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Transformation of Science and Social Studies Learning in Elementary Schools Through Problem-Based Learning: Enhancing Learning Outcomes

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Abstract

This study aims to evaluate the effectiveness of implementing the Problem-Based Learning (PBL) model in improving students' learning outcomes in Science and Social Studies. The research design employed is a pre-experimental method using the One-Group Pretest Posttest model involving 27 fourth-grade students at Pakal I Elementary School in Surabaya. The results indicate that implementing PBL significantly increased the average student scores, from 49 in the pretest to 81 in the posttest. The findings also reveal that PBL promotes active student engagement in learning and enhances comprehension, critical thinking skills, and collaboration abilities. However, this study has several limitations, including a small sample size and limited subject coverage. Future research with a broader scope and long-term analysis is recommended to validate these findings.
Keywords: *problem-based learning; academic performance; science and social studies*

Abstrak

Penelitian ini bertujuan untuk mengevaluasi efektivitas penerapan model pembelajaran Problem Based Learning (PBL) dalam meningkatkan hasil belajar siswa pada mata pelajaran Ilmu Pengetahuan Alam dan Sosial. Desain penelitian yang digunakan adalah pre-experimental dengan metode One Group Pre-Test Post-Test, yang melibatkan 27 siswa kelas IV Sekolah Dasar Negeri Pakal I Surabaya. Hasil penelitian menunjukkan bahwa penerapan PBL secara signifikan meningkatkan rata-rata nilai siswa, dari 49 pada pre-test menjadi 81 pada post-test. Temuan ini juga mengungkapkan bahwa PBL mendorong keterlibatan aktif siswa dalam pembelajaran, meningkatkan pemahaman, keterampilan berpikir kritis, serta kemampuan kolaborasi. Namun, penelitian ini memiliki beberapa keterbatasan, seperti ukuran sampel yang kecil dan cakupan mata pelajaran yang terbatas. Penelitian lanjutan dengan cakupan yang lebih luas dan analisis jangka panjang disarankan untuk memvalidasi hasil ini.
Kata kunci: problem based learning; hasil belajar; ilmu pengetahuan alam dan sosial

Introduction

Science and Social Studies are among the most essential subjects in the education system, as they help students understand the interactions between living beings and their environment while also introducing them to human life as individuals and social beings (Zuschaiya et al., 2024). Through Science and Social Studies, students understand ecosystems comprehensively, encompassing the roles of biotic and abiotic components in maintaining environmental balance. Studies have shown that understanding ecosystems can enhance students' environmental literacy, crucial for increasing

awareness of nature conservation (Zakiyyah & Haqq, 2022). Relating ecosystem concepts to everyday life also helps students recognize the impact of their actions on the environment (Arief, 2023; Nurbaya et al., 2022).

Furthermore, Science and Social Studies play a vital role in providing students with an understanding of humans as social beings. Humans inherently require interactions with others, cannot live independently, and need social networks to fulfill their social and emotional needs (Hantono & Pramitasari, 2018; Mafazah et al., 2020). Science and Social Studies education helps students develop the social skills needed to interact effectively within society while understanding the social dynamics around them (Maulana et al., 2023; Sangaswari et al., 2024).

The subject also emphasizes the importance of tolerance and cooperation in a diverse society. Students are taught to appreciate differences and realize that each individual has a unique societal role (Fadliah, 2022; Idaini, 2021). This understanding is essential for creating harmonious interpersonal relationships and reducing social conflicts. Understanding the existing social and cultural contexts makes students better prepared to contribute positively to society (Hasni & Kambali, 2023).

The relevance of Science and Social Studies in daily life is significant, especially in shaping fundamental scientific understanding that serves as the foundation for further education. The learning process of Science and Social Studies is about mastering facts and concepts and encouraging students to understand and apply their knowledge in real-world contexts. Research supports that Science and Social Studies education provides a platform for students to learn about themselves, their environment, and essential skills that are useful in daily life (Mone et al., 2023).

Based on observations conducted in July 2023 in class IV B with 27 students, it was found that student enthusiasm for learning Science and Social Studies was still low. As many as 22 students had not reached the Minimum Passing Criteria, indicating difficulties understanding the material. Moreover, the interaction between teachers and students was minimal, directly impacting low learning outcomes. A similar situation occurred in the fourth grade of Pakal I Surabaya State Elementary School, where further observations confirmed these findings. The researcher observed the learning process with a focus on the activities conducted by the teacher during teaching. Throughout the lesson, student engagement was shallow. Most students appeared passive, and the learning process tended to be monotonous, where they only listened and received the material without being actively involved in discussions. Students rarely asked questions or expressed their curiosity. In addition, some students seemed bored and engaged in other activities, such as playing independently, which indicated a lack of engagement in the learning process. This low learning enthusiasm was primarily due to the teaching methods dominated by lectures. The teacher only delivered the material orally, followed by assigning tasks. This approach made the content feel abstract and difficult for students to comprehend, making it challenging to visualize the concepts being explained. As a result, students' motivation to learn decreased, contributing to the low grades achieved. Out of 27 students, 22 failed to reach the minimum passing criteria score of 75 for Science and Social Studies at Pakal I Surabaya State Elementary School.

One alternative solution that can be implemented to improve Science and Social Studies learning outcomes in the classroom is using the Problem-Based Learning (PBL)

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model. PBL is a practical learning approach that motivates students to actively participate in the learning process (Chrisdiyanto et al., 2023; Sariastuti & Mawardi, 2021). This model encourages students to explore real-world problems relevant to the studied material, making learning more contextual and meaningful (Somalinggi et al., 2023). With PBL, students are passive listeners and engaged in problem-solving, group discussions, and creative solution-finding (Chayumi, 2021; Sutrisno & Syukur, 2023). This makes students more emotionally and intellectually engaged, ultimately enhancing their understanding of the material (Nafiah & Suyanto, 2014). PBL also develops critical thinking and analytical skills, which are essential in improving Science and Social Studies learning outcomes (Mutiara et al., 2023).

Several previous studies have shown that implementing Problem-Based Learning (PBL) positively impacts student learning outcomes, particularly in Science and Social Studies subjects. For instance, research by Yuafian and Astuti (2020) found that implementing PBL could increase student engagement in learning and deepen their understanding of Science and Social Studies concepts. The study revealed that students who learned through the PBL approach significantly improved exam scores and problem-solving skills compared to conventional teaching methods (Novianti et al., 2020). Additionally, another study by Paratiwi and Ramadhan (2023) highlighted the significant impact of PBL in Social Studies at the elementary level. In that study, PBL enhanced students' abilities to analyze social issues and enrich learning experiences with real-life contexts (Narsa, 2021). These findings strengthen the evidence that PBL improves academic performance and facilitates the development of critical thinking and collaborative skills that are essential in primary education (Suratno et al., 2020).

This research presents a novel approach to enhancing student learning outcomes in Science and Social Studies, particularly in Transforming Forms of Energy, using the Problem-Based Learning (PBL) model. The novelty of this research lies in applying PBL in the elementary school environment, specifically at Pakal I Surabaya State Elementary School, which has previously used conventional teaching methods that tend to be monotonous and less interactive. PBL is proposed as an alternative that can encourage students to be more actively engaged in the learning process and hone the critical and analytical thinking skills needed to tackle real-world problems in everyday life.

The primary objective of this study is to evaluate the extent to which the implementation of PBL can improve student learning outcomes in Science and Social Studies. By comparing student learning outcomes before and after the implementation of PBL, this study seeks to measure the effectiveness of this approach in enhancing students' understanding of complex Science and Social Studies concepts. It is hoped that the results of this study can contribute to the development of more dynamic, relevant, and contextual learning methods and play a role in improving the quality of education at the elementary school level.

Research Method

This study aims to evaluate the effectiveness of an educational intervention using a quantitative approach with a pre-experimental design, specifically the One-Group pretest and posttest model. This design was chosen as it provides an opportunity to measure changes in students' learning outcomes before and after implementing a

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specific intervention. In this context, the study was conducted on 27 fourth-grade B students at Pakal I Elementary School in Surabaya. The research employed a Nonprobability Sampling technique, specifically saturated sampling, where the entire student population was included in the study. Data was collected through learning outcome tests in two stages: a pretest conducted before the learning session and a posttest administered afterward. The test items included multiple-choice questions, short answers, and essay questions designed to measure students' comprehension of the material taught. Before use, these test items were piloted on fourth-grade C students to ensure the validity and reliability of the measurement instruments. Data analysis involved comparing the pretest and posttest results using descriptive and inferential statistical techniques, such as the t-test, to determine whether there were significant differences. Consequently, this study is expected to provide deeper insights into the effectiveness of the educational intervention applied and contribute to developing more effective teaching methods for enhancing students' learning outcomes in elementary schools.

Results

The results of this study indicate that implementing the Problem-Based Learning model significantly impacts elementary school students' learning outcomes in Science and Social Studies subjects. Based on data obtained from the pretest and posttest, there was a substantial improvement in students' comprehension following the application of the PBL model, as illustrated in Figure 1. The average pretest score before implementing this learning model was 49, while the average posttest score increased to 81 after applying the PBL model.

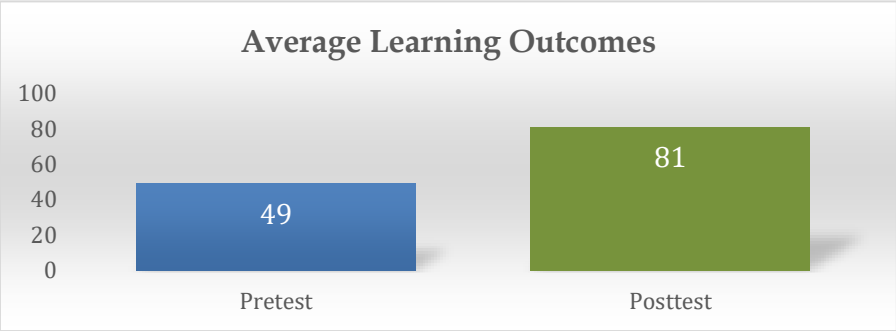

Figure 1 Science and Social Studies Learning Outcomes

The difference in pretest and posttest scores occurred due to the implementation of the Problem-Based Learning (PBL) model. During the application of this model, students actively engaged in the learning process, for instance, through group assignments that encouraged them to support and motivate each other, positively impacting their understanding of the material. Additionally, students could explore the concepts being studied through experiments or observations.

Inferential statistical tests were conducted to validate these findings further. First, prerequisite tests such as the normality test using the Kolmogorov-Smirnov and Shapiro-Wilk methods were performed. The results of the normality test are presented in Table 1.

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Table 1 Normality Test

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	Df	Sig.
Pretest	.176	27	.031	.936	27	.099
Posttest	.128	27	.200*	.961	27	.384

Table 1 indicates that the pretest and posttest data are normally distributed, with a significance value of 0.099 and 0.384 for the posttest. Since both values are more significant than 0.05, it can be concluded that the data meet the criteria for hypothesis testing. Subsequently, a hypothesis test was conducted using the Paired Sample T-test. The results of the hypothesis test are presented in Table 2.

Table 2 Hypothesis Test

		Paired Differences							
					95% Confidence Interval of the Difference				
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper	T	Df	Sig. (2-tailed)
Pair 1	Pretest - Posttest	-32.222	7.170	1.380	-35.059	-29.386	-23.351	26	.000

The hypothesis test results show a significance value 0.000, less than 0.05. This indicates that the null hypothesis (Ho) is rejected, and the alternative hypothesis (Ha) is accepted, demonstrating a significant difference between the pretest and posttest results. Overall, these findings conclude that the implementation of the Problem-Based Learning model has a substantial impact on students' learning outcomes. This model enhances academic performance and increases student engagement in the learning process, enabling them to better understand the subject matter, particularly on the topic of transforming forms of energy.

Discussion

Implementing the Problem-Based Learning (PBL) model at the elementary school level, particularly in Science and Social Studies subjects, has significantly impacted students' learning outcomes. Research indicates that PBL improves students' average scores and deepens their understanding of the subject matter. For instance, Yusa et al. demonstrated that PBL can enhance students' motivation and learning outcomes across cognitive, affective, and psychomotor domains (Yusa et al., 2023). Furthermore, Haryanti et al. revealed that integrating the PBL model with the Inquiry model enhances students' critical thinking skills in social studies (Haryanti et al., 2022). These findings align with research by Uluçınar, which indicates that PBL has similar positive effects across various disciplines, including science and social studies (Uluçınar, 2023).

A key factor contributing to the effectiveness of PBL is active student engagement. This model encourages students to collaborate in groups and explore concepts through experiments and observations, consistent with constructivist learning principles. Almulla emphasized that students are not merely recipients of information but actively construct knowledge through direct experiences (Samawati et al., 2023). Research by

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Yulianti and Gunawan further indicated that active involvement in PBL can enhance critical thinking skills and conceptual understanding, which are crucial components of the learning process (Yulianti & Gunawan, 2019). Such engagement contributes to developing students' collaborative and critical thinking skills, which are vital in modern education.

From a statistical perspective, the implementation of PBL shows significant results in hypothesis testing. Muehlenkamp et al. reported that pretest and posttest data analysis demonstrated a normal distribution, allowing for the Paired Sample T-test to test the hypothesis (Chen et al., 2021). The results indicated a significant difference between pretest and posttest scores, further supporting the argument that PBL has a tangible impact on students' learning outcomes. Research by Li and Stylianides also confirmed that PBL can enhance students' motivation and engagement, contributing to long-term understanding and retention (Kortam et al., 2018).

Applying the PBL model in elementary school learning improves students' learning outcomes and develops their critical thinking and collaborative skills. This demonstrates that PBL is a practical approach to enhancing the quality of education, especially in learning contexts that require active student participation (Arif, 2018). These findings suggest that PBL can be considered a highly relevant strategy for improving students' learning outcomes and skills in today's educational landscape.

Despite these positive results, this study has several limitations that should be considered. First, the research was conducted on only one subject, namely Science and Social Studies, making it difficult to generalize the findings to other subjects. Moreover, the study involved only one elementary school with a relatively small sample size of 27 students. This limited sample size may affect the generalizability of the findings to a broader population. Therefore, further research with larger sample sizes and involving multiple schools is needed to strengthen the external validity of the findings. Another limitation is the relatively short duration of PBL implementation. As this study did not examine the long-term effects of PBL, it remains unclear whether the improvement in students' learning outcomes can be sustained over a more extended period. Therefore, longitudinal studies that monitor students' learning outcomes over an extended period are highly recommended to evaluate the sustainability of PBL's effectiveness in enhancing learning outcomes.

Based on these limitations, recommendations for future research include conducting comparative studies across various subjects to determine whether PBL is generally effective or practical only for specific subjects. Additionally, further research involving more schools with diverse characteristics is needed to improve the generalizability of the findings. Future studies are also encouraged to explore other factors that may influence the effectiveness of PBL, such as students' learning styles, teacher involvement, and learning environments, to provide a more comprehensive understanding of the ideal conditions for implementing PBL in various learning contexts.

Conclusion

This study aims to evaluate the effectiveness of implementing the Problem-Based Learning (PBL) model in improving student learning outcomes in Science and Social

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Studies, particularly in transforming forms of energy. The research findings indicate that the application of PBL significantly enhanced student learning outcomes, with the average score increasing from 49 in the pretest to 81 in the posttest. PBL fosters active student engagement through group discussions and problem-solving activities, which also improve critical thinking and collaboration skills. However, this study has several limitations, including a small sample size, limited subject coverage, and a short research duration, making it difficult to generalize the results broadly. Future research is recommended to involve a larger sample size, include other subjects, and assess the long-term impact of PBL to ensure its sustainability and effectiveness.

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