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The Effect of Problem-Based Learning Model Assisted by Wordwall Application on Student Learning Outcomes in Grade V IPAS Subject

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A B S T R A C T

This study aims to examine the effect of the Problem-Based Learning (PBL) model supported by the Wordwall application on student learning outcomes in Grade V IPAS subjects at SD Inpres Kabonena. This research employs a quantitative approach using a pre-experimental design, specifically the one-group pretest-posttest design. The sample consisted of 25 students selected through total sampling. Data were collected through multiple-choice tests, interviews, and documentation. The analysis involved prerequisite tests including normality testing, N-Gain analysis, and hypothesis testing using the Paired Sample T-Test, assisted by IBM SPSS Statistics version 27. The results of this study indicate a T-test significance value of 0.001 < 0.05; therefore, H_0 is rejected and H_a is accepted, meaning that there is a significant effect of the Problem-Based Learning model assisted by the Wordwall application on student learning outcomes. It can be concluded that the Problem-Based Learning model assisted by the Wordwall application has a significant effect on the learning outcomes of Grade V students in IPAS subjects at SD Inpres Kabonena. The Problem-Based Learning model assisted by the Wordwall application deserves to be considered as an alternative solution for innovative and effective learning in improving student learning outcomes.

1. Introduction

In 21st-century education, advances in science and technology have brought significant changes to various aspects of life. As a result, education must not only equip students with knowledge but also foster positive attitudes, strong character, and technological proficiency. According to Law Number 20 of 2003 on the National Education System, the primary function of education is to develop students' potential while shaping a dignified national character and civilization to improve the quality of national life. The ultimate goal of education is to nurture individuals who are faithful to God Almighty, possess noble character, maintain good health, acquire knowledge, demonstrate competence, exhibit creativity, and

become democratic and responsible citizens. The quality of education is strongly influenced by the quality of learning, as learning serves as the core activity in the school system. This quality can be assessed through the effectiveness of achieving learning objectives. One way to improve learning quality is through the implementation of innovative learning models. These models support the development of essential 21st-century skills, including critical thinking, collaboration, and digital literacy. Their application enhances student learning outcomes, motivation, and readiness to face future challenges (Barella et al., 2024).

In the learning process, one of the key components is the teacher, who acts as a facilitator and serves as a primary learning resource. Teachers must possess the skills to manage classrooms effectively and create a conducive and engaging learning environment that supports student success. Furthermore, meaningful interaction between teachers and students is essential to ensure that learning materials are effectively communicated. In a student-centered learning environment, students are given opportunities to construct their own understanding. This leads to more meaningful learning and deeper comprehension, which ultimately enhances the quality of student learning (Panggabean, 2021).

Specifically, in IPAS (Ilmu Pengetahuan Alam dan Sosial) instruction, the application of basic principles of the scientific method helps cultivate scientific attitudes such as curiosity, critical and analytical thinking, and the ability to draw accurate conclusions. These characteristics contribute to the development of scientific wisdom (Kemendikbud, 2022). In this context, teachers are expected to implement innovative and engaging instructional strategies to improve students' understanding of the subject matter and to encourage active participation, thereby fostering meaningful learning experiences. Additionally, it is essential to monitor students' cognitive development as they engage with and explore scientific concepts during classroom discussions.

Based on the research findings, it was revealed that fifth-grade students at SD Inpres Kabonena still experience conventional, teacher-centered instruction in IPAS subjects. Teachers predominantly rely on lectures and assignments, while students tend to act as passive recipients of information. This condition has negatively affected students' learning outcomes in IPAS. This issue is evident from the end-of-semester test results, which show that 15 out of 25 students (60%) scored below the school's Minimum Mastery Criteria (KKTP) for IPAS, set at a score of 75. The situation indicates that learning continues to be dominated by teacher-centered methods, with limited variation in instructional strategies and learning resources. A fundamental skill that elementary students must develop is a solid understanding of key learning concepts to ensure that educational objectives are achieved effectively. One approach to address this challenge is by implementing appropriate learning models supported by the integration of relevant instructional media. This can help make the teaching and learning process more accessible, interactive, and engaging for all students (Asriani et al., 2021).

Therefore, a strategic solution is needed to address this issue and improve students' learning outcomes and understanding in IPAS. One effective approach is the

application of innovative learning models that foster active student engagement, promote critical thinking, and enhance creativity and problem-solving skills. An example of such a model is Problem-Based Learning (PBL), which not only facilitates the mastery of facts, concepts, and principles related to natural sciences, but also trains students to solve real-world problems connected to their environment and surrounding conditions (Sari, 2021). The use of the Wordwall application supports this approach by enabling students to learn through play, which helps capture their attention.

Wordwall is an interactive web-based platform designed to enhance the learning process through a variety of game templates that can be integrated with instructional content. It provides students with opportunities to learn in an engaging and enjoyable manner, fostering active participation and promoting interactive learning (Savira & Gunawan, 2022). The implementation of the Problem-Based Learning (PBL) model, which emphasizes active student involvement supported by the Wordwall application, is expected to facilitate students' understanding of the material both in groups and individually. This approach has a positive impact on improving student learning outcomes.

Based on this background, this study was conducted to examine the effect of the Problem-Based Learning (PBL) model assisted by the Wordwall application on student learning outcomes in Class V IPAS subjects at SD Inpres Kabonena. This research is expected to provide a new perspective on the implementation of innovative learning models and the integration of digital technology in the classroom to improve student performance, particularly in the cognitive domain, and to support the overall enhancement of education quality.

2. Methodology

This research employs a quantitative approach using a pre-experimental design with a one-group pretest-posttest model. According to Sugiyono (as cited in Miranti, 2021), a one-group pretest-posttest design is a type of experimental research involving a single sample group without control variables and where participants are not selected randomly. The population in this study consists of fifth-grade students at SD Inpres Kabonena. The sampling technique used is saturated sampling, in which the entire population is used as the sample appropriate for small populations of fewer than 30 individuals (Sugiyono, as cited in Pasaribu et al., 2022). The research sample consisted of 25 students. The research instrument consisted of a validated and reliability-tested multiple-choice test, used to measure student learning outcomes on a ratio scale.

Data were collected through the administration of pretests and posttests before and after the treatment, along with interviews and documentation collected during the research. Data analysis included descriptive statistics and prerequisite tests, specifically the Shapiro–Wilk normality test due to the small sample size ($n < 50$), and the N-Gain test to assess the effectiveness of the Problem-Based Learning model assisted by the Wordwall application in improving student learning

outcomes. Data were collected both before and after the treatment, and hypothesis testing was conducted using a paired sample t-test.

3. Results and Discussion

Result

Descriptive Analysis

The results of this analysis were used to summarize the data collected in the study, specifically the pretest and posttest scores, which were processed using IBM SPSS Statistics version 27.

Table 1. Results of Descriptive Data Analysis

Statistics	***Pretest***	***Posttest***
Sample	25	25
Minimum Score	15	55
Maximum Score	75	95
Mean	36,80	79,80
Standard Deviation	13.140	9.946

Based on the data presented in Table 1, the students' mean pretest score was 36.80, with a minimum score of 15, a maximum of 75, and a standard deviation of 13.140. In comparison, the mean posttest score increased to 79.80, with a minimum of 55, a maximum of 95, and a standard deviation of 9.946. The results of the data analysis indicated a significant difference between the students' pretest and posttest scores following the implementation of the Problem-Based Learning model facilitated by the Wordwall application. The higher posttest scores reflect an improvement in student learning outcomes after the intervention.

Analysis of Prerequisite Tests

A prerequisite test, specifically a normality test, was conducted using the Shapiro–Wilk method to assess the distribution of the data. The results of the normality test, processed using IBM SPSS Statistics version 27, are presented in Table 2.

Table 2. Results of *Pretest* and *Posttest* Data Normality Test

Learning Outcomes	***Shapiro-Wilk***		
	Statistic	**df**	**Sig.**
Pretest	0,937	25	0,124
Posttest	0,972	25	0,694

Based on Table 2, the significance value for the pretest was 0.124 (> 0.05), and for the posttest, it was 0.694 (> 0.05). These values meet the criteria for a normal distribution, where a significance value greater than 0.05 (sig. > 0.05) indicates that the data are normally distributed. Therefore, the pretest and posttest learning outcomes data can be considered normally distributed.

The N-Gain test in this research was conducted to evaluate the improvement in students' average learning outcomes and to assess the effectiveness of the intervention based on the pretest and posttest scores. The N-Gain values were computed using IBM SPSS Statistics version 27, and the findings are summarized in Table 3.

Tabel 3. Result of *Pretest* dan *Posttest* Data N-Gain Test

N-Gain	**Nilai *Mean***	**Tingkat *Gain***	**Kriteria**
N-Gain Score	0,6888	$0,3 \leq g \leq 0,7$	Sedang
N-Gain Score Persentase	68.8805	56 - 75	Cukup Efektif

Based on the results of the N-Gain test in Table 3, the mean N-Gain score was 0.6888, which falls between 0.3 and 0.7, indicating a moderate improvement in learning outcomes. Furthermore, the N-Gain percentage was 68.88%, placing it within the 56–75% range, which is categorized as quite effective according to the gain criteria.

It can be concluded that the use of the Problem-Based Learning model assisted by the Wordwall application has a positive effect on improving student learning outcomes, which fall into the moderate category. This also indicates that the implementation of this learning model is quite effective in enhancing student learning outcomes in Class V IPAS subjects at SD Inpres Kabonena.

Hypothesis Testing

The results of the Paired Sample t-Test hypothesis test can be seen in Table 4.

Table 4. Results of the Paired Sample T-Test for Pretest and Posttest Scores

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence interval of the Difference Lower	Upper			
Pair 1	Pretest - Postest	-43,000	13,385	2,677	-48,525	-37,475	-16.062	24	<0.001

Based on Table 4, the significance value for the comparison between pretest and posttest scores is < 0.001. Since this value is less than the threshold of 0.05, H_0 is rejected and H_a is accepted. This confirms a significant difference between the pretest and posttest scores. Therefore, It can be inferred that the implementation of the Problem-Based Learning model, supported by the Wordwall application,

significantly impacts the learning outcomes of fifth-grade students in the IPAS subject at SD Inpres Kabonena.

Disscusion

This study is an experimental research that involved only one class in May 2025. The learning process was carried out over three sessions. In the first session, students were given a pretest consisting of multiple-choice questions to assess their initial understanding of the material prior to the intervention. In the subsequent sessions, the treatment was implemented using the Problem-Based Learning model supported by the Wordwall application in the IPAS subject, with each lesson lasting 2 × 35 minutes. After the treatment, students were administered a posttest to evaluate their learning outcomes. The analysis revealed a significant improvement in student performance, as indicated by an increase in the average score from 36.80 on the pretest to 79.80 on the posttest.

This study demonstrates that implementing the Problem-Based Learning model, supported by the use of the Wordwall application, significantly contributes to the improvement of student learning outcomes. Observational data reveal that students exhibit active participation, enthusiasm, and cooperative behavior throughout the learning process. Rather than relying solely on teacher-centered instruction, this approach positions the teacher as a facilitator who guides students through their learning journey. During classroom presentations, students are engaged in responding to their peers' work, illustrating the model’s capacity to promote active participation and the development of critical thinking skills. The integration of the Wordwall application provides interactive and engaging media that enhances the learning atmosphere and fosters individual student involvement.

In this study, Wordwall was used during group formation and in the completion of student worksheets. The observations suggest that these applications of Wordwall motivated students and encouraged greater engagement in classroom activities, resulting in a more interactive and student-centered learning environment. The Problem-Based Learning model, when combined with the Wordwall application, enhances not only students' cognitive understanding but also their ability to collaborate and solve problems. These skills support deeper comprehension of subject material and help address individual learning difficulties. As a result, the learning experience becomes more meaningful, innovative, and enjoyable, contributing to improved academic performance. Moreover, the Problem-Based Learning approach encourages students to participate in group discussions and cooperative problem-solving tasks. Through the exchange of ideas and collaborative exploration, students are better able to construct their own understanding. This not only strengthens critical thinking but also creates a supportive learning environment where students are motivated and engaged, ultimately leading to enhanced learning outcomes.

The Problem-Based Learning model not only strengthens students' cognitive understanding but also cultivates their collaborative skills and enhances their ability to solve problems. These skills help students grasp the material more deeply and

address individual learning difficulties. PBL creates innovative, interactive, and enjoyable learning experiences that positively impact student learning outcomes. Furthermore, the PBL model encourages active student participation in discussions and group work, allowing them to construct their own understanding through exchanging opinions and sharing ideas to solve problems. This collaborative learning environment not only fosters critical thinking but also increases student motivation and engagement, ultimately improving their understanding of the material and contributing to better learning outcomes.

This research is supported by the constructivist theory proposed by Lev Vygotsky. According to Salsabila (2024), Vygotsky suggests that knowledge is constructed through social interaction, whether between individuals or within group learning settings, which greatly assists children in building their understanding. In the context of Vygotsky's theory and the application of the Problem-Based Learning model, the significance of active, collaborative, and context-driven learning supported by appropriate guidance is emphasized. Overall, this methodology creates a learning environment that fosters cognitive growth and the development of problem-solving skills among students.

This research is also in line with the opinion of Mahagia et al. (2021), who state that the Problem-Based Learning (PBL) model can stimulate students' thinking skills so that they do not rely solely on theory, but also develop independent problem-solving abilities and find meaning in learning. Furthermore, according to Subandi (2023), the PBL model can be implemented in groups, allowing students to collaboratively enhance their knowledge. Through this group-based problem-solving approach, students not only improve their academic understanding but also develop interpersonal relationships. Similarly, Yuafian and Astuti (2020) argue that the use of the PBL model exposes students to real-world problems, emphasizes collaborative learning, and serves as an innovative approach that encourages active participation. This, in turn, helps deepen students' understanding of the material.

The use of the Wordwall application supports interactive learning and helps students improve their concentration and deepen their understanding of the material. This is in line with Sun'iyah (2020), who states that Wordwall is designed to create interactive learning activities that can be accessed anytime and anywhere through internet-connected technological devices. In addition, Anindyajati and Choiri (as cited in Andini, 2022) emphasize that Wordwall increases students' interest in the learning process, encouraging active participation and better comprehension of the presented material.

This research is supported by previous findings from Siti Zulaihah (2022) in her study entitled "The Effect of Problem-Based Learning Model on Students' Cognitive Learning Outcomes in Grade V Mathematics Subjects in Elementary Schools." The results, based on pretest and posttest data, show that the average posttest score (87.52) was significantly higher than the pretest score (41.24). The hypothesis was tested using a paired-sample t-test, which revealed a significant difference, with a confidence interval ranging from –51.473 (lower bound) to –41.087 (upper bound). The Sig. (2-tailed) value was 0.000, which is less than α =

0.05, indicating that H_0 is rejected and H_a is accepted. Consequently, the Problem-Based Learning model has a significant impact on students' cognitive learning outcomes.

This research is also supported by a study conducted by Asmaul Husna and Farida S. (2024), which found that the Problem-Based Learning (PBL) model, assisted by Wordwall media, had a significant effect on improving student learning outcomes after treatment was applied to the experimental class. This finding demonstrates that the use of the PBL model with Wordwall media can make learning more interactive, thereby positively impacting students' academic performance. Evidence of this is seen in the comparison between the experimental and control groups. The experimental group, which applied the PBL model assisted by Wordwall media to the IPAS Chapter 5 material, achieved an average score of 78.07.

In contrast, the control group, which used conventional learning methods assisted by Wordwall media, obtained an average score of 77.82. Then a hypothesis test was carried out which showed the results of the t-test (paired Simple t-test) with the result of tcalcul> ttable, namely tcount = 11.517 > ttable = 2.048 meaning that Ha was accepted and H0 was rejected. This result leads to the rejection of H_0 and the acceptance of H_a. Thus, it can be concluded that the Problem-Based Learning (PBL) model, facilitated by Wordwall media, has a significant effect on the learning outcomes of fourth-grade IPAS students at SD MIS Masjid Raya Ujung Gading, West Pasaman Regency.

Similar research was also conducted by Asyz et al. (2023), titled "The Effect of the PBL Model Assisted by Wordwall Media on Student Learning Outcomes on Flat Shapes Material in Grade V Elementary School." It is proven through the results of the hypothesis test that obtained the value of the Independent sample t-test with a value of sig (2-tailed) 0.000 < 0.05 with a t-count of 6,858 > 1.682 meaning that Ha was accepted and Ho was rejected, and evidenced by the results of the N-Gain test obtained an average N-Gain score for the experimental class of 63.27 or 63% included in the category of quite effective with the meaning *of Problem Based Learning* Model Assisted by Wordwall Media affect student learning outcomes in flat building materials for class v sdn 15 Cakranegara.

Based on the findings, it can be concluded that the implementation of the Problem-Based Learning (PBL) model, supported by the Wordwall application, significantly enhances student learning outcomes at SD Inpres Kabonena. This indicates that the PBL approach, when integrated with Wordwall, serves as a practical and effective alternative for innovative educational practices, thereby contributing to the improvement of learning quality in elementary education.

4. Conclusion

This research demonstrates that the implementation of the Problem-Based Learning model, supported by the Wordwall application, has a positive impact on the academic performance of students at SD Inpres Kabonena, indicating that the

research objectives have been achieved. Overall, it can be concluded that the Problem-Based Learning model, when supported by the Wordwall application, fosters interactive and engaging learning. In its implementation, this model not only improves students' cognitive understanding but also enhances their collaborative and problem-solving skills in real-life contexts. This, in turn, increases students' motivation and enthusiasm to participate in the learning process, ultimately leading to improved learning outcomes. This finding is reinforced by previous studies that demonstrate the effectiveness of the Problem-Based Learning model in enhancing student achievement. It highlights the importance of active student involvement in the learning process as a means to deepen understanding and create meaningful learning experiences. However, the scope of this study is limited, as it was conducted in only one grade level and involved a single class. Therefore, further research is recommended to broaden the scope by employing different methods, involving various educational levels, and exploring other variables that may provide deeper insights into the factors influencing student learning outcomes.

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