

The Use of E-LKPD Based on Realistic Mathematics Education (RME) to Improve Mathematics Learning Outcomes at SDN 60 in Bengkulu City

**Irfan Supriatna¹, Muhammad Habib Ramadhani², Rafhi Febryan Putera³,
Anugrah Agung⁴**

¹²³⁴PGSD, FKIP, Universitas Bengkulu

irfansupriatna@unib.ac.id¹, mhramadhani@unib.ac.id², rafhifebryan@unib.ac.id³,
aagung@unib.ac.id⁴

Abstract

Students' mathematics achievement remains in the low category, with an average school exam score of 45. This is due to students' difficulty in understanding worksheets that consist solely of text, confusing instructions, and a lack of visual aids. This study aims to determine the improvement in elementary school students' mathematics achievement through the use of E-worksheets based on Realistic Mathematics Education (RME). The research method employed was a quantitative approach with a quasi-experimental design, specifically a pretest-posttest control group design, utilizing analytical techniques that included descriptive statistics and inferential statistics. The research sample consisted of 42 students at SDN 60 in Bengkulu City, with the experimental class comprising 21 students and the control class comprising 21 students. This study was conducted to measure improvements in mathematics learning outcomes. The results showed that the posttest average score for the experimental class, at 85.24, was higher than that of the control class, which was 74.10. Additionally, the mastery rate in the experimental class reached 85.71%, while the control class achieved only 57.14%. An independent samples t-test with a two-tailed significance level yielded a p-value of $0.000 < 0.05$, indicating a significant difference in the mean scores between the experimental and control classes. The n-gain value for the experimental class was 0.68, falling into the moderate category and higher than the control class's 0.35 (also in the moderate category), thereby proving an improvement in elementary school students' mathematics learning outcomes. The conclusion drawn is that the use of e-LKPD based on Realistic Mathematics Education (RME) has a positive impact on improving elementary school students' mathematics learning outcomes. The recommendation for teachers is to use e-LKPD based on Realistic Mathematics Education (RME) in mathematics instruction, and for future researchers, the use of this e-LKPD based on Realistic Mathematics Education (RME) can be used to measure other students' mathematical abilities.

Keywords: E-LKPD; Realistic Mathematics Education (RME); Learning Outcomes.

Abstrak

Hasil belajar matematika siswa masih dalam kategori rendah dengan skor rata-rata ujian sekolah yaitu 45, ini dikarenakan siswa kesulitan memahami LKPD yang hanya berisi teks, petunjuk penggunaan yang membingungkan, dan kurangnya visualisasi. Penelitian ini bertujuan untuk mengetahui peningkatan hasil belajar matematika siswa SD menggunakan E-LKPD berbasis Realistic Mathematics Education (RME). Metode penelitian ini adalah metode kuantitatif dengan desain kuasi eksperimen, prettest posttest control group design dengan teknik analisis meliputi analisis statistik deskriptif dan statistik inferensial. Sampel penelitian berjumlah 42 orang yang dilaksanakan di SDN 60 Kota Bengkulu dengan kelas eksperimen berjumlah 21 orang dan kelas control berjumlah 21 orang. Penelitian ini dilakukan untuk mengukur peningkatan hasil belajar matematika. Hasil penelitian ini menunjukkan bahwa nilai rata-rata posttest kelas eksperimen yang mencapai 85,24 lebih tinggi dibandingkan kelas kontrol sebesar 74,10. Selain itu, persentase ketuntasan pada kelas eksperimen mencapai 85,71%, sedangkan kelas kontrol hanya 57,14%. Uji independent sample t-test pada sig 2 tailed didapat $0,000 < 0,05$ sehingga terdapat perbedaan rata-rata pada kelas eksperimen dan kelas kontrol, dan nilai n-gain kelas eksperimen sebesar 0,68 dengan masuk kategori sedang dan lebih tinggi dibandingkan dengan kelas kontrol sebesar 0,35 kategori sedang, sehingga membuktikan adanya peningkatan hasil belajar matematika siswa SD. Kesimpulan yang didapat bahwa penggunaan e-LKPD berbasis Realistic Mathematics Education (RME) memberikan dampak positif dalam meningkatkan hasil belajar matematika siswa SD. Saran untuk guru yaitu diharapkan menggunakan E-LKPD berbasis Realistic Mathematics Education (RME) dalam pembelajaran matematika, dan untuk peneliti selanjutnya penggunaan E-LKPD berbasis Realistic Mathematics Education (RME) ini dapat mengukur kemampuan matematis siswa lainnya.

Kata kunci: E-LKPD; Realistic Matematik Education (RME); Hasil Belajar.

INTRODUCTION

The development of education in the 21st century faces complex challenges in preparing high-quality human resources capable of competing in today's global era. Education is the only appropriate means of developing high-quality human resources to advance this nation. The implementation of the 2013 Curriculum directs student-centered learning through a constructivist approach. This student-centered learning guides students to construct their own knowledge through learning experiences and the discovery of knowledge. One subject that enhances creativity and reasoning skills for solving problems in daily life is mathematics, known as the Queen of Sciences.

Mathematics is a field of study that plays a vital role in education, taught from early childhood education through higher education. Mathematics instruction in elementary school aims to emphasize logical, rational, and critical reasoning, as well as to provide students with the skills to apply mathematical reasoning to solve problems in everyday life (Hadi, 2017). This underscores that mathematics is expected to provide students with opportunities to think, enabling them to solve problems in daily life and helping them develop the skills needed to thrive in the 21st century.

In reality, students struggle with thinking, reasoning, and solving mathematical problems in everyday life, resulting in low mathematics achievement scores 45, according to preliminary school exam data. In this technological age, innovation is needed in the mathematics learning process to make it easier for students to understand.

Education in the era of technological advancement demands innovation in classroom learning processes. One tool that should be implemented in the classroom is the Electronic Worksheet (E-LKPD). However, the issue lies in the underutilization of worksheets that facilitate students' learning, particularly in mathematics. To address this, there is a need for electronic worksheets that meet established standards, making them practical to use and accessible to the general public. The increasing number of students who own mobile devices (laptops, tablets, smartphones, and cell phones) can be leveraged as an alternative medium to help them enhance their mastery of subject matter. By incorporating multimedia elements into worksheets, it is hoped that this will add value to the worksheets and improve students' mathematics learning outcomes.

To date, teaching and learning at SDN 60 Bengkulu has not incorporated multimedia elements into worksheets, as teachers have not fully utilized their creativity and have shown a lack of willingness to improve their competencies, resulting in limited improvement in student learning outcomes. Therefore, SDN 60 Bengkulu has been selected as the research site, with the aim of developing e-worksheets based on Realistic Mathematics Education (RME) and improving students' mathematics learning outcomes.

Previous studies have shown that the use of e-worksheets in the learning process can improve conceptual understanding, problem-solving skills, and mathematics achievement. This is because mathematical concepts are linked to real-life situations, making learning more meaningful; furthermore, e-worksheets can increase motivation and engagement in the learning process.

However, while some of these studies have focused more on the effectiveness of e-worksheets in improving conceptual understanding, they have not yet addressed the role of real-life contexts in mathematics learning outcomes. Therefore, the use of e-worksheets needs to be integrated with an appropriate model so that students can experience mathematical concepts in a tangible way, thereby making the learning process more meaningful and, of course, leading to improved mathematics learning outcomes.

One learning model that is believed to align with the characteristics of mathematics and the expectations of the current curriculum is the Realistic Mathematics Education (RME) model. This model is a mathematics learning approach that must always utilize real-life problems (Wijaya, 2012). Susanto (2019) states that Realistic Mathematics Education (RME) is a mathematics learning approach that is oriented toward connecting human activities in everyday life contexts to learning experiences focused on real-world situations. By using a learning model based on everyday problems, students face problems and attempt to solve them using the information they already possess, allowing them to appreciate what they already know.

Based on the references outlined above, this quasi-experimental study was conducted using web-based E-LKPD grounded in Realistic Mathematics Education (RME). The impact of this medium on students' mathematics learning outcomes was then assessed.

RESEARCH METHOD

This study employs a quantitative approach using a quasi-experimental design. The research design used is a pretest-posttest control group design. This design was used to determine the effect of using E-LKPD based on Realistic Mathematics Education (RME) on the mathematics learning outcomes of elementary school students.

In this design, both classes took a pretest before receiving the intervention to assess the students' initial abilities. Subsequently, the experimental class received an intervention using E-LKPD based on Realistic Mathematics Education (RME), while the control class received lecture-based instruction. After the learning process was completed, both classes took a posttest to assess the improvement in students' mathematics learning outcomes. The research design is shown in the following table:

Table 1. Pretest-Posttest Control Group Design

Class	Pretest	Treatment	Posttest
Experiment	O ₁	X	O ₂
Control	O ₃	-	O ₄

Description:

O₁ = Pre-test for the Experimental Class

O₂ = Posttest for the Experimental Class

O₃ = Pretest for the Control Class

O₄ = Posttest for the Control Class

X = A Learning Intervention Using E-LKPD Based on Realistic Mathematics Education

The population in this study consisted of all 42 fifth-grade students, with the sample comprising two classes of 21 students each: the experimental class and the control class. Purposive sampling was used because the selection of classes was based on the school's specific circumstances and conditions, which shared similarities in terms of population characteristics.

Data collection was conducted through mathematics achievement tests consisting of pretest and posttest questions. The data obtained were then analyzed using descriptive and inferential statistics, including normality tests, homogeneity tests, hypothesis testing (independent samples t-test), and n-gain tests to determine the improvement in students' mathematics learning outcomes after using E-LKPD based on Realistic Mathematics Education (RME).

RESULT AND DISCUSSION

The results of this study indicate that the use of E-LKPD based on Realistic Mathematics Education (RME) is one potential solution for educational innovation aimed at improving learning outcomes, particularly at SDN 60 in Bengkulu City.

During the e-LKPD session, the materials are displayed on the screen and a link is shared with the students, allowing them to open the materials directly on their own smartphones or laptops. The students then complete the exercises in the e-LKPD following the instructions provided. The average pretest and posttest scores for both classes are presented in Table 2 as follows:

Table 2. Average Pretest and Posttest Scores

Class	Number of Students	Average pretest score	Average posttest score	Improvement
Experiment	21	61,43	85,24	23,81
Kontrol	21	60,19	74,10	13,91

Based on Table 2 above, the initial abilities of the two classes were relatively similar. This can be seen from the average pretest score of 61.43 for the experimental class and 60.19 for the control class. After the treatment was administered, the average posttest score for the experimental class increased to 85.24, while that of the control class increased to 74.10. Figure 1 below shows the average pretest and posttest scores for the experimental and control classes.

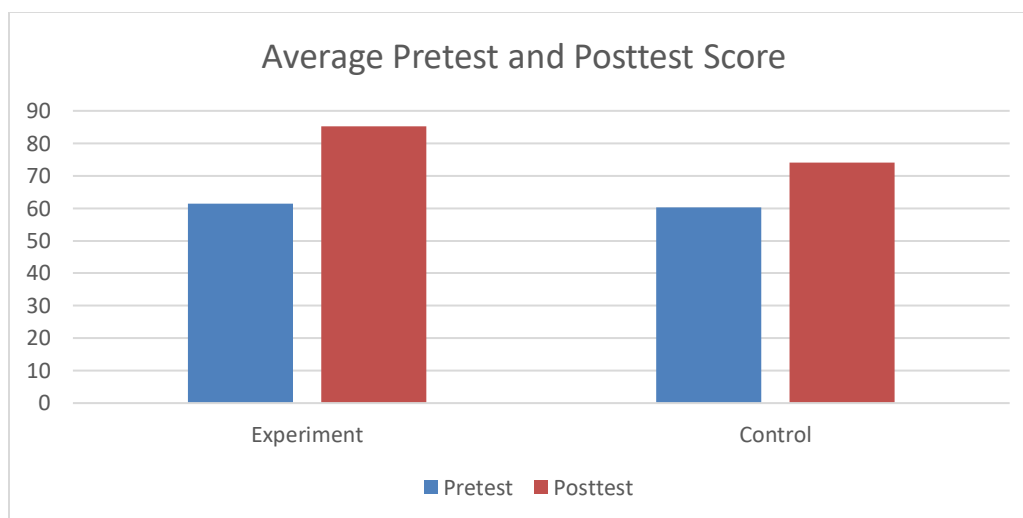


Figure 1. Average Pretest and Posttest Scores for the Experimental and Control Classes

The improvement in learning outcomes in the experimental class was greater than that in the control class. This indicates that the use of E-LKPDs based on Realistic Mathematics Education (RME) has a positive effect on students' mathematics learning outcomes.

Furthermore, student learning achievement is determined based on the minimum passing score for mathematics, which is 75 at SD Negeri 60 in Bengkulu City. The results of student learning achievement are shown in Table 3 below:

Table 3. Student Learning Achievement Results

Class	Number of Students Who Have Completed the Course	Percentage	Number of Students Who Did Not Pass	Percentage
Experiment	18	85,71%	3	14,29%
Control	12	57,14%	9	42,86%

As shown in Table 3 above, the percentage of students achieving mastery in the experimental class reached 85.71%, while in the control class it reached only 57.14%. These results demonstrate that the use of E-LKPDs based on Realistic Mathematics Education (RME) is effective in helping students achieve a higher level of mastery compared to traditional lecture-based instruction.

In the normality test, the mathematics achievement data of students in the experimental and control classes were found to be normally distributed based on the Shapiro-Wilk test conducted using SPSS at a significance level of 0.05 (5%), as shown in Table 4 below:

Table 4. Results of the Normality Test

Data	Class	Sig.	Description
Pretest	Experiment	0,121	Normal
Pretest	Control	0,094	Normal
Posttest	Experiment	0,200	Normal
Posttest	Control	0,156	Normal

Based on Table 4 above, it can be seen that all significance values are greater than 0.05. Thus, the pretest and posttest data for both classes are normally distributed.

A homogeneity test was conducted to determine whether the variances of the data from the two classes were homogeneous or not, using Levene's test with a significance level of 0.05, as shown in Table 5 below:

Table 5. Results of the Homogeneity Test

Data	Sig.	Description
Pretest and Posttest	0,287	Homogen

Table 5 above shows that the p-value is $0.287 > 0.05$; therefore, it can be concluded that the data from the two classes have homogeneous variances.

Next, the hypothesis test revealed that the calculated t-value of 3.842 was greater than the critical t-value of 2.021, with a significance level (two-tailed) of 0.000. Consequently, the alternative hypothesis (H_a) was accepted and the null hypothesis (H_o) was rejected, indicating that the use of E-LKPD based on Realistic Mathematics Education (RME) has an effect. This is shown in Table 6 below:

Table 6. Hypothesis Test Results

Data	t-statistic	t-table	Sig. (2 tailed)	Description
Posttest	3,842	2,021	0,000	H_a accepted

Next, to determine the improvement in student learning outcomes, an analysis was conducted using the N-Gain test. The results of the N-Gain test are shown in Table 7 below:

Table 7. Results of the N-Gain Test

Class	N-Gain Score	Category
Experiment	0,68	Medium
Control	0,35	Medium

Based on Table 7 above, the analysis results show that the N-Gain value for the experimental class was 0.68, which falls into the moderate category and is higher than that of the control class, which was 0.35. This indicates that the E-LKPD based on Realistic Mathematics Education (RME) is more effective in improving students' mathematics learning outcomes, although the improvement has not yet reached its maximum potential.

Discussion

The results of the study indicate that the use of E-LKPD based on Realistic Mathematics Education (RME) is effective in improving the mathematics learning outcomes of students at SD Negeri 60 in Bengkulu City. This is evident from the average posttest score of the experimental class, which reached 85.24, higher than that of the control class at 74.10. Additionally, the mastery rate in the experimental class reached 85.71%, while the control class achieved only 57.14%. These findings indicate that learning using E-LKPD based on Realistic Mathematics Education (RME) is more effective than lecture-based instruction.

This E-LKPD is an electronic learning medium designed to assist students in completing assignments. This aligns with Hamalik (2017), who states that learning media are tools, methods, and techniques used to enhance communication and interaction between teachers and students in the learning process. Furthermore, Prastowo (2015) states that a worksheet is a teaching material containing a summary of the subject matter and tasks that students must complete to achieve specific competencies; over time, worksheets.

Furthermore, this improvement in learning outcomes is also due to the Realistic Mathematics Education (RME) approach, which emphasizes learning mathematics in connection with real-life situations in students' daily lives. Through this approach, students do not merely memorize formulas but gain a deeper understanding of mathematical concepts through concrete experiences. When using the E-LKPD, students are also more actively exploring the material, engaging in discussions, and solving contextual problems, making the learning process more engaging and interactive.

According to Freudenthal (1991), mathematics must be connected to reality and human activities so that learning becomes more meaningful and easier for students to understand. This aligns with the characteristics of Realistic Mathematics Education (RME), namely that learning begins with contextual problems close to students' lives; models are used as a bridge from concrete situations to formal mathematical concepts; students are given the opportunity to discover problem-solving strategies independently; discussions and interactions occur among students as well as between students and teachers; and mathematical concepts are studied in an integrated manner with other concepts.

Based on the description of these research findings, this is consistent with the findings of Supriatna and Lusa (2021), who state that mathematics teaching materials based on Realistic Mathematics Education (RME) can help students develop a better understanding of mathematical concepts. The study shows that the Realistic Mathematics Education (RME)

approach can make it easier for students to understand abstract concepts because learning is linked to students' real-world experiences.

In addition, another relevant study by Utami et al. (2025) found that the Realistic Mathematics Education (RME) approach, supported by interactive learning media, has a positive effect on the mathematics learning outcomes of elementary school students. The use of digital media in instruction helps increase student motivation and engagement throughout the learning process.

Furthermore, another study by Afifah et al. (2025) shows that Realistic Mathematics Education (RME) based on ethnomathematics can improve the learning outcomes of elementary school students. This approach makes it easier for students to understand the material because learning is linked to the students' cultural context and daily lives

Furthermore, the findings of Damayanti et al. (2021) indicate that the use of a Realistic Mathematics Education (RME) model based on manipulative media can improve students' mathematics learning outcomes because it involves them directly in the process of discovering learning concepts. These findings also reinforce research showing that the use of interactive learning media, including digital worksheets, can enhance elementary school students' understanding and learning outcomes in mathematics.

Finally, the findings of Atikah et al. (2021) also indicate that the Realistic Mathematics Education (RME)-based mathematics e-module is valid and suitable for use in elementary school mathematics instruction because it encourages students to engage in independent and active learning during the classroom learning process. This aligns with the findings of this study, in which students in the experimental class were observed to be more active in completing tasks, engaging in discussions, and solving mathematical problems compared to students in the control class.

This study makes a significant contribution to integrating contextual problems into students' daily lives, thereby supporting the mathematics learning process in accordance with the principles of Realistic Mathematics Education (RME), and provides empirical evidence regarding the impact of using e-worksheets based on Realistic Mathematics Education (RME) on improving students' learning outcomes and understanding of mathematical concepts.

Thus, the results of this study reinforce previous research findings that the use of E-LKPD based on Realistic Mathematics Education (RME) is effective in improving the mathematics learning outcomes of elementary school students. Realistic Mathematics

Education (RME)-based learning creates a more meaningful, contextual, interactive, and student-centered learning experience, making it easier for students to understand mathematical concepts and achieve optimal learning outcomes.

CONCLUSION

The findings of this study indicate that the use of e-worksheets based on Realistic Mathematics Education (RME) has a positive impact on improving student learning outcomes, particularly in elementary school mathematics. Furthermore, it has a positive influence on mathematics learning, as students find the e-LKPD enjoyable; they demonstrate a better understanding compared to traditional printed worksheets. Teachers also gain new insights, noting that using e-LKPD simplifies the teaching process simply by sharing a link with students, who can then click and immediately access the online e-LKPD. The results of this study indicate a significant influence and impact on the improvement of student learning outcomes, particularly in mathematics at SDN 60 in Bengkulu City. A recommendation for future researchers is that the use of these Realistic Mathematics Education (RME)-based e-LKPD could assess other mathematical abilities of students, such as critical thinking skills, creative thinking skills, and others.

REFERENCES

- Afifah, C. R., & Hasibuan, A. L. (2025). Pengaruh pembelajaran realistic mathematics education (RME) berbasis ethnomatematika untuk meningkatkan hasil belajar siswa SD. *Pendas: Jurnal Ilmiah Pendidikan Dasar*, 10(4). <https://doi.org/10.23969/jp.v10i04.34832>
- Atikah, N., Gistituati, N., Fitria, Y., & Syarifuddin, H. (2021). Validitas e-modul matematika sekolah dasar berbasis pendekatan realistic mathematics education (RME). *Jurnal Basicedu*, 5(6), 6159–6167. <https://doi.org/10.31004/basicedu.v5i6.1799>
- Damayanti, P., Sangila, M. S., & Agus, I. (2021). Meningkatkan hasil belajar matematika melalui model pembelajaran realistic mathematics education (RME) berbasis media manipulatif. *Diniyah: Jurnal Pendidikan Dasar*, 2(1), 14–22.
- Freudenthal. (1991). Revisiting mathematics education: China lectures. Dordrecht: Kluwer Academic Publisher.
- Hadi, S. (2017). *Pendidikan Matematika Realistik: Teori, Pengembangan dan Implementasinya*. Jakarta: Rajawali Press.

Edisi : Vol. 10, No. 1, April/2026, hlm. 310-321

- Hamalik, O. (2017). Proses Belajar Mengajar.
- Pratowo, A. (2015). Panduan Kreatif Membuat Bahan Ajar Inovatif. Jakarta: Diva Press
- Supriatna, I., & Lusa, H. (2021). Pengembangan bahan ajar matematika berbasis realistic mathematics education (RME) untuk membangun pemahaman konsep. *Jurnal Gentala Pendidikan Dasar*, 6(2), 112–138. <https://doi.org/10.22437/gentala.v6i2.15642>
- Susanto, A. (2019). *Teori Belajar & Pembelajaran di Sekolah Dasar*. Jakarta: Kencana
- Utami, K. C., Efendi, U., Abung, M., & Nurwahidin, M. (2025). Pengaruh pendekatan realistic mathematics education (RME) berbantuan media Educandy terhadap hasil belajar matematika siswa SD. *Jurnal Riset Pembelajaran Matematika Sekolah*, 9(2). <https://doi.org/10.21009/jrpms.092.08>
- Wijaya, A. (2012). *Pendidikan Matematika Realistik Suatu Alternatif Pendekatan Pembelajaran Matematika*. Yogyakarta: Graha Ilmu