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THE EFFECT OF THE PROBLEM-BASED LEARNING (PBL) MODEL INTEGRATED WITH SNAKES AND LADDERS MEDIA ON THE IPAS LEARNING OUTCOMES OF ELEMENTARY SCHOOL STUDENTS

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ABSTRACT

This study aimed to examine the impact of the Problem-Based Learning (PBL) model assisted by the snakes and ladders media on the learning outcomes of fifth-grade students in the IPAS subject. The research method used was a quasi-experimental group design, specifically the nonequivalent control group design. The population and sample consisted of 40 students. Data were collected through tests, observations, interviews, and documentation. The hypothesis was tested using simple linear regression analysis. If the significance result was 0.00 < 0.05, then the null hypothesis (Ho) was rejected and the alternative hypothesis (Ha) was accepted. The results showed that there was a significant effect of the implementation of the PBL model assisted by the snakes and ladders media on the IPAS learning outcomes of fifth-grade students at SD Negeri 10 Metro Timur. This research indicated that the problem-based learning model integrated with educational game media had the potential to be an effective learning approach to improve students' learning outcomes at the elementary school level.

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1. INTRODUCTION

Education was considered the key factor in improving individual quality, reducing disparities, promoting social advancement, and supporting efforts to enhance the quality of learning. The implementation of the *Merdeka Curriculum* was one of the programs that helped improve the quality of education. One of the policies that emerged from this curriculum was the introduction of the IPAS subject, which integrated Natural Sciences (IPA) and Social Sciences (IPS). According to Indarta et al. (2022), the objective of IPAS learning was to help students understand nature and the social environment, with the hope of fostering their interest in exploring knowledge and developing critical thinking skills. IPAS learning encouraged students to think logically and adopt a holistic and comprehensive perspective. Students who were able to understand the concepts in IPAS learning positively impacted their learning outcomes, such as achieving conceptual understanding, critical thinking abilities, and skills in relating subject matter to real-life contexts.

In general, students' IPAS learning outcomes in Indonesia had not met expectations and tended to be low. Previous studies provided evidence of this issue. Apriliansyah et al. (2024) stated that data from the

Programme for International Student Assessment (PISA) in 2022 revealed a global decline in learning outcomes due to the pandemic. Indonesia's average PISA score had decreased by 13 points, from 396 to 383.

This issue also occurred in Grade V at SD Negeri 10 Metro Timur. Observations conducted previously showed that many students' learning achievements remained below the expected competency threshold. Based on interviews with teachers, the low learning outcomes were caused by students' passive behavior and limited active engagement during learning activities. This resulted in the learning process being dominated by the teacher. Furthermore, the implementation of learning models had not shown optimal performance, and the use of media in IPAS learning remained limited and lacked variety. A study by Winangsih & Harahap (2023) in their *Analysis of Media Use in Science Content at Elementary Schools* stated that the limited variety of media negatively affected student learning achievement. Consistent with earlier research by Puspitasari et al. (2020), low IPAS learning outcomes were often associated with the lack of interactive learning media, making it difficult for students to develop a deep conceptual understanding.

As an alternative solution to address this issue, the implementation of the PBL (Problem-Based Learning) model was proposed. According to Siswanti & Indarajit (2023), PBL was a problem-oriented learning model that trained students to find ways to solve real problems by reflecting on prior experiences, thereby developing critical thinking and deeper reasoning skills. This model focused on providing concrete problems that students needed to solve through critical and collaborative thinking stages. Students were encouraged to explore information sources, analyze, and discover their own solutions, resulting in a deeper conceptual understanding. Research by Rahmawati et al. (2024) found that implementing PBL in IPAS learning contributed to increased student engagement, critical thinking abilities, and memory retention of the material. Additionally, this model also trained communication and collaboration skills among students, which were essential in real-life situations.

To optimize the implementation of Problem-Based Learning, it needed to be supported by up-to-date educational media, such as educational games like Snakes and Ladders. The snakes and ladders game served as a specially designed learning media that allowed students to learn while playing. According to Kholipah (2020), in line with Ayu & Nisa (2023), the use of snakes and ladders in learning helped students understand the material through engaging visual presentations, making it easier for them to remember information and complete the challenges presented in the game. Integrating PBL with the snakes and ladders game was considered an innovative strategy for teachers to improve IPAS learning outcomes in elementary schools.

Therefore, this research was deemed essential to prove the effectiveness of integrating the PBL model with snakes and ladders media in enhancing IPAS learning outcomes, especially for elementary school students, considering the persistently low learning outcomes and the lack of optimal variety in the learning approaches used thus far.

2. METHODOLOGY

a. Research Design

This study employed a quantitative approach using a quasi-experimental method. The objective of the quantitative approach was to test theories and hypotheses through objective analysis of numerical data (Creswell, 2014). The experimental design used was the Nonequivalent Control Group Design, which involved two groups (experimental and control) that were not selected randomly but were compared based on pretest and posttest results (Sugiyono, 2019). This design was used because it allowed the researcher to examine the effect of a treatment even though control over external variables could not be fully achieved.

b. Participants

The study was conducted at SD Negeri 10 Metro Timur, involving all fifth-grade students as participants, totaling 40 students. Since the population was relatively small and had homogeneous characteristics, the saturated sampling technique was used, in which the entire population was taken as the sample (Sugiyono, 2019). The experimental group received a treatment in the form of the Problem-Based Learning (PBL) model assisted by Snakes and Ladders media, while the control group continued learning using the methods and media usually applied by the teacher.

The PBL model was chosen because it encouraged students to actively solve problems collaboratively and contextually (Arends, 2012). Meanwhile, the snakes and ladders media, as an educational game, helped improve student engagement and motivation (Mulyasa, 2013).

c. Data Collection

Data in this study were collected through several techniques, namely multiple-choice tests, observation, interviews, and documentation. The multiple-choice test was constructed based on the Indicators of Competency Achievement (IPK) in the IPAS subject and was administered in two stages—before the treatment (pretest) and after the treatment (posttest)—with the aim of measuring students' learning improvement. Observation was used to monitor learning activities during the implementation process, while interviews were conducted on a limited basis to obtain additional information from both teachers and

students. Furthermore, documentation served as supporting data, such as photos of learning activities or student learning outcomes. The test instruments used had been validated by subject matter experts and had been tested for reliability through a limited trial before being applied in the study.

d. Data Analysis

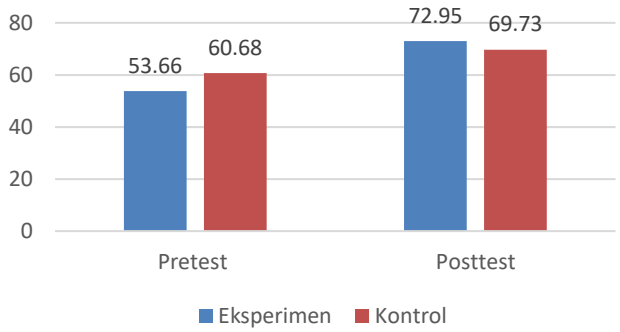
Data in this study were analyzed using descriptive statistics to present the mean, standard deviation, as well as the minimum and maximum scores of students' learning outcomes. Prior to hypothesis testing, prerequisite tests were conducted, including the normality test using the Kolmogorov-Smirnov test to assess data distribution and the homogeneity test to ensure that the variances between groups were homogeneous. Once the data met the assumptions, hypothesis testing was performed using simple linear regression analysis with the assistance of SPSS version 25. This test aimed to determine the extent of the effect of the Problem-Based Learning (PBL) model assisted by Snakes and Ladders media on students' learning outcomes. If the significance value (Sig.) was less than 0.05, the alternative hypothesis was accepted, indicating a significant effect of the treatment provided (Sudjana, 2005).

3. RESULTS AND DISCUSSION

The research was carried out at SD Negeri 10 Metro Timur, located in Metro City, Lampung Province. Prior to the learning process in both the experimental and control classes, a pretest was administered to assess the students' initial understanding. The next stage involved conducting two learning sessions for each class. In the experimental class, the Problem-Based Learning (PBL) model was implemented with the support of the Snakes and Ladders media, which was specifically designed to help students gain a comprehensive understanding of the subject matter and improve their learning outcomes, particularly in the IPAS subject. In contrast, the control class did not receive any special treatment. The learning model and media used in the control class were aligned with the usual methods applied by the teacher.

In the experimental class, the implementation of the PBL model supported by the Snakes and Ladders media was intended to enhance students' conceptual understanding and improve their learning outcomes in IPAS. Meanwhile, in the control class, no specific treatment was applied, and the learning process followed conventional teaching methods chosen by the teacher. After completing all learning activities, it was expected that students would develop better reasoning skills. To assess the extent of learning success and students' mastery of the discussed topic, a posttest was administered to both the experimental and control classes using the same set of test items. This was done to obtain statistical data for comparing the learning outcomes between students who had received the treatment and those who had not.

Based on the data analysis, it was found that the average posttest scores of the experimental class showed an increase from the pretest scores and were higher than those of the control class. As a result, it indicated that the implementation of the PBL model significantly contributed to the improvement of IPAS learning outcomes among fifth-grade students at SD Negeri 10 Metro Timur. The following histogram illustrated the score differences between the experimental and control classes.



Gambar 1. Mean Scores of Experimental and Control Classes

Referring to the histogram in the figure, a significant increase in the median score was observed in the experimental class. The average pretest score of the students was 53.66, which increased to 72.95 in the posttest. This improvement indicated that the implementation of the Problem-Based Learning (PBL) model integrated with Snakes and Ladders media contributed positively to students' learning outcomes in the IPAS subject. This approach was considered effective in creating an active and enjoyable learning environment that encouraged students to understand the material in a more contextual manner.

The PBL model, when combined with the Snakes and Ladders game, facilitated student involvement in a real-world problem-based learning process while allowing them to learn through play. Through these activities, students were encouraged to think critically, solve problems, and collaborate in groups. These

strengths were believed to be the main factors contributing to the increased learning outcomes in the experimental class compared to the control class.

Before conducting the hypothesis test, the researcher carried out prerequisite tests to ensure the data's suitability, namely normality and homogeneity tests. The results of the normality test showed that all data were normally distributed. This was evidenced by the significance values of 0.105 for the experimental class pretest, 0.201 for the posttest, 0.459 for the control class pretest, and 0.138 for the posttest. All values were greater than 0.05, indicating that the assumption of normality was met.

In addition, the homogeneity test showed that the learning outcome data between the experimental and control classes had equal variances. The significance value for the pretest was 0.994, and for the posttest, it was 0.1253—both exceeding the α value of 0.05. Since both assumptions were fulfilled, the data were deemed appropriate for further analysis using a simple linear regression test. This test was conducted using SPSS version 25 to determine whether there was a significant effect from the implementation of the PBL model assisted by Snakes and Ladders media on students' learning outcomes.

Tabel 1. Results of the Simple Linear Regression Test

Statistical Type	Calculated Value	Critical Value	Sig.
F_{count}	61,264	4,38	0,000
t_{count}	7,827	2,093	0,000

Based on Table 1, the analysis results showed that the significance value (sig.) was 0.000, which was less than 0.05. According to the standard hypothesis decision rule, if the sig. value is less than 0.05, then Ha is accepted and Ho is rejected, meaning that there was a significant effect between variable X (PBL assisted by Snakes and Ladders media) and variable Y (students' learning outcomes). The results of the hypothesis test indicated that the PBL model assisted by Snakes and Ladders media contributed to optimizing students' learning outcomes in the IPAS subject. The magnitude of this effect could be observed in the R Square table provided below.

Tabel 2. R Square

Model	R	R Square	Decision
1	.874[a]	.763	The influence of variable X on variable Y was 76.3%
a. Predictors: (Constant), Snakes and Ladder			

Referring to Table 2, the regression coefficient (R) was found to be 0.874, and the R Square value was 0.763. These results provided evidence that the implementation of the Problem-Based Learning (PBL) model assisted by Snakes and Ladders media had an effect of 76% in improving students' learning outcomes, while the remaining 24% was influenced by other factors.

The implementation of the Problem-Based Learning (PBL) model integrated with Snakes and Ladders media was proven to have a significant impact on improving IPAS learning outcomes of fifth-grade students at SD Negeri 10 Metro Timur. This finding was consistent with the practice of PBL, which emphasized real-world problem-solving as the trigger for learning, encouraging students to think critically, work collaboratively, and learn independently (Savery, 2006). The integration of Snakes and Ladders-based educational games enriched learning interaction, increased motivation, and supported contextual conceptual understanding (Setiani et al., 2022).

A recent meta-analysis also reported that PBL had a high level of effectiveness in enhancing learning outcomes and critical thinking skills, with an average effect size of 0.98 (categorized as large), positively influencing both subject mastery and students' critical thinking abilities (Triana et al., 2025). An empirical study conducted in Grade IV of SDN Kleco 1 Surakarta also found that PBL significantly affected students' critical thinking skills in integrated thematic learning (Riyantika et al., 2024).

Additional findings by Sari Imawati et al. (2025) showed that the application of PBL improved fifth-grade students' critical and creative reasoning skills, with observation and test results revealing significant differences compared to the control class. Research at SD Negeri 12 Gunung Tuleh also confirmed that PBL significantly enhanced students' critical thinking skills through a quasi-experimental design and t-test analysis.

Moreover, the use of educational game media, such as *Ubur-Ubur* (Jellyfish), within PBL was reported to significantly improve students' active participation and social interaction (Adha et al., 2024). Other studies using Wordwall media within the PBL model also demonstrated a significant increase in student learning outcomes at SD Sipahutar (2023). Additional support was also found in the development of the Hexapoli Game, a PBL-based media, which was proven effective in improving numeracy skills of fifth-grade students (Zulfa et al., 2024).

These findings consistently supported the conclusion that the combination of PBL and educational game media—particularly Snakes and Ladders—could serve as an effective learning strategy, not only improving academic achievement but also enhancing critical thinking skills, active engagement, and fostering deeper and more meaningful conceptual understanding for elementary school students.

4. CONCLUSION

Based on the research findings, it was concluded that the implementation of the Problem-Based Learning (PBL) model assisted by Snakes and Ladders media had a significant effect on the IPAS learning outcomes of fifth-grade students at SD Negeri 10 Metro Timur. This was evidenced by the results of a simple linear regression test, which showed a significance value of $0.00 < 0.05$, leading to the rejection of the null hypothesis and acceptance of the alternative hypothesis. Thus, the use of the PBL model supported by Snakes and Ladders media was proven effective in improving student learning outcomes.

However, this study had several limitations. The research subjects were limited to one school and one grade level, so the generalization of the results could not be applied broadly. In addition, external variables such as individual learning styles, teacher roles, and learning environment conditions were not fully controlled. This study also only measured cognitive learning outcomes and did not explore the affective and psychomotor domains in depth.

Nevertheless, this study held both practical and theoretical significance. Practically, the findings could serve as a reference for teachers to develop innovative, enjoyable, and meaningful learning strategies. Theoretically, the study supported constructivist theory, which posited that learning would be more effective when students were actively involved in the process of building knowledge through problem-solving and concrete experiences.

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