IJE
Interdiciplinary Journal of Education
https://skillerindonesia.id/index.php/ije/index

Vol. 4, No 1: March 2026
E-ISSN: 2988-7798
pp. 38-49
Email:ije@skillerindonesia.com

The Effects of Problem-Based Learning on Fourth-Grade Students' Critical Thinking and Speaking Skills in English Instruction

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Abstract: This study examines the effects of Problem-Based Learning (PBL) on fourth-grade students' critical thinking and speaking skills in an elementary English as a Foreign Language (EFL) context. A quasi-experimental design with a pretest–posttest control group was employed, involving 36 students divided into experimental and control groups. Data were collected using a validated multiple-choice test to assess critical thinking and a performance-based rubric to evaluate speaking skills. The data were analyzed using Multivariate Analysis of Variance (MANOVA) and independent sample t-tests. The results of the MANOVA indicated that PBL did not have a statistically significant effect on the combined dependent variables (Wilks' $\Lambda = 0.968$, $F = 0.614$, $p = 0.547$). However, univariate analysis revealed a significant effect of PBL on students' critical thinking skills ($p < 0.05$), while the effect on speaking skills was not statistically significant. These findings suggest that PBL is more effective in enhancing higher-order cognitive skills than in improving oral communication abilities in elementary EFL learners. This study contributes to the growing body of research on constructivist learning by providing empirical evidence that PBL supports the development of critical thinking skills in young learners. However, the findings also highlight the need for integrating explicit language instruction and scaffolding strategies to improve speaking performance. The study offers important pedagogical implications for designing balanced instructional approaches that address both cognitive and communicative competencies in language learning.

Article History
Received: 11-10-2025
Revised: 01-12-2025
Published: 29-03-2026

Key Words :
Problem-Based Learning, Critical Thinking, Speaking Skills, Elementary EFL

How to Cite: Wardatul Uyun, N., Padlurrahman, P., & Khairul Wazni , M. (2026). The Effects of Problem-Based Learning on Fourth-Grade Students' Critical Thinking and Speaking Skills in English Instruction. *IJE : Interdisciplinary Journal of Education*, *4*(1), 38–49. https://doi.org/10.61277/ije.v4i1.256

https://doi.org/10.61277/ije.v4i1.256

Introduction

The rapid advancement of technology and globalization has significantly transformed the landscape of education, requiring learners to develop not only cognitive knowledge but also a wide range of 21st-century skills. These skills include critical thinking, communication, collaboration, and creativity, which are essential for navigating complex and dynamic global challenges. Among these, critical thinking and communication skills have been widely recognized as fundamental competencies that enable students to analyze information, solve problems, and express ideas effectively in both academic and real-world contexts (OECD,

Vol. 4, No 1: March 2026
E-ISSN: 2988-7798
pp. 38-49
Email:ije@skillerindonesia.com

2019; Trilling & Fadel, 2009). In the context of English as a Foreign Language (EFL) learning, these competencies are particularly important, as language is not only a tool for communication but also a medium for developing higher-order thinking skills.

English instruction at the elementary level plays a strategic role in laying the foundation for students' communicative competence and cognitive development. However, in many EFL classrooms, especially in developing countries, learning practices still tend to emphasize rote memorization and teacher-centered instruction, which limits students' opportunities to engage in meaningful communication and critical thinking processes. As a result, students often demonstrate limited ability to analyze problems, express ideas, and participate actively in discussions using English. This issue highlights the need for innovative and student-centered instructional approaches that can simultaneously foster both critical thinking and speaking skills.

One pedagogical approach that has gained considerable attention in addressing these challenges is Problem-Based Learning (PBL). Rooted in constructivist learning theory, PBL emphasizes active learning through problem-solving, where students construct knowledge by engaging with authentic and meaningful problems (Barrows, 1986; Savery, 2006). From a socio-constructivist perspective, learning occurs through social interaction and collaboration, allowing students to co-construct understanding and develop cognitive as well as communicative competencies (Vygotsky, 1978). In the context of language learning, PBL aligns closely with the principles of Communicative Language Teaching (CLT), which prioritizes meaningful interaction and the functional use of language in real-life situations (Richards, 2006).

Through the implementation of PBL, students are encouraged to identify problems, analyze information, propose solutions, and communicate their ideas effectively. This process inherently promotes critical thinking skills, as students must evaluate evidence, consider alternative perspectives, and make reasoned decisions (Facione, 2011). At the same time, PBL provides opportunities for authentic language use, enabling students to practice speaking skills in collaborative and problem-solving contexts. Therefore, theoretically, PBL has the potential to simultaneously enhance both critical thinking and speaking skills in EFL classrooms.

A growing body of empirical research has examined the effectiveness of PBL in improving students' higher-order thinking and language skills. Previous studies have reported that PBL can significantly enhance students' critical thinking abilities by engaging them in active inquiry and reflective thinking processes (Hmelo-Silver, 2004; Loyens et al., 2015). In addition, several studies have shown that PBL can improve students' speaking skills by providing opportunities for interaction, discussion, and presentation (Dolmans et al., 2016). However, most of these studies have been conducted in secondary or higher education contexts, with relatively limited attention given to elementary school settings, particularly in EFL contexts.

Furthermore, existing studies often examine critical thinking and speaking skills separately, rather than investigating their development simultaneously using robust statistical approaches such as multivariate analysis. This creates a research gap in understanding how instructional models like PBL influence multiple learning outcomes concurrently. In addition, there is still limited empirical evidence from developing country contexts, including Indonesia,

Vol. 4, No 1: March 2026
E-ISSN: 2988-7798
pp. 38-49
Email:ije@skillerindonesia.com

where classroom conditions, student characteristics, and instructional practices may differ significantly from those in developed countries.

Preliminary observations conducted in a fourth-grade classroom at an elementary school revealed that students showed enthusiasm for learning English but experienced difficulties in responding to problem-based questions, expressing ideas confidently, and engaging in spontaneous communication. While students demonstrated adequate memorization skills, their ability to apply knowledge critically and communicate effectively remained limited. These findings indicate a mismatch between instructional practices and the development of essential 21st-century skills, particularly critical thinking and speaking abilities.

Based on these considerations, this study aims to investigate the effects of Problem-Based Learning on students' critical thinking and speaking skills in elementary EFL instruction. Unlike previous studies, this research employs a multivariate analytical approach to examine the simultaneous and partial effects of PBL on both variables, thereby providing a more comprehensive understanding of its effectiveness.

Accordingly, the research objectives are formulated as follows: (1) to examine the effect of Problem-Based Learning on students' critical thinking and speaking skills simultaneously; (2) to analyze the effect of Problem-Based Learning on students' critical thinking skills; and (3) to analyze the effect of Problem-Based Learning on students' speaking skills.

To guide the investigation, the following hypotheses are proposed: Problem-Based Learning has a significant effect on students' critical thinking and speaking skills simultaneously. Problem-Based Learning has a significant effect on students' critical thinking skills. Problem-Based Learning has a significant effect on students' speaking skills.

This study is expected to contribute to the literature by providing empirical evidence on the effectiveness of PBL in elementary EFL contexts, particularly in developing countries. In addition, the findings are expected to offer pedagogical implications for teachers in designing instructional strategies that integrate critical thinking and communication skills in language learning.

Research Method

This study employed a quasi-experimental design using a pretest-posttest control group approach to examine the effects of Problem-Based Learning (PBL) on students' critical thinking and speaking skills. This design was selected to enable a comparison between an experimental group receiving PBL instruction and a control group receiving conventional direct instruction. The independent variable in this study was the instructional model, while the dependent variables were students' critical thinking and speaking skills. To analyze the simultaneous effects of the independent variable on the two dependent variables, Multivariate Analysis of Variance (MANOVA) was utilized. Additionally, independent sample t-tests were conducted to examine the partial effects of the instructional model on each dependent variable.

The study was conducted at an elementary school in East Lombok, Indonesia. The population consisted of 237 students, while the sample included 36 fourth-grade students who were divided into two groups: an experimental group and a control group, each consisting of 18 students. The sample was selected using purposive sampling based on accessibility and group equivalence considerations. Prior to the intervention, both groups were administered a

IJE
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https://skillerindonesia.id/index.php/ije/index
Vol. 4, No 1: March 2026
E-ISSN: 2988-7798
pp. 38-49
Email:ije@skillerindonesia.com

pretest to assess their initial abilities. The results indicated no significant difference between the groups, confirming that they were comparable before the treatment was implemented.

Data were collected using two main instruments. The first instrument was a critical thinking test in the form of multiple-choice questions. Initially, the test consisted of 30 items developed based on the learning objectives of English instruction. After undergoing content validation by expert reviewers, 20 items were retained as valid and used in the study, while 10 items were discarded. This instrument measured students' ability to analyze information, evaluate arguments, and interpret contextual problems. The reliability of the test was assessed using Cronbach's Alpha, yielding a coefficient of 0.82, indicating a high level of internal consistency. The second instrument was a speaking skills assessment in the form of a performance-based test consisting of five tasks requiring students to express their ideas orally. A scoring rubric was used to evaluate students' performance in terms of fluency, pronunciation, vocabulary use, grammatical accuracy, and overall comprehensibility. The reliability of the speaking assessment was also confirmed using Cronbach's Alpha, resulting in a coefficient of 0.79, which indicates acceptable reliability.

The data collection procedure was carried out in three stages. First, both groups were given a pretest to measure their initial critical thinking and speaking skills. Second, during the treatment phase, the experimental group was taught using the Problem-Based Learning model, which involved presenting real-world problems, facilitating group discussions, guiding students to develop solutions, and encouraging them to present their findings. Meanwhile, the control group received instruction through a conventional direct teaching method. Finally, after the treatment was completed, both groups were administered a posttest to measure the improvement in their critical thinking and speaking skills.

Data analysis was conducted using SPSS version 26. Prior to conducting the main analysis, several assumption tests were performed to ensure the validity of the statistical procedures. The normality of the data was assessed using the Shapiro–Wilk test, which indicated that the data were normally distributed ($p > 0.05$). The homogeneity of variance was tested using Levene's Test, showing that the data met the homogeneity assumption ($p > 0.05$). In addition, multicollinearity testing indicated that the correlation between dependent variables was within acceptable limits, suggesting no multicollinearity issues. Subsequently, MANOVA was conducted to examine the simultaneous effect of the PBL model on students' critical thinking and speaking skills at a significance level of 0.05. To further analyze the effect on each dependent variable, independent sample t-tests were performed. Effect size was also calculated using partial eta squared to determine the magnitude of the treatment effect.

This study adhered to ethical research standards. Prior to data collection, informed consent was obtained from the school and participants. Participation in the study was voluntary, and all data were kept confidential and used solely for research purposes.

Result

Descriptive Statistics

Descriptive statistics were first analyzed to provide an overview of students' performance in critical thinking and speaking skills across the experimental and control groups.

IJE
Interdiciplinary Journal of Education
https://skillerindonesia.id/index.php/ije/index
Vol. 4, No 1: March 2026
E-ISSN: 2988-7798
pp. 38-49
Email:ije@skillerindonesia.com

Table 1. Descriptive Statistics of Students' Critical Thinking and Speaking Skills

Variable	Group	Pretest Mean	Posttest Mean	Gain
Critical Thinking	Experimental (PBL)	68.89	82.22	13.33
	Control (Direct)	66.67	76.11	9.44
Speaking Skills	Experimental (PBL)	73.11	83.89	10.78
	Control (Direct)	66.56	77.33	10.77

The results in Table 1 indicate that both groups experienced improvements in all measured variables. However, the experimental group showed a greater increase in critical thinking skills compared to the control group. In contrast, the improvement in speaking skills was relatively similar between the two groups, suggesting that the effect of the PBL model on speaking ability was less pronounced.

Preliminary Analysis (Pretest Equivalence)

Before conducting the main analysis, a MANOVA test was performed on the pretest data to examine the equivalence of the experimental and control groups.

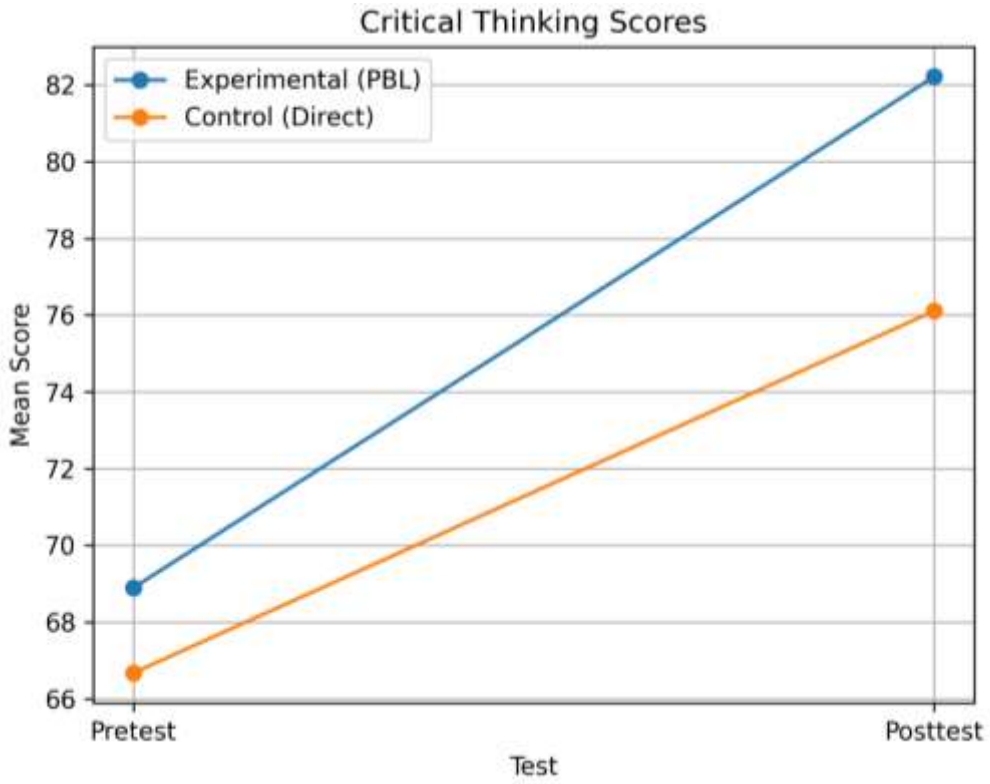

Figure 1. Critical Thinking Score

IJE
Interdiciplinary Journal of Education
https://skillerindonesia.id/index.php/ije/index
Vol. 4, No 1: March 2026
E-ISSN: 2988-7798
pp. 38-49
Email:ije@skillerindonesia.com

Figure 1 presents the comparison of pretest and posttest mean scores of students' critical thinking skills between the experimental group (Problem-Based Learning) and the control group (direct instruction). The results indicate that both groups experienced an improvement in their critical thinking abilities, as reflected by the increase in mean scores from pretest to posttest. However, the improvement observed in the experimental group was notably higher than that of the control group. Specifically, the mean score of the experimental group increased from 68.89 in the pretest to 82.22 in the posttest, while the control group showed a more moderate increase from 66.67 to 76.11. This pattern suggests that the implementation of the Problem-Based Learning model contributed more effectively to enhancing students' critical thinking skills compared to the direct instruction method.

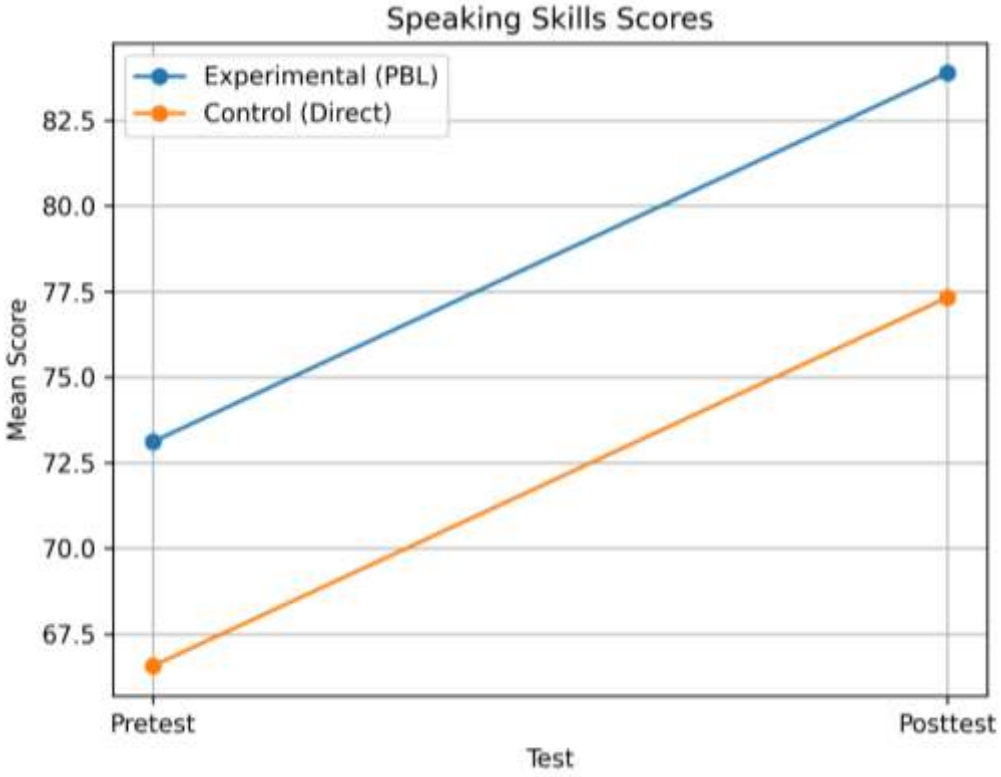

Figura 2. Speaking Skills Scores

Figure 2 presents the comparison of pretest and posttest mean scores of students' speaking skills between the experimental group (Problem-Based Learning) and the control group (direct instruction). The results indicate that both groups experienced an improvement in speaking performance, as reflected by the increase in mean scores from pretest to posttest. The experimental group's mean score increased from 73.11 to 83.89, while the control group improved from 66.56 to 77.33. Although the experimental group consistently achieved higher scores than the control group in both pretest and posttest, the magnitude of improvement

IJE
Interdiciplinary Journal of Education
https://skillerindonesia.id/index.php/ije/index
Vol. 4, No 1: March 2026
E-ISSN: 2988-7798
pp. 38-49
Email:ije@skillerindonesia.com

between the two groups appears relatively similar. This pattern suggests that while the Problem-Based Learning model contributes to the enhancement of students' speaking skills, its effect is not substantially different from that of the direct instruction method.

Table 2. MANOVA Results for Pretest Scores

Test Statistic	Value	F	Sig. (p)
Wilks' Lambda	0.987	0.244	0.785

The results show that there was no statistically significant difference between the groups at the pretest stage ($p = 0.785 > 0.05$). This indicates that both groups had equivalent initial abilities in terms of critical thinking and speaking skills, and thus were suitable for further comparison.

Multivariate Analysis (Posttest MANOVA)

To examine the simultaneous effect of the Problem-Based Learning model on both dependent variables, a MANOVA test was conducted on the posttest data.

Table 3. MANOVA Results for Posttest Scores

Test Statistic	Value	F	Sig. (p)
Wilks' Lambda	0.968	0.614	0.547

The MANOVA results indicate that the effect of the instructional model on the combined dependent variables (critical thinking and speaking skills) was not statistically significant ($p = 0.547 > 0.05$). Therefore, the first hypothesis (H1), which states that Problem-Based Learning has a significant effect on both variables simultaneously, is not supported.

Univariate Analysis (Independent Sample t-test)

Table 4. Results of Independent Sample t-test

Variable	Mean Difference	Sig. (p)	Interpretation
Critical Thinking	Significant	0.025	Significant Effect
Speaking Skills	Not Significant	> 0.05	No Significant Effect

The results show that there was a statistically significant difference in critical thinking skills between the experimental and control groups ($p = 0.025 < 0.05$). This indicates that the Problem-Based Learning model had a significant effect on improving students' critical thinking skills, supporting the second hypothesis (H2).

However, the difference in speaking skills between the two groups was not statistically significant ($p > 0.05$), indicating that the effect of the PBL model on speaking skills was not strong enough to produce a statistically significant improvement. Thus, the third hypothesis (H3) is not supported.

IJE
Interdiciplinary Journal of Education
https://skillerindonesia.id/index.php/ije/index
Vol. 4, No 1: March 2026
E-ISSN: 2988-7798
pp. 38-49
Email:ije@skillerindonesia.com

Effect Size

To determine the magnitude of the treatment effect, effect size was calculated using partial eta squared.

Table 5. Effect Size (Partial Eta Squared)

Variable	Effect Size (η^2)	Interpretation
Critical Thinking	Moderate	Meaningful Effect
Speaking Skills	Small	Limited Effect

The results indicate that the effect of the PBL model on critical thinking skills was in the moderate range, suggesting a meaningful impact on students' higher-order thinking abilities. In contrast, the effect size for speaking skills was relatively small, indicating that additional instructional support may be needed to enhance students' oral communication skills.

Discussion

The findings of this study provide important insights into the differential impact of Problem-Based Learning (PBL) on students' critical thinking and speaking skills in an elementary EFL context. Although the multivariate analysis did not reveal a statistically significant effect on the combined dependent variables, the univariate results demonstrated a significant improvement in critical thinking skills. This finding is consistent with recent studies indicating that PBL tends to have a stronger impact on cognitive outcomes compared to language production skills (Guo et al., 2024; Liu, 2022).

The significant improvement in students' critical thinking skills can be explained through the lens of constructivist learning theory, which emphasizes active knowledge construction through problem-solving and inquiry-based learning. In PBL environments, students engage in authentic tasks that require them to analyze information, evaluate alternatives, and construct solutions. These processes align with higher-order thinking frameworks that promote analytical reasoning and metacognitive awareness (Facione, 2011; Loyens et al., 2015). Recent empirical studies have shown that PBL significantly enhances students' critical thinking by fostering reflective thinking and collaborative problem-solving (Amin et al., 2020; Jumhur, 2024).

Furthermore, research in EFL contexts has demonstrated that PBL facilitates deeper cognitive engagement by encouraging students to interact with meaningful content and apply language in problem-solving situations (Kök, 2023; Orhan, 2024). This is supported by findings that PBL promotes inquiry-based learning and helps students connect prior knowledge with new information, leading to improved conceptual understanding (Song, 2025; Šliogerienė, 2025). Therefore, the results of this study reinforce the argument that PBL is particularly effective in developing critical thinking skills in language learning contexts.

However, the absence of a statistically significant effect on speaking skills suggests that the implementation of PBL alone may not be sufficient to substantially improve students' oral communication abilities. This finding aligns with previous studies indicating that speaking proficiency in EFL contexts requires not only interaction but also structured linguistic input and explicit instruction (Richards, 2006; Dolmans et al., 2016). Although PBL provides

Vol. 4, No 1: March 2026
E-ISSN: 2988-7798
pp. 38-49
Email:ije@skillerindonesia.com

opportunities for communication, it does not automatically ensure improvements in pronunciation, fluency, or grammatical accuracy without additional scaffolding.

Recent studies have highlighted that students' speaking performance is influenced by multiple factors, including vocabulary mastery, confidence, and anxiety levels (Tarigan, 2025; Gunawan, 2025). In elementary contexts, learners often lack sufficient linguistic resources to express their ideas effectively, even when they are actively engaged in discussions. As a result, the communicative benefits of PBL may not be fully realized unless accompanied by structured language support (Uzma, 2025).

Moreover, the findings of this study are consistent with recent research showing that the effectiveness of PBL in improving speaking skills depends on the integration of communicative strategies and scaffolding techniques (Orhan, 2024; Kök, 2023). Studies suggest that combining PBL with approaches such as task-based language teaching and guided interaction can significantly enhance students' speaking performance (Guo et al., 2024; Liu, 2022). Without such integration, PBL may primarily benefit cognitive development rather than communicative competence.

The discrepancy between the non-significant multivariate results and the significant univariate effect on critical thinking reflects the complexity of learning outcomes in educational research. Similar findings have been reported in recent studies, where PBL showed stronger effects on higher-order thinking skills compared to language production when analyzed simultaneously (Guo et al., 2024; Liu, 2022). This suggests that instructional interventions may have domain-specific effects, and multiple analytical approaches are necessary to capture these differences.

From a pedagogical perspective, the results of this study suggest that PBL can be effectively implemented to enhance students' critical thinking skills in elementary EFL classrooms. However, to improve speaking skills, teachers should integrate PBL with explicit language instruction, including vocabulary development, pronunciation training, and structured speaking activities. Recent studies emphasize that combining constructivist approaches with communicative language teaching (CLT) principles can produce more balanced outcomes in both cognitive and communicative domains (Orhan, 2024; Song, 2025).

In addition, the integration of digital technologies into PBL environments has been shown to enhance both critical thinking and communication skills by providing interactive and engaging learning experiences (Guo et al., 2024; Liu, 2022). Therefore, future implementations of PBL should consider incorporating technology-enhanced learning strategies to maximize student engagement and learning outcomes.

Despite its contributions, this study has several limitations. The relatively small sample size and the focus on a single school limit the generalizability of the findings. Additionally, the duration of the intervention may not have been sufficient to produce significant improvements in speaking skills, which typically require long-term practice and exposure. These limitations are consistent with recent studies highlighting the need for extended interventions and larger samples in PBL research (Guo et al., 2024; Jumhur, 2024).

Future research is recommended to involve larger and more diverse samples, as well as longer intervention periods, to better understand the long-term effects of PBL on language learning outcomes. Furthermore, future studies could explore hybrid instructional models that

Vol. 4, No 1: March 2026
E-ISSN: 2988-7798
pp. 38-49
Email:ije@skillerindonesia.com

combine PBL with other approaches, such as task-based language teaching, digital learning environments, and AI-assisted learning, to enhance both critical thinking and speaking skills simultaneously (Song, 2025; Šliogerienė, 2025).

Conclusion

This study examined the effects of Problem-Based Learning (PBL) on students' critical thinking and speaking skills in an elementary EFL context. The findings revealed that PBL had a statistically significant effect on students' critical thinking skills, indicating that the model is effective in fostering higher-order thinking through problem-solving and collaborative learning processes. However, the multivariate analysis showed that PBL did not have a significant effect on the combined variables of critical thinking and speaking skills, and its effect on speaking skills alone was not statistically significant.

These findings suggest that while PBL is highly effective in promoting cognitive development, its impact on language production particularly speaking may require additional instructional support. The study confirms that PBL aligns well with constructivist learning principles and contributes meaningfully to the development of 21st-century skills, especially critical thinking. However, the results also highlight that communicative competence, particularly speaking skills, may not develop optimally without explicit language scaffolding.

Recommendation

Based on the findings of this study, several recommendations can be proposed. First, teachers are encouraged to implement Problem-Based Learning in English instruction to enhance students' critical thinking skills. However, it is essential to integrate PBL with explicit language instruction, such as vocabulary development, pronunciation practice, and structured speaking activities, to improve students' speaking proficiency.

Second, schools should support the implementation of innovative learning models like PBL by providing adequate training for teachers and sufficient learning resources. Institutional support is crucial to ensure that PBL can be effectively implemented in classroom settings.

Third, future researchers are recommended to conduct studies with larger sample sizes and longer intervention durations to better capture the long-term effects of PBL on both cognitive and language skills. Further research could also explore the integration of PBL with other instructional approaches, such as task-based language teaching or digital learning environments, to enhance students' communicative competence.

Acknowledgement

The authors would like to express their sincere gratitude to all parties who contributed to the completion of this study. Special appreciation is extended to the school administrators, teachers, and students who participated in this research. The authors also acknowledge the support and guidance provided by academic supervisors and colleagues throughout the research process. This study would not have been possible without their valuable contributions and cooperation.

Vol. 4, No 1: March 2026
E-ISSN: 2988-7798
pp. 38-49
Email:ije@skillerindonesia.com

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Vol. 4, No 1: March 2026
E-ISSN: 2988-7798
pp. 38-49
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