



## The Impacts of Problem-Based Learning on English Vocabulary Mastery for Elementary Students

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### ABSTRACT

In a globalized world, mastering English vocabulary is crucial for elementary students. This research investigates the effectiveness of Problem-Based Learning (PBL) in enhancing vocabulary acquisition compared to traditional methods. A quasi-experimental design was designed, and the study involved 20 students for the total sampling in the experimental group (receiving PBL instruction) and the control group (taught through traditional methods). Vocabulary proficiency was assessed through pre-tests and post-tests, and data were collected using paired t-tests to investigate within-group changes and independent t-tests to explore differences between groups. The Kolmogorov-Smirnov test confirmed normal distribution, while Levene's test indicated homogeneity. Results highlighted a significant boost in the experimental group, with a post-test mean score of 86.75 compared to the control group's 78.25. The paired t-test for the experimental group yielded a t-statistic of -12.862 ( $p = 0.000$ ), exceeding the critical t-value of  $\pm 2.093$ , confirming PBL's effectiveness. The N-gain percentage was 59.09% for the experimental group and 35.83% for the control group, indicating a notable enhancement in vocabulary mastery through PBL. The study concludes that PBL significantly outperforms traditional methods in improving vocabulary skills. Recommendations include incorporating PBL into curricula to enhance vocabulary learning and conducting further research to explore its long-term effects and broader applicability.

**Keywords:** *Problem-based learning (PBL), Vocabulary mastery, Elementary school*

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## 1. INTRODUCTION

Communication among people worldwide relies fundamentally on language, a system based on words and their combination into sentences (Foley, 2017). Language enables the exchange of knowledge, beliefs, opinions, desires, threats, commands, thanks, promises, and expressions of feelings, with only our imagination setting limits. Around the globe, numerous languages are used, with some, such as Mandarin, Spanish, Russian, French, Arabic, and English, being recognized as international languages by global organizations (United Nations, 2022). In Indonesia, English is a prominent foreign language and plays a critical role in international communication, making its mastery essential (Marcelino, 2015). The 2013 Curriculum (K-13) in Indonesia emphasizes the necessity of English proficiency in responding to contemporary challenges (Isrokijah, 2020). Mastery of vocabulary is crucial for proficiency in English since it addresses all four critical language competencies: listening, speaking, reading, and writing. (Nation, 2001). For primary school students, learning basic vocabulary, including nouns, verbs, adjectives, conjunctions, and prepositions, is vital for constructing sentences and giving presentations (Widodo, 2005). The

Problem-Based Learning (PBL) method can enhance English instruction by engaging students in solving real-world problems, thereby improving their active learning and critical thinking skills (Isrokijah, 2020).

Problem-Based Learning (PBL) is an instructional model widely advocated for enhancing the educational process. According to the Ministry of Education and Culture of Indonesia, PBL involves presenting students with contextual problems that drive their learning (Isrokijah, 2020). This approach contrasts with traditional methods by fostering active engagement among learners. The effectiveness of PBL lies in its ability to engage students in collaborative problem-solving and critical thinking. Students work in groups to investigate real-world issues, which helps them internalize knowledge more profoundly and meaningfully (Isrokijah, 2015). Research indicates that PBL is particularly beneficial for developing students' critical thinking skills, problem-solving abilities, and creativity. For instance, PBL actively involves young learners in solving practical problems, thus enhancing their motivation and focus (Isrokijah, 2020). This method addresses the limitations of rote learning and prepares students for real-life challenges by equipping them with essential skills such as teamwork and analytical thinking.

Several previous studies support the effectiveness of PBL in language education. For example, Putri (2020) found a significant improvement in students' speaking abilities when using PBL. Pradana (2022) reported that PBL positively affected vocabulary mastery, with pretest and posttest results showing notable gains. Sari (2020) also highlighted the impact of the method on reading comprehension and vocabulary size. Fahmi et al. (2021) observed significant advancements in students' speaking skills due to PBL. Furthermore, Chai and Swanto (2020) demonstrated that environmental PBL significantly enhanced vocabulary acquisition compared to traditional methods.

Despite these positive findings, further research is needed to explore the full potential of PBL across different educational levels, particularly in elementary settings. Karim (2021) argues that young learners at the concrete operational stage, as described by Piaget (in Susanto, 2013), can benefit from PBL due to their ability to handle concrete problems and think systematically. This research gap highlights the need for more studies to validate PBL's efficacy for younger students and to develop effective strategies for implementing PBL in elementary education.

The researcher proposes to investigate the impact of Problem-Based Learning (PBL) on elementary students' vocabulary acquisition. Understanding the effectiveness of PBL in enhancing vocabulary mastery, the research addressed key research questions: Does PBL improve elementary students' English vocabulary knowledge? By evaluating PBL's impact in these areas, the research aims to provide valuable insights and practical recommendations for educators looking to refine language teaching strategies and improve student outcomes.

## **2. METHOD**

### **2.1. Research Design**

This research examined how Problem-Based Learning (PBL) affected students' vocabulary knowledge using a quasi-experimental design and a quantitative method. According to Ary et al. (2002), quasi-experimental designs are used to compare the results of treatments given to experimental groups to observe any causal effects. In support of this, Suryabrata (2003) points out that experimental research compares outcomes before and after the treatment in an attempt to ascertain causal linkages.

This research used a nonequivalent control group design, which included two groups: one control group and one experimental group. The experimental group received PBL treatment, whereas the control group did not. Both groups were examined before and after the treatment to determine any improvements in language mastery (Sugiono, 2017). Despite not being assigned at random, this design allows us to compare the effects of the intervention to those of a control group.

### **2.2. Population and Sample**

The research focused on the sixth-grade students of SD IT Al FIKRI Makassar, constituting a population of 40 students (Arikunto, 2006). The sample was selected using a total sampling technique, meaning all members of this population were included in the study, as Sugiono (2017) advised for populations under 100. According to Creswell (2012), a sample is a subset of the target population used to generalize the whole group. The sample comprised two classes: 6A, serving as the control group, and 6B, the experimental group. The data analysis follows the research design and procedure.

### **2.3. Research Instrument**

#### **2.3.1. Test**

Test: A multiple-choice test with 20 questions was administered to evaluate students' vocabulary mastery. The test, which had a 60-minute time limit, was used both before (pre-test) and after (post-test) the implementation of the Problem-Based Learning (PBL) method. The pre-test aimed to measure initial vocabulary skills, while the post-test assessed vocabulary mastery after the PBL intervention.

### **2.4 Technique of Data Collection**

The data collection for this research involved three main procedures: the pre-test, treatment, and post-test.

#### 2.4.1 Pre-Test

The pre-test was given to students before the treatment. The process included distributing the test, providing instructions, and collecting the completed tests (Arikunto, 2006).

#### 2.4.2 Treatment

The experimental group received the Problem-Based Learning (PBL) treatment. This method involved starting with a problem and engaging students in a structured inquiry process. The researcher designed a Q&A activity with questions from textbooks and additional materials. Divided into small groups, students discussed problems using English and Indonesian to ensure comprehension. The treatment followed six steps:

- Presenting the problem on a learning sheet and explaining it in Indonesian.
- Introducing target vocabulary with translations and practicing spelling.
- Conducting Q & A sessions and demonstrating possible answers.
- Reading and discussing assigned materials to find solutions.
- Recording and presenting group solutions.
- Synthesizing reports and offering a general solution (Bridges, 1992).

In contrast, the control group received traditional teacher-led instruction without PBL. The researcher provided explicit vocabulary teaching using the textbook, reading aloud, and explaining grammar and meanings in Indonesian. This approach focused on direct instruction and memorization without the problem-based approach used in the experimental group.

#### 2.4.3 Post-Test

After the treatment, a post-test was administered to evaluate the effectiveness of the PBL method. The post-test, similar in format to the pre-test, assessed improved vocabulary mastery based on the material covered during the treatment.

These steps comprehensively evaluated the PBL method's impact on student's vocabulary learning.

### 2.5 Technique of Data Analysis

Data analysis for this study was conducted using IBM SPSS Statistics 25 (IBM, 2023). Both descriptive and inferential statistical methods were applied. Descriptive statistics, including measures such as mean, median, mode, and frequency distribution, were utilized to summarize and describe the characteristics of the data (Pallant, 2021). In assessing the normality of the data distribution, the Kolmogorov-Smirnov and Shapiro-Wilk tests were employed; data is normally distributed if the p-value exceeds 0.05 (Razali & Wah, 2011). The independent samples t-test was used to compare differences between two separate groups. In comparison, the paired samples t-test was applied to compare two related groups, such as scores from pre-tests and post-tests, to identify significant differences between the means of these groups (Field, 2018). Additionally, the Date N-Gain Percent method was used for calculations.

## 3. FINDINGS

The research was conducted toward the sixth grade of SDIT Al FIKRI Makassar. These research findings answer the problem statement formulated before, and the researcher conducted this research for four weeks (pre-test, two times treatments, post-test) to investigate the impact of Problem-Based Learning on elementary students' English vocabulary mastery and the interest in studying English through implementing the Problem-Based Learning method. The findings presented in this part consist of the data gained through the test of vocabulary mastery.

#### 3.1 Problem-Based Learning in Students' Vocabulary Mastery

The result of this research is analyzed in numeral form. Those data described the increase in students' English vocabulary mastery.

Table 3.1.1: Comparison of Pre-Test and Post-Test Scores

<i>Group</i>	<i>Pre-Test Average</i>	<i>Post-Test Average</i>	<i>Difference</i>
<i>Experimental</i>	69.00	86.75	17.75
<i>Control</i>	64.50	78.25	13.75

The table illustrates the comparison between pre-test and post-test scores, showing a more substantial average improvement in the Experimental Group compared to the Control Group. The significance level confirms that the enhancement in vocabulary mastery achieved by the Experimental Group through Problem-Based Learning (PBL) is statistically significant compared to the Control Group. PBL led to a considerable boost in vocabulary skills among students compared to traditional teaching approaches. The Experimental Group experienced a more pronounced average score increase of 17.75 points, as opposed to the Control Group's increase of 13.75 points. Statistical analysis validates the effectiveness of PBL in improving vocabulary proficiency. The results indicate a significant difference in vocabulary mastery between the Experimental and Control Groups following the application of PBL. Specifically, the Experimental Group showed a significant gain in vocabulary scores, with an average pre-test score of 69.00 and a post-test score of 86.75, reflecting a notable increase of 17.75 points. Conversely, the Control Group, which adhered to traditional teaching methods, recorded an average pre-test score of 64.50 and a post-test score of 78.25, resulting in a minor improvement of 13.75 points.

Table 3.1.2: N-Gain Percent

Class	Mean (%)	Std. Error	95%Confidence Interval for Mean	Std. Deviation	Minimum	Maximum	Range	Skewness	Kurtosis
Experimental	59.09	4.80	49.04 - 69.14	21.48	33.33	100.00	66.67	0.571	-0.644
Control	35.83	2.93	29.70 - 41.97	13.12	16.67	57.14	40.48	0.069	

The difference in N Gain scores between the two classes was calculated to be 23.25 percentage points. This difference highlights a significant positive impact of the PBL methodology. Specifically, the Experiment Class demonstrated an average increase of approximately 23.25 percentage points more in vocabulary acquisition than the control class.

Table 3.1.3 Normality Test of Experimental Group

Test Statistic	Sig. (2-tailed)
0.116	0.200

Conclusion: The data is normally distributed ( $p > 0.05$ ).

Table 3.1.4 Normality Test of Control Group

Test Statistic	Sig. (2-tailed)
0.140	0.200

Conclusion: The data is normally distributed ( $p > 0.05$ ).

Table 3.1.5 Homogeneity Test of Pre-Test

Levene Statistic	Sig.
1.967	0.169

Conclusion: The variances are homogeneous ( $p > 0.05$ ).

Table 3.1.6 Homogeneity Test of Post-Test

Levene Statistic	Sig.
9.741	0.003

Conclusion: The variances are not homogeneous ( $p < 0.05$ ).

Table 3.1.7 Paired T-Test for Experimental Group Group

Mean Difference	Std. Deviation	Std. Error Mean	95% Confidence Interval	t	df	Sig. (2-tailed)
-17.750	6.690	1.501	-20.788 to -14.713	-11.83	19	0.000

Based on this comparison, the deficient t-statistic value (-12.862) falls outside the critical t-values ( $\pm 2.093$ ) required to reject the null hypothesis at a significance level of 0.05. Therefore, the study results indicate a statistically significant difference between the pretest and posttest measurements in the tested sample.

#### 4. DISCUSSION

The main goal of this research was to extend theoretically, give further information, and contribute to the impact of problem-based learning on enhancing students' vocabulary mastery and interest in learning English. Based on the data provided, the research employed a quasi-experimental design to compare the impacts of Problem-Based Learning (PBL) against conventional teaching methods in enhancing vocabulary mastery and student interest among sixth graders at SD IT Al Fikri Makassar. The researcher presented the result below:

##### 4.1. Problem-Based Learning in Students Vocabulary Mastery

This research utilized a quantitative approach with a quasi-experimental design involving two groups: an experimental group taught using Problem-Based Learning (PBL) and a control group taught with conventional methods. Vocabulary mastery, focusing on nouns and verbs as fundamental components of sentence construction, was assessed through pre-tests and post-tests before and after the intervention. This focus aligns with the school's curriculum, emphasizing these parts of speech as foundational for learning English. Therefore, the research aimed to enhance students' vocabulary skills consistent with their curriculum and learning needs. Problem-based learning, which engages students with problems to foster new knowledge and critical thinking, was applied to the experimental group. This method is known for improving students' problem-solving abilities, independence, and confidence in their understanding (Karim, 2021; Shoimin, 2014). The findings reveal that PBL significantly impacted vocabulary mastery and student interest. In the experimental group, pre-test scores ranged from 50 to 80 (mean = 69.00), and post-test scores ranged from 80 to 100 (mean = 86.75), showing a substantial improvement. The N-Gain percentage for this group was 59.09%, indicating a high level of vocabulary acquisition improvement. This result is supported by a paired t-test ( $t = -12.862$ ,  $p < 0.001$ ), confirming a significant difference between pre-test and post-test scores.

In contrast, the control group, which received conventional instruction, showed less improvement. Their pre-test scores ranged from 45 to 80 (mean = 64.50), and post-test scores ranged from 75 to 85 (mean = 78.25). The N-Gain percentage for the control group was 35.83%, reflecting a lower improvement level than the experimental group. The paired t-test for the control group ( $t = -7.585$ ,  $p < 0.001$ ) also indicated a significant difference between pre-test and post-test scores. Still, the improvement was less pronounced than in the experimental group. Overall, the experimental group exposed to PBL demonstrated a mean N-Gain of 59.09%, while the control group using conventional methods had a mean N-Gain of 35.83%. This approximately 23.25 percentage point difference highlights the superior effectiveness of PBL in enhancing vocabulary skills compared to traditional teaching methods.

#### 5. CONCLUSION

The analysis of vocabulary mastery using SPSS 25 revealed significant results: Experimental Group (PBL): The group employing Problem-Based Learning (PBL) demonstrated marked improvement in vocabulary mastery. Pre-test scores ranged from 50 to 80, with a mean of 69.00, and post-test scores improved to a range of 80 to 100, with a mean of 86.75. The N-Gain score for this group was 59.09%, reflecting substantial enhancement in vocabulary acquisition. The paired t-test showed a t-value of -12.862 with a p-value of less than 0.001, indicating a significant improvement in vocabulary skills. The difference of approximately 23.25 percentage points between the pre-test and post-test scores underscores the effectiveness of PBL compared to traditional methods.

Control Group (Conventional Methods): The control group, which followed conventional teaching methods, also showed improvement. Pre-test scores ranged from 45 to 80 (mean = 64.50), and post-test scores ranged from 75 to 85 (mean = 78.25). However, their N-Gain score was lower at 35.83%, with a t-value of -7.585 and a p-value of less than 0.001. Thus, this suggests less effective improvement than in the experimental group. The calculated t-statistic for the experimental group was well beyond the critical t-value of  $\pm 2.093$  (for  $df = 19$  and  $\alpha = 0.05$ ), highlighting the statistical significance of improving vocabulary skills for the PBL group.

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