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THE EFFECT OF ASSESSMENT AS LEARNING IN PROBLEM-BASED LEARNING ON THE SCIENTIFIC ATTITUDES AND LEARNING ACHIEVEMENTS OF ELEMENTARY SCHOOL STUDENTS

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Abstrak
Penelitian ini bertujuan menguji pengaruh model Pembelajaran Berbasis Masalah (PBM) berbantuan *Quizizz* terhadap sikap ilmiah dan prestasi belajar IPAS siswa kelas V. Penelitian ini dilatarbelakangi oleh penggunaan metode pembelajaran konvensional dalam pembelajaran IPAS di sekolah dasar yang masih kurang efektif dalam mengembangkan sikap ilmiah dan prestasi belajar siswa. Pendekatan yang digunakan adalah kuantitatif dengan metode kuasi-eksperimen melalui desain posttest-only *control group*. Populasi penelitian mencakup seluruh siswa kelas V SD di Gugus Singakerta, dengan sampel yang ditentukan menggunakan teknik *random sampling* dan dibagi menjadi kelompok eksperimen serta kelompok kontrol. Kelompok eksperimen dibelajarkan menggunakan model PBM berbantuan *Quizizz*, sedangkan kelompok kontrol menggunakan pembelajaran konvensional. Data sikap ilmiah dikumpulkan melalui kuesioner, sementara prestasi belajar diukur menggunakan tes pilihan ganda. Hasil penelitian menunjukkan bahwa siswa yang dibelajarkan dengan PBM berbantuan *Quizizz* memiliki sikap ilmiah dan prestasi belajar IPAS yang lebih unggul dibandingkan dengan siswa yang mengikuti pembelajaran konvensional, baik secara simultan maupun parsial.

Kata Kunci: Pembelajaran Berbasis Masalah (PBM); Quizizz; Sikap Ilmiah; Prestasi Belajar IPAS; Siswa Sekolah Dasar (SD).

Abstract
This study aims to examine the effect of the Problem-Based Learning (PBL) model assisted by Quizizz on scientific attitudes and IPAS learning achievement of fifth-grade students. The study is motivated by the continued use of conventional teaching methods in elementary IPAS instruction, which have been considered less effective in fostering students' scientific attitudes and learning achievement. A quantitative approach was employed using a quasi-experimental method with a posttest-only control group design. The population consisted of all fifth-grade elementary school students in the Singakerta Cluster, with samples selected through random sampling and assigned to experimental and control groups. The experimental group was taught using the Quizizz-assisted PBL model, while the control group received conventional instruction. Scientific attitude data were collected through questionnaires, whereas learning achievement was measured using multiple-choice tests. The results indicate that students taught using the Quizizz-assisted PBL model demonstrated superior scientific attitudes and IPAS learning achievement compared to those receiving conventional instruction, both simultaneously and partially.

Keywords*: Problem Based Learning (PBM); Quizizz; Scientific Attitude; IPAS Learning Achievement; Elementary School Students*

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INTRODUCTION

Education plays a strategic role in developing students' potential in order to produce a high-quality future generation of the nation (Novitasari et al., 2023). Education is the main key to building the future of a nation. Quality education will produce intelligent, excellent human resources with strong competencies. Along with the rapid advancement of science and technology, the education sector is required to continuously adapt through learning innovations that are more creative, effective, and student-centered (Nurliana & Nugroho, 2021; Siregar, 2025). Quality learning is learning that enables students to acquire knowledge and experience through their own efforts (Hakiki et al., 2023). Therefore, learning strategies implemented in the classroom must be able to accommodate students' learning needs holistically, including encouraging emotional, cognitive, and metacognitive engagement in the learning process.

Efforts to improve the quality of learning are reflected in government policy through the refinement of the national curriculum into the Merdeka Belajar Curriculum. This curriculum emphasizes student-centered and contextual learning and encourages the strengthening of 21st-century competencies. One of the learning contents in the Merdeka Curriculum that has abstract and contextual characteristics is Natural and Social Sciences (Ilmu Pengetahuan Alam dan Sosial/IPAS). IPAS is a subject that integrates natural sciences and social sciences. Science learning aims to foster students' curiosity about various phenomena in their surrounding environment, thereby encouraging them to understand how the universe works and the interactions between human life and the Earth's environment (Juniasih & Riastini, 2024).

However, the learning achievement of Indonesian students still shows less optimal results. Based on the results of the Programme for International Student Assessment (PISA) and the Trends in International Mathematics and Science Study (TIMSS), Indonesia has ranked in the lower positions for more than two decades. PISA aims to assess and compare the performance of students from various countries worldwide in reading, mathematics, and science. PISA assessment captures cognitive skills measured through literacy aspects to map the ability to process information and apply knowledge in new contexts (Hewi et al., 2020). PISA results not only reflect literacy skills but also indicate the level of mastery of students' academic competencies as outcomes of the learning process in schools. These low achievements indicate weak learning outcomes and higher order thinking skills (HOTS) among Indonesian students, particularly at the intermediate to higher cognitive levels (Alfiah & Dwikoranto, 2022). Various studies show that one of the causes of low achievement in IPAS learning is the dominant use of conventional learning models centered on lectures and individual assignments (Wibawa et al., 2024). Conventional learning models tend to make students passive, less motivated, and insufficiently trained to solve real-world problems. This condition is contrary to the spirit of the Merdeka Curriculum, which emphasizes differentiated and student-centered learning (Agustina & Margunayasa, 2024).

One learning model that is relevant to these demands is Problem-Based Learning (PBL). According to the Regulation of the Minister of Education and Culture No. 22 of 2016 concerning Process Standards, PBL is recommended as a learning model that can shape scientific and social behavior and develop students' curiosity. In the context of IPAS learning, the PBL model places IPAS-related problems at the center of the learning process (Oktariani et al., 2024). Several previous studies have also proven that PBL has a positive effect on students' learning achievement and scientific attitudes (Afandi et al., 2024; Handayani & Koeswanti, 2021; Suhar, 2022; Suswati, 2021; Yuliani, 2021). PBL is viewed as an effective approach in science education because it encourages active engagement and contextual learning that enhance students' learning motivation (Farida et al., 2024; Kanyesigye et al., 2025). Nevertheless, most previous studies have still focused on

conventional PBL without integrating digital learning technology. In fact, the use of technology has great potential to increase student engagement, particularly in the assessment and evaluation process. One digital platform that can be utilized is Quizizz. The use of Quizizz in IPAS subjects has been proven to increase students' motivation, participation, and responsiveness in learning (Nirwana & Azizah, 2024).

Based on observation results, SD Gugus Singakerta also experiences problems in the implementation of the learning process. The challenges include low student learning achievement, particularly in the HOTS domain, weak scientific attitudes, lack of learning innovation, minimal integration of technology, and low student independence and learning focus. These conditions contribute to the weak competitiveness and critical thinking skills of Indonesian students, as reflected in PISA results that remain in the lower rankings. This field reality indicates a gap between curriculum demands and actual classroom practices. The presence of the PBL model amid these issues can not only improve learning achievement but also simultaneously develop students' scientific attitudes.

The scientific novelty of this study lies in the integration of the Problem-Based Learning model with the Quizizz platform in IPAS learning at the elementary school level and in examining its simultaneous effects on students' scientific attitudes and learning achievement. The PBL model, which is oriented toward solving real-world problems, is considered relevant in addressing the challenges of IPAS learning. The integration of PBL with a digital platform such as Quizizz also serves as a strategic alternative to increase student engagement and strengthen conceptual understanding interactively. To examine its effects, this study is conducted under the title "The Effect of the Quizizz-Assisted Problem-Based Learning Model on Scientific Attitudes and Science Learning Achievement of Grade V Students in the Singakerta Cluster, Gianyar Regency."

METHOD

This study is a quantitative research employing a quasi-experimental method. The research design used is the posttest-only control group design, which is an experimental design involving an experimental group and a control group without the administration of a pretest. This design was selected to objectively examine the effect of the treatment in the form of implementing the Quizizz-assisted Problem-Based Learning (PBL) model on students' scientific attitudes and IPAS learning achievement after the treatment was administered.

The study was conducted at SD Negeri Gugus Singakerta, which consists of six elementary schools. The research was carried out during the odd semester of the 2025/2026 academic year. The research population included all fifth-grade students of elementary schools in the Singakerta Cluster. The sampling technique used was random sampling, so that each class had an equal opportunity to be selected as the research sample. Before determining the experimental and control classes, an equivalence test of initial ability was conducted on the entire population using the average IPAS learning outcomes from previously relevant material. The equivalence test was analyzed using a one-way ANOVA with SPSS version 29 at a 5% significance level. The results showed a significance value of 0.859 ($p > 0.05$), indicating that there was no significant difference in initial ability among the classes. Therefore, the determination of the experimental and control classes could be carried out randomly, and the internal validity of the study could be maintained.

The research procedure was conducted through three stages, namely the preparation stage, the implementation stage, and the final stage of the experiment. In the preparation stage, the researcher conducted initial observations, randomly determined the sample, prepared learning instruments, developed and tested the research instruments, and aligned perceptions with the classroom teachers. The study was conducted over eight meetings, consisting of seven treatment sessions and one

posttest session. In the implementation stage, the experimental group was taught using the Quizizz-assisted Problem-Based Learning model, while the control group was taught using conventional learning. In the final stage, both groups were given a posttest in the form of an objective test and a scientific attitude questionnaire, and the data were analyzed in accordance with the research objectives.

The variables in this study consisted of one independent variable and two dependent variables. The independent variable was the Quizizz-assisted Problem-Based Learning model. The dependent variables included scientific attitudes and IPAS learning achievement of fifth-grade students. Scientific attitudes were measured based on several dimensions, namely curiosity, critical attitude, openness to new evidence, objectivity, honesty in reporting data, perseverance and hard work, and respect for others' opinions. IPAS learning achievement was measured in the cognitive domain, focusing on levels C1 to C4, namely understanding, applying, implementing, and analyzing. Data collection techniques included test methods in the form of multiple-choice questions and non-test methods in the form of questionnaires.

Data analysis was conducted using descriptive and inferential statistics. Descriptive analysis included the calculation of mean, median, range, maximum score, minimum score, and standard deviation. Inferential analysis was conducted using Multivariate Analysis of Variance (MANOVA) to test the research hypotheses. Before conducting the MANOVA test, the data were first tested for assumptions, including univariate normality using the Kolmogorov–Smirnov test and multivariate normality using Mahalanobis distance, homogeneity of variance using Levene's test, homogeneity of variance–covariance matrices using Box's M test, and correlation between dependent variables using the Pearson Product-Moment. All tests were conducted at a 5% significance level.

RESULT

Based on the research subject grouping, students were divided into an experimental group and a control group. Both groups received the same science and science material over an equal learning period, but with different treatments. The experimental group was taught using the Problem-Based Learning (PBL) model with the help of Quizizz, while the control group used conventional learning.

Table 1. Descriptive Statistics

Descriptive Statistics				
		Mean	Std. Deviation	N
Scientific Attitude	Experiment	98,961	5,902	26
	Control	91,529	6,819	34
Science Learning Achievement	Experiment	74,155	12,861	26
	Control	61,294	10,547	34

Descriptive statistical analysis was conducted to provide an overview of students' scientific attitudes and IPAS learning achievement in the experimental group and the control group. Based on Table 1, it is shown that the average scientific attitude score of students in the experimental class was 98.961 with a standard deviation of 5.902, while the control class had an average score of 91.529 with a standard deviation of 6.819. For the IPAS learning achievement variable, the experimental class obtained an average score of 74.153 with a standard deviation of 12.861, whereas the control class had an average score of 61.294 with a standard deviation of 10.547. The differences in mean scores for both variables indicate that the experimental group achieved higher outcomes than the control group. These descriptive statistical results indicate the influence of the implementation of the Quizizz-assisted Problem-Based Learning (PBL) model on students' scientific attitudes and IPAS learning achievement, thus requiring further inferential testing.

Before conducting inferential analysis using MANOVA, the data were first tested for analysis assumptions. Univariate normality testing was performed using the Kolmogorov–Smirnov test at a significance level of 0.05. The results showed that the significance value of scientific attitudes in the experimental class was 0.193 and in the control class was 0.055. Meanwhile, the significance values of IPAS learning achievement in the experimental class and the control class were 0.200 and 0.132, respectively. All significance values were greater than 0.05, so it can be concluded that the data on scientific attitudes and IPAS learning achievement in both groups were normally distributed. In addition, multivariate normality testing was conducted using Mahalanobis Distance with a Chi-Square critical value at two degrees of freedom (df = 2) and a significance level of $\alpha = 0.001$, which was 13.82. The analysis results showed that the minimum Mahalanobis value was 0.007 and the maximum was 7.940. All data were below the critical value, so it can be concluded that there were no multivariate outliers and the assumption of multivariate normality was satisfied.

Table 2. MANOVA Test Results

Multivariate Tests						
	Effect	**Value**	**F**	**Hypothesis df**	**Error df**	**Sig.**
Intercept	Pillai's Trace	0,996	7219,490	2,000	57,000	<0,001
	Wilks' Lambda	0,004	7219,490	2,000	57,000	<0,001
	Hotelling;s Trace	253,351	7219,490	2,000	57,000	<0,001
	Roy's Largest Root	253,351	7219,490	2,000	57,000	<0,001
Class	Pillai's Trace	0,389	18,157	2,000	57,000	<0,001
	Wilks' Lambda	0,611	18,157	2,000	57,000	<0,001
	Hotelling;s Trace	0,637	18,157	2,000	57,000	<0,001
	Roy's Largest Root	0,637	18,157	2,000	57,000	<0,001

The homogeneity of variance test was conducted using Levene's test. The results showed significance values of 0.653 for the scientific attitude variable and 0.211 for IPAS learning achievement. Both values were greater than 0.05, indicating that the variances between groups were homogeneous. Furthermore, the homogeneity of variance–covariance matrices was tested using Box's M Test. The analysis results showed a Box's M value of 3.63 with a significance value greater than 0.05, indicating that the variance–covariance matrices between the experimental and control groups were homogeneous.

Table 3. Results of the Inter-Subject Effect Test

Tests of Between-Subject Effects						
Source	**Dependent Variable**	**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
Corrected Model	Sikap Ilmiah	813,818	1	413,818	19,623	<0,001
	Prestasi Belajar IPAS	2436,490	1	2436,490	18,103	<0,001
Intercept	Sikap Ilmiah	534635,55	1	534625,551	12890,940	<0,001
	Prestasi Belajar IPAS	270299,95	1	270299,957	2008,264	<0,001
Kelas	Sikap Ilmiah	813,818	1	813,818	19,623	<0,001
	Prestasi Belajar IPAS	2436,490	1	2436,490	18,103	<0,001
Error	Sikap Ilmiah	2405,432	58	41,473		
	Prestasi Belajar IPAS	7806,443	58	134,594		
Total	Sikap Ilmiah	541873,00	60			
	Prestasi Belajar IPAS	278512,00	60			
Corrected Total	Sikap Ilmiah	3219,250	59			
	Prestasi Belajar IPAS	10242,933	59			
R Squared						

Based on Table 2, the MANOVA test results showed significance values for Pillai's Trace, Wilks' Lambda, Hotelling's Trace, and Roy's Largest Root of <0.001. These significance values were smaller than $\alpha = 0.05$; therefore, H_0 was rejected, and H_1 was accepted. These results indicate

a significant difference between the experimental group and the control group. This difference indicates that the Quizizz-assisted PBL model affects scientific attitudes and IPAS learning achievement among fifth-grade students at 5 Gugus Singakerta Elementary School.

The results of the Test of Between-Subjects Effects in Table 3 show that the variables of scientific attitude and science learning achievement each have a significance value of <0.001. This value is smaller than $\alpha = 0.05$, so H_0 is rejected, and H_1 is accepted. Thus, there is a significant difference in scientific attitude and science learning achievement between students in the experimental group who were taught using the Quizizz-assisted PBM model and students in the control group.

DISCUSSION

The results of the multivariate analysis using the MANOVA test indicate that the implementation of the Quizizz-assisted Problem-Based Learning (PBL) model simultaneously has a significant effect on the scientific attitude and IPAS learning achievement of fifth-grade students. Testing at a significance level of $\alpha = 0.05$ produced a significance value of < 0.001; therefore, H_0 was rejected and H_1 was accepted. These results are reinforced by all multivariate test indicators, namely Pillai's Trace, Wilks' Lambda, Hotelling's Trace, and Roy's Largest Root, which showed an F value of 18.157 with a significance of < 0.001. The consistency across all these statistical tests indicates that the differences in scientific attitude and IPAS learning achievement between the two groups were indeed influenced by the learning treatment provided.

The PBL model is a learning model that presents material by directing students toward a problem that must be solved to achieve learning objectives. Through this model, students construct new knowledge based on experience and prior knowledge already possessed (Antara et al., 2025). Meanwhile, the teacher acts as a facilitator who accompanies the learning process (Mariana et al., 2022). This condition differs from conventional models, which tend to be teacher-centered and position students passively. The integration of the PBL model with the digital platform Quizizz serves as a supporting factor that strengthens learning effectiveness. Quizizz functions as an interactive evaluation medium that incorporates elements of games, competition, and immediate feedback. The presence of this medium creates a more enjoyable learning atmosphere, increases student motivation, and encourages active engagement during the learning process (Sari et al., 2025). The combination of the problem-solving approach in PBL and game-based evaluation through Quizizz results in an optimal learning experience and has a positive impact on students' scientific attitudes and IPAS learning achievement.

Partial analysis was further conducted through the Test of Between-Subjects Effects. The test results indicate that the implementation of the Quizizz-assisted PBL model has a significant effect on students' scientific attitudes. This is reflected in an F value of 19.623 with a significance level of < 0.001. In addition, the R Square value of 0.253 and the Adjusted R Square value of 0.240 indicate that 25.3% of the variance in students' scientific attitudes is influenced by the implementation of the Quizizz-assisted PBL model, while the remaining variance is influenced by other factors outside the learning model. Thus, it can be concluded that there is a significant difference in scientific attitudes between students who participated in learning using the Quizizz-assisted PBL model and those who participated in conventional learning.

The advantages of the Quizizz-assisted PBL learning model cannot be separated from the characteristics of the PBL model, which positions students as active subjects in the learning process. These findings are in line with the research of Wiragasari et al. (2021), which states that the PBL model is able to optimally foster student participation, whereas in conventional learning students only listen to the teacher's explanation so that aspects of scientific attitude do not develop optimally.

Through the PBL model, students become more confident in expressing opinions, are trained to think critically, and can explore skills and knowledge independently (Andriani & Supiah, 2021). This not only functions to understand learning concepts, but also fosters scientific attitudes in students (Ribawa et al., 2024). Research by Yulia and Salirawati (2023) also supports that scientific activities in learning can change the dimensions of scientific attitudes through collaboration and curiosity that are built when students use their ideas to solve problems. In addition, students' scientific attitudes can develop through learning activities such as discussions, experiments, simulations, and field projects (Tamansiswa et al., 2024). These various empirical supports confirm that the improvement of scientific attitudes is not only influenced by problem-solving activities in PBL, but is also strengthened by the use of interactive evaluation media such as Quizizz, which maintains student engagement and motivation during learning. In line with this, research by Kumara et al. (2024) emphasizes that the integration of technology in learning is an important necessity to improve learning quality.

In addition to contributing to scientific attitudes, the implementation of the Quizizz-assisted PBL model also shows a better influence on students' IPAS learning achievement. The Test of Between-Subjects Effects results show an F value of 18.103 with a significance level of < 0.001. Furthermore, the R Square value of 0.238 indicates that 23.8% of the variance in IPAS learning achievement is influenced by the implementation of the Quizizz-assisted PBL model. These findings indicate that differences in learning achievement between the experimental group and the control group are influenced by the characteristics of the learning applied.

The improvement in learning achievement in the experimental group is caused by the characteristics of the PBL model, which makes problems the main stimulus in learning (Wiratama et al., 2025). The demands of problem-solving in the PBL model also generate self-awareness and a sense of responsibility in students toward learning. This commitment encourages students to be more active in seeking information, understanding material, and correcting mistakes, which directly impacts the improvement of learning outcomes (Mareti et al., 2021). The results of research by Bara and Xhomara (2020) also support that the PBL model is proven to have a positive linear relationship with IPAS learning achievement through increased learning engagement, motivation, and positive student attitudes toward science learning. Along with this, students' desire to achieve learning success will increase, which in turn contributes to the improvement of IPAS learning achievement (Krisna et al., 2025). The consistency of the influence of the PBL model on learning achievement is also reinforced by the results of cross-disciplinary meta-analyses showing that PBL has a large and positive effect on students' academic achievement, including in language learning, indicating that PBL is effective in various fields of study (Orhan, 2025). Similar research results were also demonstrated by Uluçınar (2022), indicating that PBL consistently outperforms traditional learning in improving students' academic achievement across various learning contexts.

The effectiveness of the PBL model in improving IPAS learning achievement will be stronger when combined with appropriate learning media (Puspawati et al., 2025). This is in line with research by Ariyani et al. (2021), which revealed that appropriate learning media can help students understand material systematically and encourage active engagement during the learning process. In this study, the PBL model was combined with Quizizz, which provides an interactive, competitive, and enjoyable learning atmosphere. In addition, research by Kumara et al. (2024) emphasizes that the integration of technology in learning is an important necessity to improve learning quality.

The implication of these findings is that elementary school teachers can use the Quizizz-assisted PBL model as an alternative learning strategy capable of developing scientific attitudes while

simultaneously improving students' learning achievement. The development of students' scientific attitudes can be optimized through learning that emphasizes problem-solving and is supported by interactive digital media. Teachers need to design IPAS learning that is not only oriented toward mastery of content, but also toward the continuous formation of students' scientific attitudes. Meanwhile, active, contextual, and technology-supported learning can create meaningful learning experiences and have a positive impact on students' learning outcomes.

CONCLUSION

The implementation of the Quizizz-assisted Problem-Based Learning (PBL) model has been proven to have a significant effect on the scientific attitude and IPAS learning achievement of fifth-grade students. The results of the MANOVA analysis show that the Quizizz-assisted PBL model has a simultaneous effect on both variables with a significance value of < 0.001; H_0 is rejected. These findings indicate a significant difference between the experimental group and the control group. In addition, the results of the Test of Between-Subjects Effects indicate that the Quizizz-assisted PBL model has a significant partial effect on students' scientific attitudes and IPAS learning achievement. This confirms that the implementation of the PBL model, combined with Quizizz media, is effective in creating active and meaningful learning experiences and in encouraging the development of scientific attitudes, as well as improving IPAS learning achievement among elementary school students.

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