023) found that students taught with the RME approach experienced a notable enhancement in the comprehension of mathematical concepts compared to students who were taught conventionally. This shows that RME is effective in improving mathematics learning outcomes at the elementary school level.

The use of contextual problems in this study can trigger the development of students' mathematical reasoning skills. Fendrik (2021) in his research showed that students taught with the RME approach had better increased mathematical reasoning skills compared to students who were taught conventionally. This is because RME encourages students to understand concepts in depth and develop logical thinking skills in solving problems

Students who develop their interpretation skills can easily solve mathematical problems, so that they are able to obtain better learning outcomes. Nur'aini (2020) shows that students taught with the RME approach show a significant improvement in problem-solving skills compared to students who are taught conventionally. RME encourages students to think critically and creatively in solving math problems.

RME implementation in this study was designed in the form of small group discussions, although RME does not emphasize group learning. This is intended so that students can play an active role optimally during the learning process. At the beginning of the learning activity, the teacher conveyed the learning objectives, followed by the division into small groups, each consisting of 4 students. The groups are formed heterogeneously (Fauzi et al., 2020; Imamuddin, 2022).

Through group discussions, students can convey their contributions in the form of ideas or ideas to solve contextual problems, in turn, so that students are engaged in the learning process. Although there is more emphasis on student contribution, in the implementation of learning using the RME approach, teachers are still involved in observing and helping students, especially in providing problem-solving instructions when students need them. This allows for interaction between students and teachers, not just between students and students (Sari et al., 2021).

The findings of this study provide empirical evidence on the effectiveness of RME in improving student learning outcomes. These findings can serve as a basis for educators and policymakers to adopt and implement RME approaches and mathematics learning practices in elementary schools. Thus, it is expected to improve the quality of mathematics learning and overall student learning outcomes.

## CONCLUSION

Based on data analysis and discussion, it can be concluded that mathematics learning using the Realistic Mathematics Education (RME) approach in the third grade of elementary school is more effective than conventional learning. This is evidenced by (1) a difference of -33.438 between the average scores of the control group and the experimental group, and (2) the mean difference test showing t = -9.223 with a significance level of 5% and a p-value (sig.) of 0.000.

Research has provided strong empirical evidence, so it is recommended that primary school teachers implement the RME approach in mathematics learning. In addition, researchers are further advised to examine the implementation of RME on various other mathematics topics or at different grade levels to strengthen evidence of the effectiveness of this approach.

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