

Research Article

The Effectiveness of Using LKPD on Circle Material to Improve Students' Numeracy Skills

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ABSTRACT

Numeracy is the ability to apply number concepts, calculation operation skills, and the ability to explain information or problems using Mathematics. The purpose of this research is to determine the effectiveness of using Reciprocal Teaching-based Worksheets (LKPD) to enhance students' numeracy in circle material. This type of research is an experiment with a pretest and posttest design. The sample in this study consisted of students from class XI F2 at SMA N 4 Yogyakarta. Data collection techniques included interviews, observations, and numeracy skills test questions for students. The results of this research indicate that the use of Reciprocal Teaching-based LKPD is effective in improving students' numeracy skills. Therefore, this research concludes that the use of Reciprocal Teaching-based LKPD is effective in improving students' numeracy skills in circle material.

Keywords: Numeracy; Reciprocal Teaching; Student's Worksheets.

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1. Introduction

The Merdeka curriculum is designed to develop character through the concept of the Pancasila Student Profile (Ulandari & Rapita, 2023). The character of the Pancasila Student Profile is formulated from the goals of Indonesia's national education (Kahfi, 2022). The Merdeka learning curriculum focuses on character education based on the P5 Project for Strengthening the Pancasila Student Profile (Ulandari & Rapita, 2023). The goal of this curriculum is to create a generation with excellent character guided by the noble values of Pancasila (Sitorus et al., 2023). One significant idea in this curriculum is enabling students to learn independently. Independence here means that students have the freedom to access knowledge from both formal and non-formal education (Saputri et al., 2023). The Merdeka learning curriculum does not limit ongoing learning concepts and demands creativity from both teachers and students in the learning process (Manalu et al., 2022). Learning conducted in schools includes several subjects, one of which is mathematics.

Mathematics is a branch of science taught in schools because it is based on pure deduction, which is an absolute truth and cannot be revised, and the unity of the system in mathematical proof (Majidah, 2023). According to Puspaningtyas (2019), mathematics is not just about numbers but encompasses much more. Ruseffendi (Handayani & Syahrini, 2019) states that mathematics learned by students in school is not through exploration but notification. Mathematics is a science taught in schools to be applied in everyday life (Rahmah, 2013). Besides being a calculation tool, mathematics is also used as a language to formulate and understand concepts in various disciplines. Its broad applications include fields like technology, economics, and many others (Simanjuntak et al., 2021). Mathematical skills are also essential in developing logical, analytical thinking, and problem-solving abilities (Rachmantika & Wardono, 2019; Siswanto & Azhar, 2018).

Mathematical skills are crucial for students to possess because if their mathematical skills are good, it will positively impact their numeracy skills.

Numeracy refers to an individual's ability to understand and use numbers and mathematical operations in various contexts (Napsiyah, 2022). According to Han (Winata et al., 2021), numeracy skills include several basic mathematical skills essential for daily life and problem-solving. Numeracy skills are very important in daily life and play a key role in various fields, including education, work, and decision-making (Haloho & Napitu, 2023). Improving numeracy skills can enhance an individual's ability to understand quantitative information, tackle mathematical tasks, and contribute to success in various life domains. Han et al. (2017) explain that numeracy skills involve applying number concepts, performing mathematical operations, and interpreting data in real-world contexts. Ekowati and Suwandayani (2017) state that numeracy skills have significant value in various aspects of life, including at home, work, and society. Therefore, it is very important to improve students' numeracy skills.

Efforts to improve students' numeracy can be done in various ways, one of which is by choosing appropriate learning media. Learning media are tools to transfer learning material (Nurseto, 2011). In this era, learning media must be well-packaged to assist students in learning. One learning medium that can be used is LKPD. LKPD combined with the Reciprocal Teaching-based learning method is developed to help facilitate students in learning mathematics. The development of this teaching material is adjusted to the needs of students with learning achievements and goals aligned with the curriculum. Based on interviews with mathematics teachers for class XI at SMA Negeri 4 Yogyakarta, it was found that the curriculum used by class XI students is the Merdeka learning curriculum.

2. Method

This research is experimental, with the population consisting of students from class XI F2 at SMA Negeri 4 Yogyakarta. Data collection techniques include interviews, observations, and pretest-posttest questions assessing students' numeracy skills on circle material. The hypothesis of this research is that the use of LKPD (Student Worksheets) is more effective in improving students' numeracy skills compared to using existing teaching materials.

To analyze the data, the first step is to ensure it meets the prerequisite tests, namely the normality and homogeneity tests. If the data meets the normality criteria, parametric tests are conducted. However, if the data does not meet the normality criteria, non-parametric tests are used. Since the data obtained did not meet the normality criteria, non-parametric tests were conducted, specifically the Wilcoxon Signed Rank Test, to determine the impact of using Reciprocal Teaching-based LKPD on students' numeracy skills. Finally, the N-Gain test was performed to determine the effectiveness of the developed product, which is the Reciprocal Teaching-based LKPD, in improving students' numeracy skills.

3. Result and Discussion

This experimental research utilized Reciprocal Teaching-based LKPD on circle material to improve students' numeracy skills. The developed LKPD incorporated numeracy indicators, with each of the four numeracy indicators translated into practice questions within the LKPD. This LKPD was only used in the research class. The study's findings were derived from pretest and posttest numeracy skill questions on circle material. After administering the pretest and posttest in the research class, data analysis

was conducted using IBM SPSS Statistics 26 to determine the effectiveness of the Reciprocal Teaching-based LKPD. The following are the steps of the testing conducted:

3.1. Prerequisite Analysis Tests

The normality test was used to determine whether the data obtained were normally distributed. The Shapiro-Wilk Normality Test, conducted using IBM SPSS Statistics 26, yielded the following results:

Table 1. Normality Test Results

Data	Significance Value	Note
Pretest	0.000	Not normally distributed
Posttest	0.000	Not normally distributer

Table 1 indicates that the significance values for both the pretest and posttest data were not normally distributed, necessitating the use of non-parametric tests for further analysis. The homogeneity test is used to determine whether the data obtained are homogeneous. However, since the data did not meet the normality assumption, the homogeneity test was not performed. Therefore, the effectiveness test proceeded with non-parametric testing.

3.2. Effectiveness Test

The Wilcoxon Signed Rank Test, a non-parametric alternative to the paired sample t-test, was used to determine whether there was a significant difference between two paired samples, i.e., pretest and posttest scores. The test aimed to assess whether the treatment (use of Reciprocal Teaching-based LKPD) had an effect by comparing the mean pretest and posttest scores. The Wilcoxon Signed Rank Test was conducted using IBM SPSS Statistics 26. The results are presented in Table 2.

Table 2. Wilcoxon Signed Rank Test Results

	<i>N</i>	<i>Mean Rank</i>	<i>Sum Of Ranks</i>
<i>Negative Ranks</i>	0 ^a	0.00	0.00
<i>Positive Ranks</i>	32 ^b	16.50	528.00
<i>Ties</i>	0 ^c		
<i>Total</i>	32		

a. *Post-Test < Pretest*

b. *Post-Test > Pretest*

c. *Post-Test = Petest*

All 32 students showed an increase in scores, with a mean rank increase of 16.50. To determine if there was a significant difference between the pretest and posttest scores, at the significance value of the Wilcoxon Signed Rank Test in Table 3

Table 3. Wilcoxon Signed Rank Test Statistics

<i>Pretest dan Posttest</i>	
<i>Z</i>	-4.963
<i>Asymp. Sig. (2-tailed)</i>	0.000

The significance value (*Asymp. Sig. (2-tailed)*) is 0.000, which is less than the significance level of 0.05 ($0.000 < 0.05$), leading to the rejection of H_0 and acceptance of H_1 . This means there is a significant difference between the pretest and posttest scores, indicating the impact of using Reciprocal Teaching-based LKPD on students' numeracy skills. The average pretest score was 35.18, while the average posttest score was 86.5, showing an increase of 51.32, with the average posttest score surpassing the school's minimum competency criterion (KKM) of 70.

3.3. N-Gain Test

The N-Gain test is a non-parametric test used when the independent sample t-test cannot be performed due to data not meeting normality assumptions. This test uses the average N-Gain score to determine the effectiveness of the Reciprocal Teaching-based LKPD in improving students' numeracy skills. The N-Gain test involved pretest and posttest data processed using IBM SPSS Statistics 26. The results are shown in Table 4.

Table 4. N-Gain Test Results

<i>N-Gain Percent</i>	
<i>Mean</i>	78.9%
<i>Minimum Score</i>	52.94
<i>Maximoum Score</i>	92.54

The N-Gain score results show an average N-Gain score of 78.9%, indicating the method's effectiveness, with minimum and maximum scores of 52.94 and 92.54, respectively. Thus, the conclusion is that the use of Reciprocal Teaching-based LKPD on circle material effectively improves students' numeracy skills.

Based on the hypothesis testing conducted, it can be concluded that the use of Reciprocal Teaching-based LKPD can enhance students' numeracy skills. The significant increase in average pretest and posttest scores, as well as the comparison of average posttest scores with the school's KKM, are illustrated in Figure 1.

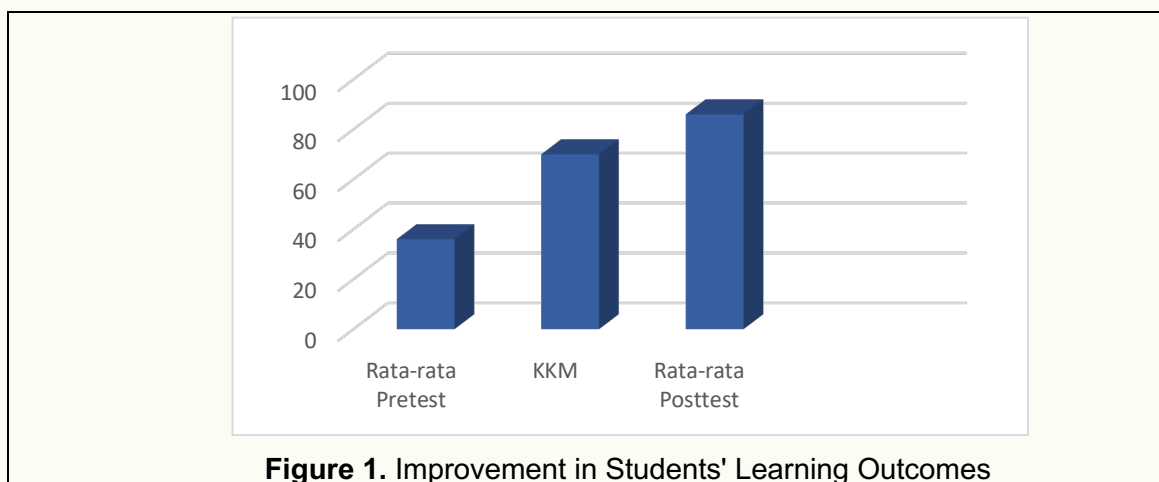


Figure 1 shows a significant increase in students' average learning outcomes in the research class using LKPD. This effectiveness is due to the numeracy indicators included in the LKPD, distinguishing it from typical school worksheets. The research results demonstrate that Reciprocal Teaching-based LKPD effectively improves numeracy skills in class XI high school students. Therefore, this research concludes that using Reciprocal Teaching-based LKPD on circle material can enhance students' numeracy skills.

The findings of this study highlight the significant impact of Reciprocal Teaching-based LKPD on improving students' numeracy skills in the context of circle material. This section delves into the implications of these results, the effectiveness of the teaching method, and comparisons with existing literature.

The Reciprocal Teaching-based LKPD guided students through problem analysis and solution processes using symbols and numbers, leading to a substantial improvement in their numeracy skills. This method aligns with the core principles of Reciprocal Teaching, which include predicting, questioning, clarifying, and summarizing. These strategies help students to better understand and retain mathematical concepts, as evidenced by the significant improvement in posttest scores compared to pretest scores. The Wilcoxon Signed Rank Test results confirmed this improvement, with a significant value (Asymp. Sig. (2-tailed) of 0.000, well below the 0.05 threshold. This indicates a statistically significant difference between the pretest and posttest scores, affirming the positive impact of the LKPD on student performance.

Similar studies have also demonstrated the effectiveness of Reciprocal Teaching in various educational contexts. For instance, a study by Palincsar and Brown (1984), who initially developed the Reciprocal Teaching method, found that it significantly improved students' reading comprehension skills. This study extends their findings to the realm of mathematics, specifically numeracy, showing that Reciprocal Teaching can be successfully adapted to different subjects.

Moreover, the study's results align with research conducted by King and Rosenshine (1993), which demonstrated that structured, interactive teaching methods enhance students' problem-solving abilities. The significant N-Gain score average of 78.9% in this study supports these findings, indicating that the structured, interactive nature of Reciprocal Teaching-based LKPD effectively enhances students' numeracy skills.

The results suggest that integrating Reciprocal Teaching into mathematics education can lead to substantial improvements in students' numeracy skills. This method encourages active student engagement and self-regulation, which are critical components of effective learning. Teachers adopting this approach may need to provide initial guidance and scaffolding, but as students become more familiar with the process, they can increasingly take control of their learning.

Additionally, the significant increase in posttest scores above the school's minimum competency criterion (KKM) of 70 indicates that this method not only improves overall performance but also helps more students meet or exceed academic standards. This suggests that Reciprocal Teaching-based LKPD can be a valuable tool for addressing diverse learning needs and promoting equity in education.

While this study provides compelling evidence of the effectiveness of Reciprocal Teaching-based LKPD, it is limited to a specific student group and mathematical topic. Future research could explore its application across different subjects, grade levels, and student demographics to validate and extend these findings. Additionally, longitudinal studies could examine the long-term impact of this teaching method on students' academic performance and retention of mathematical concepts.

4. Conclusion

This study concludes that the use of Reciprocal Teaching-based LKPD has been proven effective in enhancing students' numeracy skills. The effectiveness is attributed to the Reciprocal Teaching-based LKPD's ability to guide students in analyzing given problems and solving them using symbols and numbers to draw conclusions. This conclusion is supported by data analysis results, particularly the Wilcoxon Signed Rank Test, where the significance value (Asymp. Sig. (2-tailed)) was 0.000, which is less than the significance level of 0.05 ($0.000 < 0.05$). Therefore, H_0 is rejected, and H_1 is accepted, indicating a significant difference between pretest and posttest scores. This

demonstrates the impact of using Reciprocal Teaching-based LKPD on circle material on students' numeracy skills.

The average pretest score before treatment was 35.18, while the average posttest score after treatment was 86.5. The N-Gain test results showed an average N-Gain score of 78.8696 or 78.9%, categorized as effective, with a minimum N-Gain score of 52.94 and a maximum score of 92.54. Thus, it can be concluded that the use of Reciprocal Teaching-based LKPD on circle material is effective in improving students' numeracy skills. Therefore, students' numeracy skills can be enhanced by using Reciprocal Teaching-based LKPD during mathematics lessons on circle material.

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