

## THE EFFECT OF THE PROBLEM BASED LEARNING MODEL USED BY KOBELKA CONCRETE MEDIA AND THE IMPLEMENTATION OF CLASS MANAGEMENT ON THE NUMERATION SKILLS OF GRADE III STUDENTS

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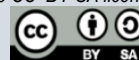
### KEYWORDS

KOBELKA,  
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### ABSTRACT

This study was motivated by the low multiplication numeracy skills of elementary school students due to learning practices that remain conventional and the minimal use of concrete instructional media. Based on theoretical studies, the Problem Based Learning model, concrete manipulative media, and effective classroom management can improve students' conceptual understanding and learning engagement. This study aimed to determine the effect of implementing the Problem Based Learning model assisted by KOBELKA media and classroom management on students' multiplication numeracy skills. This research employed a quantitative experimental approach with a quasi-experimental design in the form of a Non-Equivalent Control Group Design. The study was conducted at SD Negeri Bringin 01 (experimental class) and SD Negeri Bringin 02 (control class). Data collection techniques included tests (pretest-posttest), observation, and documentation. The research instrument consisted of multiple-choice questions that had been tested for validity and reliability. Data analysis included descriptive tests, normality tests, homogeneity tests, N-Gain analysis, and hypothesis testing using the Wilcoxon test, paired sample t-test, and Mann-Whitney U Test. The results showed a significant difference between the experimental and control classes (sig. < 0.05), with a higher improvement in numeracy skills in the experimental class. Therefore, the implementation of the Problem Based Learning model assisted by KOBELKA media and classroom management had a significant effect on improving students' multiplication numeracy skills. These findings suggest that integrating problem-based learning with concrete manipulative media and effective classroom management can serve as a practical instructional strategy for enhancing numeracy learning outcomes in elementary education.

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## INTRODUCTION

Mathematics learning in elementary schools plays an important role in developing students' logical thinking, problem-solving abilities, and conceptual understanding. Mathematics is not only concerned with numbers and calculations but also serves as a means of training students to think critically, systematically, and creatively in dealing with various situations (Pradika et al., 2019; Djuanda, Hairun, & Suharna, 2019). Among the fundamental mathematical concepts taught in elementary school, multiplication occupies a particularly important position because it serves as the basis for learning more advanced topics such as division, fractions, ratios, and algebra. Students who experience difficulties in understanding multiplication concepts often encounter obstacles in mastering subsequent mathematical concepts.

The importance of multiplication mastery is particularly relevant for third-grade elementary students because this stage represents a transition from basic arithmetic recognition to more complex numerical operations. Preliminary observations and interviews conducted with third-grade teachers at SD Negeri Bringin 01 and SD Negeri Bringin 02 revealed that multiplication remains one of the most challenging topics for students. Many students still rely on memorization without fully understanding the concept of repeated addition, resulting in difficulties when solving multiplication problems in different contexts. Limited mastery of multiplication facts, low concentration levels, and negative perceptions toward mathematics further contribute to students' learning difficulties. If these challenges are not addressed at an early stage, they may hinder students' mathematical development in higher grades. Therefore, investigating strategies to improve multiplication numeracy skills among third-grade students is both academically and practically important.

The findings from interviews also indicated variations in students' participation and understanding during classroom learning. While some students actively participated and followed lessons well, others tended to lose focus, engage in unrelated activities, or require additional guidance to understand mathematical concepts. These conditions suggest that effective learning is influenced not only by instructional materials but also by how teachers manage the learning environment and facilitate student engagement. A well-managed classroom can create a conducive atmosphere that supports active participation, interaction, and meaningful learning experiences.

Despite students generally demonstrating enthusiasm for learning and enjoying collaborative activities, mathematics instruction in both schools is still largely dominated by lecture-based methods with limited use of learning media. As a result, students often find it difficult to understand abstract mathematical concepts, particularly multiplication. This condition highlights the need for innovative instructional approaches that can make mathematical concepts more concrete, meaningful, and accessible to young learners.

One potential solution is the use of manipulative learning media. Manipulative media enable students to learn through direct interaction with objects, thereby helping them bridge the gap between concrete experiences and abstract mathematical concepts. KOBELKA (Kotak Belajar Perkalian/Multiplication Learning Box) is a concrete learning medium designed to facilitate students' understanding of multiplication through hands-on activities. The media consists of ten numbered boxes that allow students to represent multiplication situations by placing objects into the boxes according to the problem given and then counting the total number of objects. Through this process, students can visualize multiplication as repeated addition rather than merely memorizing multiplication facts.

The effectiveness of manipulative media is supported by previous studies indicating that instructional media can improve students' attention, engagement, and understanding of learning materials (Junaidi, 2019; Zaini, 2017). However, the successful implementation of learning media also depends on the instructional approach used by teachers. Therefore, this study integrates KOBELKA media with the Problem Based Learning (PBL) model, which encourages students to actively explore problems, construct knowledge, and develop problem-solving skills through collaborative learning activities.

Based on these considerations, this study focuses on examining the effect of the Problem Based Learning model assisted by KOBELKA media and supported by classroom management on the multiplication numeracy skills of third-grade students. The study is expected to provide empirical evidence regarding the effectiveness of combining

innovative learning media, student-centered learning models, and effective classroom management in improving students' understanding of multiplication concepts and numeracy achievement.

The research problems in this study are as follows: Is there a difference in multiplication numeracy skills between third-grade students who participate in learning using the Problem Based Learning (PBL) model assisted by KOBELKA media with classroom management implementation and those who participate in conventional learning. Are the multiplication numeracy skills of students who participate in learning using the Problem Based Learning (PBL) model assisted by KOBELKA media with classroom management implementation higher than those of students who participate in conventional learning.

## METHOD

This study employed a quantitative approach using a quasi-experimental research design. The quantitative approach was chosen because the research data consisted of numerical scores obtained from pretests and posttests, which were analyzed using statistical techniques to determine the effect of the treatment on students' numeracy skills. Experimental research aims to examine the cause-and-effect relationship between independent and dependent variables through the administration of specific treatments under controlled conditions. The independent variables in this study were the Problem Based Learning (PBL) model assisted by concrete KOBELKA media and the implementation of classroom management, while the dependent variable was the multiplication numeracy skills of third-grade students. This study aimed to determine the effect of implementing the PBL model assisted by KOBELKA media and classroom management on improving students' multiplication numeracy skills compared to conventional learning.

The research design used was the Non-Equivalent Control Group Design, which is a form of Quasi-Experimental Design. The study involved two groups, namely the experimental group and the control group. The experimental group consisted of third-grade students from SD Negeri Bringin 01 who received treatment in the form of the implementation of the Problem Based Learning model assisted by concrete KOBELKA media and classroom management, while the control group consisted of third-grade students from SD Negeri Bringin 02 who participated in conventional learning. Both groups were given a pretest before the treatment and a posttest after the treatment to determine the improvement in students' numeracy skills. The research design can be illustrated as follows:

| Group        | Pretest        | Treatment      | Posttest       |
|--------------|----------------|----------------|----------------|
| Experimental | O <sub>1</sub> | X <sub>e</sub> | O <sub>2</sub> |
| Control      | O <sub>3</sub> | X <sub>c</sub> | O <sub>4</sub> |

Source: Adapted from Creswell and Creswell (2018) and Shadish, Cook, and Campbell (2002).

Description: O<sub>1</sub> and O<sub>3</sub> represent the pretest scores, X<sub>e</sub> represents the treatment in the form of the PBL model assisted by KOBELKA media with the implementation of classroom management, X<sub>c</sub> represents conventional learning, while O<sub>2</sub> and O<sub>4</sub> represent the posttest scores.

The research was conducted during the second semester of the 2025/2026 academic year, from November 4, 2025, to February 10, 2026, at two elementary schools located in Bringin District, Semarang Regency, Central Java, namely SD Negeri Bringin 01 and SD Negeri Bringin 02. SD Negeri Bringin 01 served as the experimental group with a total of 22 students, while SD Negeri Bringin 02 served as the control group with a total of 21 students. The research locations were selected because both schools had relatively comparable student characteristics, particularly in mathematics learning on multiplication material. The sampling technique used was saturated sampling (total sampling), in which all members of the population were used as research samples because the population size was relatively small.

The research variables consisted of independent variables and a dependent variable. The first independent variable (X<sub>1</sub>) was the Problem Based Learning model assisted by concrete KOBELKA media, namely a learning model that emphasizes problem-solving through the stages of problem orientation, student organization, investigation, presentation of results, and evaluation with the assistance of manipulative KOBELKA media to understand

multiplication concepts. The second independent variable ( $X_2$ ) was classroom management, namely the teacher's ability to plan, implement, control, and evaluate the learning process in order to create a conducive learning environment. The dependent variable (Y) was students' multiplication numeracy skills, namely students' ability to understand multiplication concepts, perform multiplication operations, and solve contextual problems related to multiplication.

The research procedure was carried out through three stages, namely the planning stage, implementation stage, and data analysis stage. During the planning stage, the researcher conducted a theoretical review, prepared learning instruments, prepared the KOBELKA media, developed the research instruments, and validated the instruments. The implementation stage began with administering a pretest to both groups to determine the students' initial abilities. Subsequently, the experimental group was taught using the PBL model assisted by KOBELKA media and classroom management implementation, while the control group received conventional learning. During the learning process, observations were conducted on teacher activities, student activities, and the implementation of classroom management. After the treatment was completed, both groups were given a posttest to determine the improvement in students' numeracy skills.

The data collection techniques in this study included tests, observation, and documentation. The test technique was used to measure students' numeracy skills through pretest and posttest instruments in the form of 20 multiple-choice questions developed based on numeracy skill indicators in multiplication material. Observation was used to examine the implementation of the PBL model, student activities, teacher activities, and the implementation of classroom management during the learning process using an observation checklist with a rating scale. Meanwhile, documentation was used to obtain supporting data in the form of student lists, test results, learning instruments, and documentation of learning activities.

The research instruments consisted of test instruments and non-test instruments. The test instrument was in the form of multiple-choice questions designed to measure students' abilities in understanding multiplication concepts as repeated addition, performing multiplication operations, and solving contextual story problems. The non-test instruments consisted of observation sheets for student activities, teacher activities, and classroom management. Before being used, the research instruments were first tested for validity and reliability. The validity test was conducted using the Pearson Product Moment Correlation with the assistance of IBM SPSS version 30 by examining the Corrected Item-Total Correlation values. Based on the validity test results, 17 items were declared valid, while 3 items were declared invalid. The reliability test was conducted using the Cronbach's Alpha method and obtained a value of 0.844, indicating that the instrument was reliable.

The data analysis techniques employed descriptive statistics and inferential statistics with the assistance of IBM SPSS version 30. Descriptive analysis was used to determine the mean score, maximum score, minimum score, and standard deviation of students' learning outcomes. Before hypothesis testing was conducted, the data were first tested for normality using the Kolmogorov-Smirnov and Shapiro-Wilk tests and tested for homogeneity using Levene's Test. Furthermore, hypothesis testing was carried out using the Paired Sample t-test to determine differences between pretest and posttest results within each group when the data were normally distributed. If the data were not normally distributed, the Wilcoxon test was used. In addition, the Mann-Whitney test was employed to determine differences in learning outcomes between the experimental group and the control group. The level of improvement in students' numeracy skills was analyzed using the N-Gain test with categories of high, medium, and low based on the obtained gain scores.

## RESULT AND DISCUSSION

### Research Implementation

This research was conducted from November 4, 2025, to February 10, 2026, at two elementary schools, namely SD Negeri Bringin 01 and SD Negeri Bringin 02. The subjects of this study were third-grade students from each

school. There were 22 third-grade students at SD Negeri Bringin 01, while SD Negeri Bringin 02 had 21 third-grade students.

This study employed an experimental design involving two groups, namely the experimental group and the control group. SD Negeri Bringin 01 was assigned as the experimental group that received special treatment, whereas SD Negeri Bringin 02 served as the control group that did not receive special treatment.

Before conducting the research, the researcher first carried out preliminary activities in the form of observations and interviews with the third-grade homeroom teachers at each school. The observations were conducted to identify the learning conditions, student characteristics, and problems encountered in the mathematics learning process, particularly in multiplication material. In addition, interviews with the third-grade homeroom teachers were intended to obtain more in-depth information regarding students' learning outcomes, the learning methods used, and the obstacles faced during the learning process.

Based on the results of the observations and interviews, it was found that the learning process still tended to use conventional methods and involved students less actively, which affected their low understanding of multiplication concepts. Therefore, the researcher designed a more innovative learning process through the implementation of the Problem Based Learning (PBL) model assisted by KOBELKA learning media and classroom management implementation.

The research implementation began with administering a pretest to both groups to determine the students' initial abilities. Subsequently, the experimental group received treatment in the form of learning using the Problem Based Learning (PBL) model supported by the use of KOBELKA (Multiplication Learning Box) media and classroom management implementation. The learning activities were designed based on previously prepared teaching modules, allowing the learning process to proceed in a structured and systematic manner.

During the implementation of learning in the experimental group, third-grade students were encouraged to actively participate in problem-solving activities related to multiplication material. In addition, the use of KOBELKA media helped students understand multiplication concepts concretely. The learning activities were also enriched with a multiplication snakes-and-ladders game aimed at increasing students' engagement and learning motivation. Throughout the learning process, the teacher also implemented classroom management strategies that supported the creation of a conducive, active, and enjoyable learning environment.

Meanwhile, in the control group, learning was conducted using conventional teaching methods. The teacher delivered the material through direct explanations, examples, and practice exercises. Students tended to act as recipients of information, resulting in relatively lower active participation compared to the experimental group.

After the entire series of learning activities had been completed, both groups were given a posttest to determine students' learning outcomes after the treatment. The data obtained from the pretest and posttest were then analyzed to identify differences in learning outcomes between the experimental group and the control group.

## Description of Research Results

### Descriptive Analysis of Pretest and Posttest Scores

**Table 1. Descriptive Analysis of Experimental Group Pretest and Posttest Scores**

|                       | Descriptive Statistics |         |         |         |                |
|-----------------------|------------------------|---------|---------|---------|----------------|
|                       | N                      | Minimum | Maximum | Mean    | Std. Deviation |
| Experimental Pretest  | 22                     | 12.00   | 88.00   | 47.1364 | 26.03349       |
| Experimental Posttest | 22                     | 47.00   | 100.00  | 84.5000 | 18.93032       |
| Valid N (listwise)    | 22                     |         |         |         |                |

**Table 2. Descriptive Analysis of Control Group Pretest and Posttest Scores**

|                 | Descriptive Statistics |         |         |         |                |
|-----------------|------------------------|---------|---------|---------|----------------|
|                 | N                      | Minimum | Maximum | Mean    | Std. Deviation |
| Control Pretest | 21                     | 6.00    | 88.00   | 51.1905 | 27.23531       |

|                    |    |       |        |         |          |
|--------------------|----|-------|--------|---------|----------|
| Control Posttest   | 21 | 24.00 | 100.00 | 69.6667 | 23.63331 |
| Valid N (listwise) | 21 |       |        |         |          |

Based on the results of the descriptive analysis, the experimental group obtained a pretest mean score of 47.14 (SD = 26.03), with a minimum score of 12 and a maximum score of 88. After receiving the treatment, the posttest mean score increased to 84.50 (SD = 18.93), with scores ranging from 47 to 100. This indicates a considerable improvement in learning outcomes in the experimental group after the treatment was administered.

Meanwhile, in the control group, the pretest mean score was 51.19 (SD = 27.24), with a minimum score of 6 and a maximum score of 88. The posttest mean score increased to 69.67 (SD = 23.63), with scores ranging from 24 to 100. Although there was an improvement in the control group, the increase was not as substantial as that observed in the experimental group.

Overall, both groups experienced an improvement in learning outcomes from the pretest to the posttest. However, the improvement in the experimental group was higher than that in the control group, indicating that the treatment administered to the experimental group had a more effective influence on improving learning outcomes.

#### Prerequisite Tests for Data Analysis

The prerequisite tests for data analysis were conducted to determine whether the research data met the requirements for hypothesis testing. In this study, the prerequisite tests included the normality test and the homogeneity test.

#### Normality Test

The normality test is a statistical procedure used to determine whether the data are normally distributed. In this study, the normality test was conducted using the Kolmogorov-Smirnov test with a significance level of  $\alpha = 5\%$  to detect the normality of the data.

The guidelines for decision-making in the normality test are as follows:

- If the significance value is greater than 5% or 0.05, the data are normally distributed.
- Conversely, if the significance value is less than 5% or 0.05, the data are not normally distributed.

The results of the normality test in this study are presented in the tables below:

**Table 3. Normality Test of Experimental Group Pretest and Posttest Scores**

|                       | Tests of Normality              |    |        |              |    |        |
|-----------------------|---------------------------------|----|--------|--------------|----|--------|
|                       | Kolmogorov-Smirnov <sup>a</sup> |    |        | Shapiro-Wilk |    |        |
|                       | Statistic                       | df | Sig.   | Statistic    | df | Sig.   |
| Experimental Pretest  | .177                            | 22 | .073   | .907         | 22 | .040   |
| Experimental Posttest | .255                            | 22 | < .001 | .785         | 22 | < .001 |

<sup>a</sup> Lilliefors Significance Correction

**Table 4. Normality Test of Control Group Pretest and Posttest Scores**

|                  | Tests of Normality              |    |       |              |    |      |
|------------------|---------------------------------|----|-------|--------------|----|------|
|                  | Kolmogorov-Smirnov <sup>a</sup> |    |       | Shapiro-Wilk |    |      |
|                  | Statistic                       | df | Sig.  | Statistic    | df | Sig. |
| Control Pretest  | .152                            | 21 | .200* | .925         | 21 | .109 |
| Control Posttest | .162                            | 21 | .156  | .933         | 21 | .160 |

\*This is a lower bound of the true significance.

<sup>a</sup> Lilliefors Significance Correction

Based on the results of the normality test using the Kolmogorov-Smirnov and Shapiro-Wilk tests, it can be seen that the pretest data in the experimental group had a significance value of 0.040 (Shapiro-Wilk), indicating that the data were not normally distributed because the significance value was less than 0.05. Likewise, the posttest data

in the experimental group had a significance value of  $< 0.001$ , which also indicates that the data were not normally distributed.

In the control group, the pretest data had a significance value of 0.109 (Shapiro-Wilk), and the posttest data had a significance value of 0.160, indicating that both were normally distributed because the significance values were greater than 0.05.

Thus, because there were non-normally distributed data in the experimental group (both pretest and posttest), the difference analysis for this group was conducted using a non-parametric test, namely the Wilcoxon Signed Rank Test. Meanwhile, in the control group, where all data were normally distributed, a parametric test could be applied, namely the Paired Sample t-test.

**Table 5. Normality Test for Independent t-test Assumption**

|                   | Group        | Tests of Normality              |    |        |              |    |        |
|-------------------|--------------|---------------------------------|----|--------|--------------|----|--------|
|                   |              | Kolmogorov-Smirnov <sup>a</sup> |    |        | Shapiro-Wilk |    |        |
|                   |              | Statistic                       | df | Sig.   | Statistic    | df | Sig.   |
| Learning Outcomes | Experimental | .255                            | 22 | < .001 | .785         | 22 | < .001 |
|                   | Control      | .162                            | 21 | .156   | .933         | 21 | .160   |

<sup>a</sup> Lilliefors Significance Correction

Based on the results of the normality test, it can be seen that the learning outcome data in the experimental group had a significance value of  $< 0.001$  (Shapiro-Wilk), indicating that the data were not normally distributed because the significance value was less than 0.05. Meanwhile, the control group obtained a significance value of 0.160, indicating that the data were normally distributed because the significance value was greater than 0.05.

Therefore, because one of the groups did not show normal distribution, the difference test between the two groups could not use a parametric test (independent sample t-test). Instead, a non-parametric test, namely the Mann-Whitney U Test, was used to determine the difference in learning outcomes between the experimental and control groups.

### Homogeneity Test

In statistical analysis, the homogeneity test aims to determine whether the variances of several data groups from a population are equal or not.

The decision rules for the homogeneity test are as follows:

1. If the significance value (Sig.)  $< 0.05$ , then the variances of two or more population groups are considered unequal (not homogeneous).
2. If the significance value (Sig.)  $> 0.05$ , then the variances of two or more population groups are considered equal (homogeneous).

The results of the homogeneity test in this study are presented in the table below:

**Table 6. Homogeneity Test**

|                      |                                      | Tests of Homogeneity of Variances |       |     |        |
|----------------------|--------------------------------------|-----------------------------------|-------|-----|--------|
|                      |                                      | Levene                            | df1   | df2 | Sig.   |
|                      |                                      | Statistic                         |       |     |        |
| Learning<br>outcomes | Based on Mean                        | 1.300                             | 1     | 41  | .261   |
|                      | Based on Median                      | 1.258                             | 1     | 41  | .269   |
|                      | Based on Median and with adjusted df |                                   | 1.258 | 1   | 40.769 |
|                      | Based on trimmed mean                | 1.401                             | 1     | 41  | .243   |

Based on the output above, it is known that the significance value (Sig.) based on the mean is greater than 0.05. Therefore, it can be concluded that the data variances are homogeneous. Although the data are homogeneous, the

posttest results in the experimental group were not normally distributed; therefore, the independent sample t-test was replaced with the Mann-Whitney U test.

### Hypothesis testing

Hypothesis testing was conducted to determine whether there is an effect of using learning media on students' learning outcomes. Based on the results of the prerequisite tests, which indicated that some data were not normally distributed, the hypothesis testing in this study used non-parametric tests.

### Wilcoxon Signed Rank Test (Within-Group Analysis)

The Wilcoxon test was used to determine differences in learning outcomes before and after treatment in each group.

**Table 7. Wilcoxon Test Output (Ranks)**

|   |                | N               | Mean Rank | Sum of Ranks |
|---|----------------|-----------------|-----------|--------------|
| Posttest Eksperimen -<br>Pretest Eksperimen | Negative Ranks | 1 <sup>a</sup>  | 11.00     | 11.00        |
|   | Positive Ranks | 21 <sup>b</sup> | 11.52     | 242.00       |
|   | Ties           | 0 <sup>c</sup>  |           |              |
|   | Total          | 22              |           |              |

a. Posttest Eksperimen < Pretest Eksperimen

b. Posttest Eksperimen > Pretest Eksperimen

c. Posttest Eksperimen = Pretest Eksperimen

1. Negative Ranks represent the negative differences between pretest and posttest scores. There is 1 negative case (N), meaning 1 respondent experienced a decrease in score from pretest to posttest. The mean rank is 11.00, with a sum of ranks of 11.00.
2. Positive Ranks represent positive differences between pretest and posttest scores. There are 21 positive cases (N), meaning 21 respondents experienced an increase in score from pretest to posttest. The mean rank is 11.52, with a sum of ranks of 242.00.
3. Ties represent equal values between pretest and posttest scores. The value is 0, indicating that there are no equal scores between pretest and posttest.

The interim conclusion from the ranks analysis shows that the majority of respondents experienced an improvement in scores after the treatment, as the number of positive ranks is far greater than the number of negative ranks.

### Wilcoxon Hypothesis Test

#### Wilcoxon Test

**Table 8. Wilcoxon Test**

| Test Statistics <sup>a</sup>  |  |
|-------------------------------|--|
|                               | Posttest Eksperimen - Pretest Eksperimen |
| Z                             | -3.754 <sup>b</sup>                      |
| Asymp. Sig. (2-tailed)        | <.001                                    |
| a. Wilcoxon Signed Ranks Test |  |
| b. Based on negative ranks.   |  |

Based on the results of the Wilcoxon Signed Rank Test, the Z value obtained was -3.754 with a significance value (Asymp. Sig. 2-tailed) of < 0.001. Since the significance value is less than 0.05, it can be concluded that there is a statistically significant difference between pretest and posttest scores in the experimental group.

Thus, it can be interpreted that the treatment given to the experimental group had a significant effect on improving students' learning outcomes.

**Mann-Whitney U Test (Between-Group Analysis)**

The Mann-Whitney test was used to determine differences in learning outcomes between the experimental group and the control group.

**Table 9. Rank Output**

| Mann-Whitney Test |              | Ranks |           |              |
|-------------------|--------------|-------|-----------|--------------|
| Learning outcomes | Group        | N     | Mean Rank | Sum of Ranks |
|                   | Experimental | 22    | 26.16     | 575.50       |
|                   | control      | 21    | 17.64     | 370.50       |
|                   | Total        | 43    |           |              |

**Table 10. Mann-Whitney Test**

| Test Statistics <sup>a</sup> |  | Learning outcomes |
|------------------------------|--|-------------------|
| Mann-Whitney U               |  | 139.500           |
| Wilcoxon W                   |  | 370.500           |
| Z                            |  | -2.255            |
| Asymp. Sig. (2-tailed)       |  | .024              |

a. Grouping Variable: Kelompok

The Mann-Whitney test was conducted to determine whether there is a difference in learning outcomes between the experimental group and the control group. Based on the Ranks table, it can be seen that the mean rank of learning outcomes in the experimental group was 26.16 with a total rank of 575.50. Meanwhile, the control group had a lower mean rank of 17.64 with a total rank of 370.50. This difference in mean ranks indicates that the learning outcomes of the experimental group tend to be higher compared to those of the control group.

These results are also consistent with the descriptive analysis, where the mean posttest score of the experimental group (84.50) was higher than that of the control group (69.67). This further strengthens the evidence that the experimental group achieved better learning outcomes.

Furthermore, based on the Test Statistics table, the Mann-Whitney U value was 139.500 and the Wilcoxon W value was 370.500, with a Z value of -2.255. The Asymp. Sig. (2-tailed) value was 0.024, which is less than 0.05. This indicates that there is a statistically significant difference between the learning outcomes of the experimental group and the control group.

Thus, it can be concluded that the treatment applied to the experimental group had an effect on learning outcomes, where the experimental group achieved higher results compared to the control group.

**N-Gain Test**

The Gain Test or N-Gain Score is used to determine the effectiveness of a learning method or treatment in a pretest–posttest research design or in studies involving both control and experimental groups.

The N-Gain test is conducted by calculating the difference between pretest and posttest scores. This calculation helps determine whether the applied learning method is effective or not.

The classification of N-Gain effectiveness is presented as follows:

**Table: Interpretation of N-Gain Effectiveness**

| Percentage (%) | Interpretation |
|----------------|----------------|
|----------------|----------------|

|         |                  |
|---------|------------------|
| < 40    | Not Effective    |
| 40 – 55 | Less Effective   |
| 56 – 75 | Fairly Effective |
| > 76    | Effective        |

Source: Hake, R.R. (1999)

**Table 11. N-Gain Score Results**

|                     |            | Descriptives                     |             | Statistic | Std. Error |          |
|---------------------|------------|----------------------------------|-------------|-----------|------------|----------|
| NGain Persen        | Eksperimen | Mean                             |             | 65.0473   | 11.21969   |          |
|                     |            | 95% Confidence Interval for Mean | Lower Bound | 41.7147   |            |          |
|                     |            |                                  | Upper Bound | 88.3799   |            |          |
|                     |            | 5% Trimmed Mean                  |             | 72.9692   |            |          |
|                     |            | Median                           |             | 89.2850   |            |          |
|                     |            | Variance                         |             | 2769.390  |            |          |
|                     |            | Std. Deviation                   |             | 52.62499  |            |          |
|                     |            | Minimum                          |             | -125.00   |            |          |
|                     |            | Maximum                          |             | 100.00    |            |          |
|                     |            | Range                            |             | 225.00    |            |          |
|                     |            | Interquartile Range              |             | 55.00     |            |          |
|                     |            | Skewness                         |             | -2.463    |            | .491     |
|                     |            | Kurtosis                         |             | 7.597     |            | .953     |
|                     |            | Mean                             |             | 32.4319   |            | 13.95436 |
|                     |            | 95% Confidence Interval for Mean | Lower Bound | 3.3236    |            |          |
|                     |            |                                  | Upper Bound | 61.5402   |            |          |
|                     |            | 5% Trimmed Mean                  |             | 39.4160   |            |          |
|                     |            | Median                           |             | 42.8600   |            |          |
|                     |            | Variance                         |             | 4089.208  |            |          |
|                     |            | Std. Deviation                   |             | 63.94691  |            |          |
| Minimum             |            | -166.67                          |             |           |            |          |
| Maximum             |            | 100.00                           |             |           |            |          |
| Range               |            | 266.67                           |             |           |            |          |
| Interquartile Range |            | 92.59                            |             |           |            |          |
| Skewness            |            | -1.592                           | .501        |           |            |          |
| Kurtosis            |            | 3.502                            | .972        |           |            |          |

Based on the analysis of N-Gain percentage values and their interpretation according to effectiveness categories, there is a difference in effectiveness levels between the experimental and control groups.

In the experimental group, the mean N-Gain value was 65.05%. According to the interpretation criteria, this value falls within the range of 56–75%, which is categorized as fairly effective. This indicates that the treatment given to the experimental group was able to improve learning outcomes at a fairly good level of effectiveness. In addition, the high median value (89.29) indicates that most respondents experienced a substantial improvement.

Meanwhile, in the control group, the mean N-Gain value was 32.43%. This value falls below 40%, which is categorized as not effective. This indicates that the learning process in the control group was less effective in improving learning outcomes, although some students still showed improvement.

Thus, it can be concluded that the treatment applied in the experimental group was more effective in improving learning outcomes compared to the control group, even though its level of effectiveness is still classified as fairly effective.

#### **Validation Results**

Based on the validation results conducted by expert lecturers on the KOBELKA learning media, a score of 44 out of a maximum score of 48 was obtained. This result was then converted into a percentage using the following formula:

$$\frac{44}{48} \times 100 = 91,66$$

This percentage falls within the range of 81%–100%, which, according to the media feasibility criteria, is categorized as very feasible. Therefore, the results of the expert validation indicate that the KOBELKA media is suitable for use in learning. The high score obtained shows that the KOBELKA media has met various assessment aspects, such as alignment of content with the curriculum, clarity of concepts, ease of use, safety, and attractive media design. This indicates that the developed media has been systematically designed and is appropriate to the needs of elementary school students, particularly in understanding multiplication concepts.

However, based on the validation results, the expert lecturer provided several suggestions for improvement, namely the need to add learning activities that support the use of the media and to develop clearer usage guidelines. These suggestions indicate that, in addition to content and design aspects, the effectiveness of media use is also influenced by structured learning activities and systematic instructions.

In response to these suggestions, the researcher made revisions by adding a learning activity in the form of a multiplication snakes-and-ladders game integrated with the KOBELKA media. In this game, several question boxes are marked with a question mark symbol (?). Students who land on these boxes are required to take a flashcard containing a multiplication problem. The problem is then discussed and solved collaboratively using the KOBELKA media. This additional activity aims to increase student engagement and create a more interactive learning environment.

In addition, the researcher also developed a user guide that integrates the steps for using the KOBELKA media with the multiplication snakes-and-ladders game. This guide was systematically prepared to facilitate teachers and students in using the media effectively during the learning process.

Thus, the validation results not only indicate that the KOBELKA media is highly feasible, but also provide a basis for further refinement. The improvements made have made the KOBELKA media more optimal and applicable in supporting the multiplication numeracy skills of third-grade elementary school students.

#### **Classroom Management Observation Results**

Based on the results of classroom management observations conducted during the learning process in the experimental class (Grade III) at SD Negeri Bringin 01, it was found that the classroom management implemented by the researcher was in the very good category.

The observation results showed that from a maximum score of 80, the researcher obtained a score of 75. When converted into a percentage, this equals 93.75%, which falls into the very good category.

In detail, for the planning aspect of classroom management, the researcher prepared the learning tools properly, such as lesson modules, classroom seating arrangements, and learning media. In addition, students were also well-prepared to participate in the learning process.

In the implementation aspect, the researcher was able to open the lesson in an orderly manner, apply the Problem Based Learning model effectively, and organize students into group activities. Student engagement was also high, especially during learning activities using the KOBELKA media and the multiplication snakes-and-ladders game.

Furthermore, in the control aspect, the researcher was able to maintain a conducive classroom atmosphere throughout the learning process. The teacher also provided clear instructions to students and was able to effectively manage group discussions.

In the evaluation aspect, the researcher involved students in learning reflection activities and provided feedback on learning outcomes. Students were also able to express their opinions and demonstrate understanding of the material that had been learned.

Thus, based on the observation results, it can be concluded that the classroom management implemented by the researcher in learning using the Problem Based Learning model assisted by KOBELKA media on multiplication material in Grade III at SD Negeri Bringin 01 was carried out very well and successfully.

This success is indicated by the high observation score and the creation of an active, conducive, and well-structured learning environment, which supported the improvement of students' numeracy skills. The complete observation results are presented in the classroom management observation sheet included in the appendix.

#### **Students' Activity Observation Results**

Based on the observation of students' activities designed by the researcher using the Problem Based Learning (PBL) model assisted by KOBELKA media and the implementation of classroom management in Grade III students at SD Negeri Bringin 01 as the experimental class, with the classroom teacher acting as the observer, a total score of 77 out of a maximum score of 80 was obtained, with a percentage of 96.25%, which is categorized as very good. These results indicate that students' activities during the learning process were highly optimal and aligned with the implemented learning syntax.

In detail, at the problem orientation stage, students showed very good engagement in listening to the teacher's explanation of multiplication story problems, responding to guiding questions, and expressing their initial opinions. In addition, students were able to understand the given problems well, although a few students were still in the good category (score 3).

At the learning organization stage, student activity was also categorized as very good. Students were able to use the KOBELKA media in multiplication learning, follow the rules of the multiplication snakes-and-ladders game, and actively participate and collaborate in group activities. This indicates that students were able to work cooperatively and actively engage in group-based learning.

Furthermore, at the investigation stage, students demonstrated very high levels of activity, such as working on student worksheets (LKPD) on multiplication, discussing with group members, and using the KOBELKA media to assist in calculations. Students also actively asked questions when encountering difficulties, reflecting curiosity and strong engagement in the learning process.

At the presentation stage, most students were able to compile their group discussion results and present them in front of the class clearly and confidently. However, some students were still in the good category (score 3), particularly in responding to other groups' presentations, indicating that this aspect still needs improvement.

Finally, at the evaluation stage, students demonstrated very good ability in concluding the multiplication material, actively participating in reflection activities, and answering reflective questions. This shows that students had a good understanding of the material being learned.

Thus, it can be concluded that the learning activities of Grade III students in SD Negeri Bringin 01 in the experimental class were in the very good category. Students were active, enthusiastic, and highly engaged in each stage of the learning process. This indicates that the learning design implemented by the researcher using the Problem Based Learning (PBL) model assisted by KOBELKA (Multiplication Learning Box) media, supported by effective classroom management, was successful in increasing student activity and engagement in learning.

However, improvement is still needed in students' confidence in giving responses and participation in class discussions so that learning activities can become more optimal.

### **Teacher Activity Observation Results**

Based on the results of the teacher activity observation conducted by the Grade III teacher at SD Negeri Bringin 01 as the observer of the researcher during the learning implementation, a total score of 78 out of a maximum score of 80 was obtained, with a percentage of 97.5%, which is categorized as very good. These results indicate that the teacher's activities in implementing the learning process were highly optimal and in accordance with the designed learning syntax.

In detail, at the problem orientation stage, the teacher carried out learning activities very well, such as opening the lesson with an apperception related to multiplication, presenting learning objectives, providing story problems, and giving guiding questions to students. All indicators in this stage obtained high scores, indicating that the teacher was able to facilitate the beginning of the lesson in an engaging and structured manner.

At the learning organization stage, the teacher also demonstrated very good performance in explaining the use of the KOBELKA media, presenting the rules of the multiplication snakes-and-ladders game, and dividing students into groups. This shows that the teacher was able to manage the classroom and organize learning activities systematically.

Furthermore, at the investigation stage, the teacher was able to manage the classroom effectively by guiding students in completing worksheets (LKPD), assisting students who experienced difficulties, providing opportunities for questions, and actively interacting with students. Most indicators in this stage received very good scores, indicating that the teacher played an active role as a facilitator in the learning process.

At the presentation stage, the teacher provided opportunities for students to present their group discussion results, gave feedback, reinforced the material, and managed classroom discussions effectively. This shows that the teacher was able to encourage student engagement and create an interactive learning environment.

Finally, at the evaluation stage, the teacher guided reflection activities, administered evaluation tests, assessed student learning outcomes, and closed the lesson effectively. All indicators in this stage also showed very good results, indicating that the teacher was able to conclude the learning process in an effective and meaningful way.

Thus, it can be concluded that the teacher's activities in learning using the Problem Based Learning (PBL) model assisted by KOBELKA (Multiplication Learning Box) media and supported by effective classroom management were successfully implemented. This is demonstrated by the implementation of all learning syntax stages, which were categorized as very good, thereby supporting the creation of an active, conducive, and student-centered learning process. However, continuous efforts are still needed to maintain and further improve the quality of learning so that even more optimal results can be achieved.

### **Discussion**

This discussion explains the implementation results in both the experimental and control groups and their relationship with the statistical tests conducted. The experimental group was carried out at SD Negeri Bringin 01 using the Problem Based Learning (PBL) model assisted by KOBELKA (Multiplication Learning Box) media and supported by well-planned classroom management, involving 22 students. Meanwhile, the control group was conducted at SD Negeri Bringin 02 using conventional learning without any special treatment, involving 21 students. The differences in treatment between the two groups served as the basis for examining the effect of the learning model and classroom management on students' numeracy skills improvement.

Based on the instrument test results, it was found that out of 20 multiple-choice pretest items administered to Grade III students at SD Negeri Bringin 01 (as the experimental class), 17 items were declared valid and 3 items were invalid, so only 17 items were used in the study. Furthermore, the reliability test results showed that the Cronbach's Alpha value was greater than 0.600, indicating that the instrument was reliable. This indicates that the instrument had a good level of consistency and was appropriate for accurately measuring students' numeracy skills.

Based on the assumption tests, the normality test results showed that the experimental group data were not normally distributed, as indicated by the pretest significance value of 0.040 and posttest value of  $< 0.001$  ( $\text{sig} < 0.05$ ). Meanwhile, in the control group, the pretest value of 0.109 and posttest value of 0.160 indicated that the data were

normally distributed ( $\text{sig} > 0.05$ ). The homogeneity test results showed that the significance value (Sig. Based on Mean) was 0.261, which is greater than 0.05, indicating that the variances between the experimental and control groups were homogeneous. Based on these results, it can be interpreted that both groups had similar levels of data variability. Although the data were homogeneous, the posttest data in the experimental group were not normally distributed; therefore, the independent t-test could not be used and was replaced with the non-parametric Mann-Whitney test.

The hypothesis testing results in the experimental group using the Wilcoxon test showed a significance value of  $< 0.001$  ( $\text{sig} < 0.05$ ), indicating a significant difference between pretest and posttest scores. This suggests that the treatment given had an effect on improving students' learning outcomes. Based on the rank results, 21 students experienced an increase, while only 1 student experienced a decrease. Meanwhile, in the control group, the Paired Sample t-test results showed a significance value of 0.005 ( $\text{sig} < 0.05$ ), indicating a significant difference between pretest and posttest scores. Descriptively, the mean score in the control group increased from 51.19 to 69.67, although the improvement was not as large as in the experimental group.

The difference in learning outcomes between the two groups was further confirmed by the Mann-Whitney test, which showed that the mean rank of the experimental group (26.16) was higher than that of the control group (17.64). In addition, the Mann-Whitney U value was 139.500 with a significance value of 0.024 ( $\text{sig} < 0.05$ ), indicating a significant difference between the learning outcomes of both groups. These results are also consistent with the descriptive analysis, where the posttest mean score of the experimental group (84.50) was higher than that of the control group (69.67). This indicates that learning in the experimental group was more effective than in the control group.

In addition, the N-Gain effectiveness test results showed that the experimental group obtained an average score of 65.05%, which falls into the fairly effective category, while the control group obtained an average score of 32.43%, which is categorized as not effective. This indicates that the implementation of the Problem Based Learning (PBL) model assisted by KOBELKA media was able to improve student learning outcomes with a higher level of effectiveness compared to conventional learning. The high median value in the experimental group also indicates that most students experienced a substantial improvement in learning outcomes.

These findings are further strengthened by the observation results, which show that the learning process in the experimental class was implemented very well. Based on the classroom management observation results, a score of 75 out of a maximum of 80 was obtained, with a percentage of 93.75%, categorized as very good. This indicates that the researcher was able to manage the classroom optimally, starting from planning, implementation, controlling, and evaluation. Good classroom management was reflected in the preparation of learning tools, classroom seating arrangements, use of learning media, and the ability to maintain a conducive classroom atmosphere during the learning process.

In addition, the student activity observation results showed a percentage of 96.25%, categorized as very good. This indicates that students were actively involved in all stages of learning, including understanding problems, discussing in groups, using KOBELKA media, and presenting their work. The high level of student activity demonstrates that the PBL model was effective in increasing students' engagement, collaboration, and participation in the learning process.

Furthermore, the teacher activity observation results showed a percentage of 97.5%, categorized as very good. This indicates that the teacher was able to implement all stages of the learning syntax optimally, including problem orientation, learning organization, investigation guidance, presentation of results, and evaluation. The teacher also played an active role as a facilitator who was able to guide, support, and create an interactive and enjoyable learning environment.

Thus, the observation results of classroom management, student activities, and teacher activities indicate that the learning process in the experimental class was implemented very well. This condition directly supports the statistical test results showing a significant improvement in learning outcomes. Therefore, it can be concluded that the

success of the learning process is not only reflected in students' scores but also in the quality of the learning process itself.

This research is consistent with theories stating that the Problem Based Learning model can enhance students' activeness and problem-solving skills. In addition, the use of concrete media helps students understand abstract concepts more concretely. From the perspective of classroom management, these findings also support the view of Karwati and Priansa (2014) that effective classroom management can create a conducive learning environment and improve student learning outcomes.

Therefore, based on all analyses and discussions, it can be concluded that the implementation of the Problem Based Learning model assisted by concrete KOBELKA media and classroom management was proven to be successful and had a significant effect on improving students' multiplication numeracy skills in Grade III. This is indicated by significant statistical results, increased mean scores, high improvement percentages, better effectiveness outcomes, and observation results showing that the learning process was active, conducive, and well-structured.

## CONCLUSION

Based on the results of the study conducted on Grade III students at SD Negeri Bringin 01 as the experimental class consisting of 22 students and SD Negeri Bringin 02 as the control class consisting of 21 students, it can be concluded that the implementation of the Problem Based Learning (PBL) model assisted by KOBELKA (Multiplication Learning Box) media, supported by effective classroom management, was successful and had a significant effect on improving students' multiplication numeracy skills.

This conclusion is supported by several findings. First, the research instruments met valid and reliable criteria, where out of 20 test items, 17 were declared valid and the Cronbach's Alpha value was above 0.600, indicating that the instrument was appropriate for use in the study. Second, the assumption test results showed that the data were homogeneous with a significance value above 0.05, although the posttest data in the experimental group were not normally distributed, so non-parametric analysis was applied.

Third, the hypothesis testing results showed a significant effect on student learning outcomes. This is indicated by the Wilcoxon test in the experimental group with a significance value of less than 0.05 and 95.45% of students showing improvement in learning outcomes. In addition, the Mann-Whitney test results showed a significant difference between the experimental and control groups with a significance value of 0.024 ( $< 0.05$ ), indicating differences in multiplication numeracy skills between the two groups.

Fourth, descriptively, students' numeracy skills in the experimental class were higher than in the control class, as shown by the posttest mean score of 84.50 in the experimental group and 69.67 in the control group. This is further supported by the N-Gain test results, where the experimental group obtained a score of 65.05% (fairly effective), while the control group obtained 32.43% (not effective).

Fifth, the observation results indicated that the learning process was implemented very well. This is shown by classroom management observation results of 93.75%, student activity of 96.25%, and teacher activity of 97.5%, all of which are categorized as very good. This indicates that the learning process was active, conducive, and well-structured.

Thus, it can be emphasized that this study has answered the research questions, namely that there is a difference in multiplication numeracy skills between the experimental and control groups, and that the experimental group achieved higher learning outcomes than the control group. Therefore, the implementation of the Problem Based Learning model assisted by KOBELKA media and effective classroom management has been proven to be effective in improving Grade III students' multiplication numeracy skills.

### Suggestions

Based on the findings of this study, the researcher provides the following suggestions:

1. For Teachers

Teachers are recommended to apply the Problem Based Learning (PBL) model assisted by concrete learning media such as KOBELKA in mathematics instruction. The use of this model and media can enhance students' activeness, conceptual understanding, and numeracy skills. In addition, effective classroom management should continue to be improved in order to maintain a conducive learning environment and support optimal student engagement.

2. For Students

Students are expected to be more active in participating in learning activities, to have the courage to express their opinions, and to improve collaboration in group work. An active and participatory attitude will help students understand mathematical concepts more deeply.

3. For Schools

Schools are expected to support the implementation of innovative learning models and provide adequate learning media. Such support is important to continuously improve the quality of learning and student learning outcomes.

4. For Future Researchers

This study is expected to serve as a reference for other researchers to develop similar studies with broader scope, including larger sample sizes, different learning materials, or additional research variables. Furthermore, future research may examine the effectiveness of the KOBELKA media in other topics or over a longer implementation period. In addition, future researchers are encouraged to investigate the effectiveness of KOBELKA media on different dependent variables beyond multiplication numeracy skills, such as students' self-regulation, critical thinking skills, problem-solving abilities, learning motivation, or mathematical communication skills. Such investigations would provide a more comprehensive understanding of the pedagogical value of KOBELKA and its contribution to students' cognitive and affective development. Future studies may also employ experimental designs involving different grade levels, compare KOBELKA with other innovative learning media, or integrate KOBELKA with digital learning technologies to examine its effectiveness in various educational contexts. These efforts would help expand the academic contribution and practical applicability of KOBELKA-based learning

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