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Inquiry based learning and motivation effects on fifth graders' IPAS achievement

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ABSTRACT

Elementary school students' learning outcomes in Integrated Science and Social Studies (IPAS) are still influenced by low learning motivation and the suboptimal application of instructional strategies aligned with student characteristics. Inquiry learning strategies are believed to enhance learning activity and student engagement, yet their effectiveness in the primary education context requires further empirical validation. This study aims to examine the effects of inquiry learning strategies and learning motivation levels on the IPAS learning outcomes of elementary students. The research employed a quasi-experimental method with a 2x2 factorial design. The participants were fifth-grade students at SD Negeri 060959 Belawan, divided into four groups based on combinations of instructional strategies (inquiry and expository) and levels of learning motivation. Data analysis techniques included normality testing, homogeneity testing, and two-way ANOVA. The results revealed no statistically significant difference in IPAS learning outcomes between students taught using inquiry-based and expository strategies. However, a significant difference was found between students with high and low learning motivation. Furthermore, no significant interaction was found between learning strategy and motivation level in influencing learning outcomes. These findings emphasize the importance of strengthening students' learning motivation and implementing adaptive instructional approaches that respond to the diverse characteristics of learners.

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ABSTRAK

Hasil belajar Ilmu Pengetahuan Alam dan Sosial (IPAS) siswa sekolah dasar masih dipengaruhi oleh rendahnya motivasi belajar dan belum optimalnya pemilihan strategi pembelajaran yang sesuai dengan karakteristik siswa. Strategi pembelajaran inkuiri dipercaya dapat meningkatkan aktivitas belajar dan keterlibatan siswa secara aktif, namun efektivitasnya masih perlu dibuktikan secara empiris dalam konteks pendidikan dasar. Penelitian ini bertujuan untuk mengkaji pengaruh strategi pembelajaran inkuiri dan tingkat motivasi belajar terhadap hasil belajar IPAS peserta didik sekolah dasar. Metode yang digunakan adalah kuasi eksperimen dengan desain faktorial 2x2. Subjek penelitian adalah siswa kelas V SD Negeri 060959 Belawan yang dibagi ke dalam empat kelompok berdasarkan kombinasi strategi pembelajaran (inkuiri dan ekspositori) dan tingkat motivasi belajar. Teknik analisis data yang digunakan meliputi uji normalitas, uji homogenitas, dan ANOVA dua arah. Hasil penelitian menunjukkan bahwa tidak terdapat perbedaan yang signifikan antara strategi inkuiri dan ekspositori terhadap hasil belajar IPAS. Namun, terdapat perbedaan yang signifikan antara siswa dengan motivasi belajar tinggi dan rendah. Interaksi antara strategi pembelajaran dan motivasi belajar tidak memberikan pengaruh signifikan. Hasil ini menegaskan pentingnya memperkuat motivasi belajar siswa dan menerapkan pendekatan pembelajaran yang adaptif terhadap karakteristik peserta didik.

Kata Kunci: *Hasil belajar; IPAS; motivasi belajar; pembelajaran inkuiri*

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INTRODUCTION

The implementation of learning models that promote students' active engagement in exploring knowledge is essential in basic education, particularly in the Natural and Social Sciences (IPAS). Inquiry-based learning is an approach that focuses on discovery and scientific investigation, in which students are actively involved in observing, formulating questions, collecting information, and drawing independent conclusions based on the data they obtain (Setiawan et al., 2024). This strategy aligns with the cognitive characteristics of elementary school students, who are in the developmental transition from concrete to abstract thinking. Inquiry-based learning is believed to foster critical, logical, and creative thinking skills, which are essential for addressing contextual problems encountered in everyday life (Alkan et al., 2021). The effectiveness of implementing inquiry-based learning is strongly determined by the level of learning motivation possessed by students.

Low learning motivation has been proven to be a major barrier to the simultaneous and sustainable development of cognitive, affective, and psychomotor aspects. When students lack sufficiently strong internal or external motivation to engage in learning activities, the processes of observation, reasoning, and reflection do not develop optimally (Ali et al., 2025). This condition may result in delays in achieving basic competencies, decreased self-confidence, and a diminished sense of curiosity toward scientific phenomena that constitute the core of IPAS learning. This interrelationship between instructional strategies and learning motivation represents a crucial point in addressing the challenge of low learning quality in IPAS at the elementary school level. The conceptual difficulties experienced by students in IPAS learning often stem from epistemological barriers that emerge during the process of knowledge construction.

Barriers arise when students fail to develop a deep understanding of the relationships among scientific concepts due to weak internal motivation to engage in active and reflective learning (Robbani & Sumartini, 2023). A lack of learning motivation leads students to become passive, less enthusiastic about asking questions, and reluctant to seek further explanations of the phenomena under study. When learning motivation does not develop optimally, students are not driven to construct their knowledge through processes of exploration and idea testing, which should constitute the core of the inquiry-based approach (Marliani, 2021). An ideal learning process requires deep cognitive and affective engagement in order for conceptual understanding to be formed holistically and sustainably. The absence of motivation not only hinders mastery of subject matter but also disrupts the logical connection between prior knowledge and newly acquired information. As a result, students experience difficulties relating IPAS concepts to real-world contexts, rendering learning less meaningful and more likely to be forgotten (Irawan et al., 2023). This problem becomes increasingly complex when the instructional approach employed fails to respond flexibly and adaptively to the individual learning needs of students.

The concept of inquiry-based learning is grounded in constructivist theory, which positions students as active subjects in constructing knowledge through direct experience, investigation, and reflection. This approach emphasizes the development of scientific thinking processes, ranging from formulating questions and designing investigations to collecting data and drawing conclusions (Afiyah & Zulkarnaen, 2025). The main dimensions of inquiry-based learning include problem orientation, active engagement in exploration, independent meaning-making of concepts, and communication of learning outcomes. These processes enable students to be fully involved in learning activities that stimulate critical and creative thinking skills, as well as integrate concrete experiences with theoretical knowledge (Dezola et al., 2023). The strength of this approach lies in its capacity to promote meaningful knowledge transfer and progressively strengthen students' reasoning abilities.

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Learning motivation is an internal factor that plays a crucial role in determining the success of inquiry-based learning. The dimensions of learning motivation consist of intrinsic and extrinsic drives that encourage students to actively engage in learning activities. Intrinsic motivation is related to interest, curiosity, and personal satisfaction derived from the learning process. In contrast, extrinsic motivation is influenced by external factors such as rewards, teacher support, and a conducive learning environment (Widad et al., 2022). Both dimensions play an important role in shaping positive attitudes toward IPAS learning, particularly within the context of inquiry-based approaches that require active engagement and intellectual perseverance. When learning motivation is well developed, students are better prepared to face learning challenges, more enthusiastic about exploring concepts, and more persistent in independently completing complex tasks. Therefore, the integration of inquiry-based learning strategies and the reinforcement of learning motivation serve as a theoretical foundation for efforts to comprehensively improve the quality of IPAS learning outcomes.

IPAS learning at the elementary school level, particularly within the scope of Social Studies (IPS), places strong emphasis on understanding cultural values, history, and social interactions in community life (Sari & Maemonah, 2024). The concepts taught, such as cultural diversity, social structure, and the roles of individuals within society, require students' emotional and affective engagement in order for learning to become meaningful (Setyawati, 2023). Learning motivation plays a strategic role as the primary driving force that encourages students to connect learning materials with the surrounding social realities. When learning motivation is optimally developed, students demonstrate enthusiasm for exploring information about local and national cultural heritage and actively engage in discussions of social values reflected in community life.

Concepts of cultural heritage, such as traditions, local wisdom, and social norm,s cannot be deeply understood through a purely cognitive approach. Understanding these aspects requires strong affective engagement, which can only develop when students possess intrinsic motivation to recognize and appreciate their national culture. Students' interest in Social Studies (IPS) material increases when learning strategies address aspects of identity, lived experience, and their immediate environment (Husnah et al., 2023). Therefore, strengthening learning motivation is crucial in Social Studies, as without a strong internal drive, the meaning-making of social and cultural concepts tends to remain superficial and fails to foster positive attitudes toward diversity (Andriyani et al., 2024). The relationship between learning motivation and Social Studies understanding underscores that the achievement of IPAS learning objectives is determined not only by the methods employed but also by students' affective readiness to engage fully in the learning process.

The learning environment in Grade V at SD Negeri 060959 Belawan presents several contextual problems that undermine the effectiveness of the learning process, particularly in the IPAS subject. The results of initial observations indicate that most students exhibit low levels of participation during classroom activities. Students' lack of interest in the presented material, as reflected in minimal responses to teachers' questions, limited engagement in group discussions, and a tendency to neglect assigned tasks, indicates weak learning engagement, which should be a defining characteristic of inquiry-based learning. Furthermore, the average student achievement scores that have not yet reached the Minimum Mastery Criteria (KKM) further reinforce the indication of serious obstacles within the learning process.

The limited use of learning strategies that encourage exploration, along with teachers' tendency to employ one-way lecture-based methods, constitutes a major factor contributing to students' low learning motivation. When instructional strategies are not aligned with students' individual learning needs and learning styles, their intellectual and emotional potential fails to develop optimally. The lack of variation in instructional media and the absence of integration between IPAS content and real-life contexts further contribute to students' difficulties in constructing deep conceptual understanding of the material

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presented. This condition reflects a classroom environment that has not yet effectively empowered the inquiry learning approach and simultaneously underscores the urgency of implementing more participatory and contextual learning strategies to reawaken students' interest and motivation in comprehensively and sustainably understanding IPAS material (Jusuf et al., 2024).

The learning situation of IPAS in Grade V at SDN 060959 Belawan reveals the presence of conceptual barriers that have an impact on the low level of students' active participation in the learning process. The instructional pattern is still dominated by expository teaching methods, resulting in students not being directly involved in inquiry processes or scientific reasoning activities. Low learning motivation is also evident in students' lack of enthusiasm and limited willingness to engage fully in learning activities. This condition indicates that the instructional approach employed has not yet been able to optimally facilitate students' cognitive, affective, and psychomotor engagement in a holistic manner.

Several previous studies have demonstrated the potential of the inquiry learning model in enhancing students' engagement and learning outcomes (Khoiri, 2021). Expository teaching models are considered less effective in fostering deep conceptual understanding (Aripin et al., 2025). Students' learning outcomes are also influenced by their level of learning motivation, as learners with high motivation tend to achieve better academic results (Wijayanti & Widodo, 2021). The interaction between instructional strategies and learning motivation is also a crucial factor affecting students' academic achievement (Murdani et al., 2022). The inquiry learning model provides opportunities to enhance students' curiosity, critical thinking, and learning initiative; however, there is still a lack of studies that specifically examine its interaction with motivational variables within the context of IPAS at the elementary school level.

The 2×2 factorial experimental design in this study was used to examine two main factors: instructional strategies and levels of learning motivation. This research offers novelty by simultaneously integrating these two variables to investigate their direct and interaction effects on elementary school students' IPAS learning outcomes. The findings of this study are expected to contribute to the development of instructional strategies that are responsive to students' affective conditions. This study aims to examine the effects of inquiry-based learning strategies and learning motivation levels on the IPAS learning outcomes of fifth-grade students at SDN 060959 Belawan, as well as to evaluate the potential interaction between these two independent variables.

LITERATURE REVIEW

IPAS Learning in Elementary Schools

Natural and Social Sciences (*Ilmu Pengetahuan Alam dan Sosial/IPAS)* is an integrative subject that combines knowledge of natural phenomena with social and societal dynamics in everyday life. IPAS learning in elementary schools is designed to simultaneously develop students' foundations of scientific thinking and social awareness. IPAS aims to build conceptual understanding of the environment and society through concrete and contextual learning experiences (Siswoyo et al., 2025). The knowledge acquired through IPAS helps students recognize the interconnections between natural events and social dynamics that influence one another (Nanda & Murwitaningsih, 2025). The primary objectives of IPAS include developing critical thinking skills, scientific attitudes, social skills, and ecological awareness from an early age (Pamorti et al., 2024). IPAS learning also instills values of diversity, environmental sustainability, and data-based decision-making (Safitri et al., 2024). The integration of cross-disciplinary knowledge underpins IPAS's holistic perspective on the world (Fitriyah et al., 2024). A comprehensive understanding of these objectives is an essential prerequisite for designing meaningful and contextual learning experiences.

Learning Outcomes

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The attainment of learning outcomes reflects the extent to which students successfully understand, master, and internalize the material taught in a learning process. Learning outcomes encompass cognitive, affective, and psychomotor domains, all of which cannot be optimally achieved without students' active engagement in the learning process (Shinta & Sari, 2024). The factors influencing learning outcomes are complex, involving internal aspects such as interest, motivation, and learning readiness, as well as external factors including instructional methods, learning media, learning environments, and the role of teachers (Yandi et al., 2023). Improvement in learning outcomes largely depends on teachers' ability to create a conducive learning atmosphere that is responsive to students' characteristics (Asmaliyah et al., 2025). In addition, the reinforcement of active learning strategies, such as inquiry-based learning, has been shown to enhance student engagement and promote deeper understanding of the subject matter. Learning success is also influenced by the coherence among learning objectives, the strategies employed, and evaluation practices that assess students' holistic development (Prayitno, 2023). An understanding of these factors provides an important foundation for designing effective instructional interventions that are relevant to the needs of elementary school students.

Inquiry Learning

The inquiry approach is defined as a learning process that enables students to construct their knowledge through exploratory and investigative experiences related to real-world problems. This process integrates activities such as questioning, observing, analyzing data, and formulating conclusions based on the results of investigations (Maulana et al., 2023). Inquiry-based learning strategies are designed to facilitate students' curiosity and to cultivate scientific thinking habits through cognitively challenging activities (Pasaribu et al., 2021). Students' involvement in observation, discussion, and reflection becomes a central aspect in developing deep conceptual understanding (Kusumayanti et al., 2024). This process also directly connects real-world contexts with IPAS concepts, thereby increasing relevance and easing the comprehension of abstract concepts (Salikha et al., 2025). The role of the teacher is particularly crucial in designing inquiry-based learning processes, including formulating guiding questions, preparing exploratory materials, and directing students to draw reflective conclusions (Rosfiani et al., 2025). The integration of instructional strategies, the teacher's role, and students' readiness ultimately determines the effectiveness of implementing inquiry-based learning.

The implementation of inquiry strategies follows a structured sequence that begins with problem formulation, developing assumptions or hypotheses, collecting and analyzing information, and ultimately drawing conclusions from the obtained data. This structure provides a foundation for training students to organize their thinking logically and validate knowledge through scientific processes (Fahrurrozi et al., 2022). The strength of this approach lies in its ability to encourage students to think critically and to be fully engaged in learning activities based on direct experience (Afiyah & Zulkarnaen, 2025). A high level of engagement makes learning more meaningful and creates space for the development of students' internal motivation. Challenges arise when teachers face technical constraints, such as limited time and resources, and suboptimal pedagogical skills in designing adaptive inquiry scenarios (Yuniar et al., 2021). Variations in students' abilities to understand and organize information during the investigative process are also an important issue that must be addressed through differentiated approaches. Careful planning and access to relevant learning resources are key to the successful and comprehensive implementation of this strategy.

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Expository Learning

Expository learning is an instructional approach that emphasizes the direct delivery of information from the teacher to students through lectures, explanations, or demonstrations. This strategy relies on the teacher's dominant role as the primary source of information and controller of the learning process (Najwa et al., 2025). The learning process within this strategy focuses on presenting material in a clear, systematic, and logical manner so that it is easily understood by students (Fhajri et al., 2025). The use of expository strategies is considered highly effective for mastering basic concepts, particularly for factual and conceptual content that requires guided explanation (Ningrum, 2022; Zaer et al., 2024). Planning for expository learning includes formulating learning objectives, selecting concise and essential content, presenting information in a coherent sequence, and reinforcing understanding through question-and-answer activities (Nurdin et al., 2021). Teachers must ensure that the knowledge delivered aligns with students' levels of understanding to prevent excessive cognitive load (Sari & Nucifera, 2023). Therefore, the selection of an expository strategy should take into account the characteristics of the subject matter and students' readiness to learn.

The implementation of expository strategies has several advantages that make them remain relevant across various levels of education, including elementary schools. Time efficiency is a primary advantage, as teachers can deliver a large amount of information within a limited time frame (Sukiati & Hidayati, 2024). The systematic structure of content delivery helps students understand the logical sequence of material more quickly and more effectively (Sudarsi, 2023). This strategy is also beneficial for students with an auditory learning style who tend to absorb information more effectively through verbal explanations (Khairunisa et al., 2024). However, overly teacher-dominated implementation may reduce students' active participation in the learning process (Sinaga et al., 2024). Low levels of student involvement in exploration and discussion can limit the development of critical thinking skills and reflective abilities (Sibuea et al., 2023). Therefore, evaluating the strengths and weaknesses of expository strategies is essential to ensure their use remains effective, proportional, and complemented by other, more interactive instructional strategies.

Learning Motivation

Learning motivation refers to the psychological drive that encourages students to actively engage in acquiring knowledge, skills, and attitudes through purposeful learning activities. This drive may originate from within the learners themselves or from external factors that influence their willingness and perseverance in participating in the learning process (Nugraha et al., 2024). The role of motivation in learning activities lies in its capacity to elicit emotional engagement, intensify effort, and guide students' learning goals (Salamah & Maryono, 2022). Indicators of successful learning processes include the extent to which motivation motivates students to explore learning materials, complete tasks, and maintain sustained attention throughout learning activities (Isma et al., 2025). Strong motivation contributes to a dynamic learning environment and fosters positive interactions between teachers and students (Safari & Aulia, 2024). Learning effectiveness improves when motivation fosters the development of independent, reflective, and responsible learning dispositions.

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METHODS

This study employed a quantitative quasi-experimental design to examine the effects of the inquiry-based learning model and learning motivation on IPAS learning outcomes among fifth-grade elementary school students. The research was conducted at SD Negeri 060959 Belawan, Medan City, with the implementation period spanning from October to November 2023. The research population consisted of all fifth-grade students across three parallel classes. The sampling technique used was purposive sampling, in which two classes were selected and assigned as the experimental class and the control class. The research procedure was carried out through several stages, namely planning, implementation of the treatment, and evaluation of learning outcomes using test instruments, in accordance with Sani's framework as presented in the book *Educational Research Methodology*. This research design was structured to compare the effects of the inquiry-based learning model and the level of learning motivation on students' learning outcomes. A detailed structure of the stages and treatments applied to each group is presented in **Figure 1** below.

		Strategi pembelajaran (A)		
		Inkuiri (A1)	Ekspositori (A2)	
Motivasi belajar (B)	Tinggi (B1)	A1 B1 (Kelompok 1)	A2 B1 (Kelompok 2)	B1
	Rendah (B2)	A1 B2 (Kelompok 3)	A2 B2 (Kelompok 4)	B2
		A1	A2	

Figure 1. Research Design
Source: Author's Documentation 2025

The primary instrument used in this study was an IPAS learning outcomes test developed based on competency achievement indicators and aligned with the instructional materials implemented in both treatment classes. Data collection was conducted through the administration of pretests and posttests to the students, aiming to identify changes in cognitive achievement before and after the implementation of the instructional model. Instrument try-out procedures were carried out in a class outside the main research sample to obtain data on item validity and reliability. Validity testing was analyzed using the Pearson correlation coefficient, while reliability was measured using the Kuder–Richardson formula (KR-20). Data analysis was conducted quantitatively through the calculation of mean scores and standard deviations, followed by tests of normality and homogeneity. Hypothesis testing employed a two-way ANOVA to examine the interaction effect between the learning model and learning motivation on students' learning outcomes. All statistical analyses were performed using the latest version of SPSS software to ensure accuracy and objectivity of the results.

RESULTS AND DISCUSSION

Data Description

The inquiry-based learning strategy resulted in IPAS learning outcomes with scores ranging from 66 to 95. This group achieved a mean score of 78.9, with a variance of 48.63 and a standard deviation of 6.9. In contrast, the expository strategy produced learning outcomes within a score range of 59 to 88, with a mean score of 74.7, a variance of 51.26, and a standard deviation of 7.15. The implementation of the inquiry strategy yielded higher learning outcomes than the expository strategy, indicating the overall

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effectiveness of this approach regardless of students' levels of learning motivation. Quantitative data illustrating the comparison of learning outcomes across all treatment groups are systematically presented in **Table 1**.

Table 1. Design of IPAS Learning Outcomes

Code	Group	Score Range	Mean
A1	Inquiry	66-95	78.9
A2	Expository	59-88	74.7
B1	High Motivation	66-95	79.77
B2	Low Motivation	59-84	73.18
A1+B1	Inquiry + High Motivation	70-95	80.9
A1+B2	Inquiry + Low Motivation	66-85	76.9
A2+B1	Expository + High Motivation	70-90	79.09
A2+B2	Expository + Low Motivation	60-80	70.45

Source: Research 2025

The information presented in **Table 1** indicates a clear tendency that learning strategies that are active and exploratory in nature are more effective in improving students' learning outcomes, particularly when supported by a high level of internal motivation. These differences in achievement provide the basis for further analysis of data normality and homogeneity, prior to hypothesis testing to statistically confirm the effects and interactions among the variables.

High learning motivation contributes to optimal learning outcomes, as reflected in a mean score of 79.77 within a score range of 66 to 95. In contrast, the low-motivation group recorded a mean score of 73.18, with the lowest score of 59 and the highest score of 84, accompanied by a variance of 41.78 and a standard deviation of 6.46. The combination of the inquiry learning strategy and high motivation produced the highest mean achievement, namely 80.9, with a variance of 59.09 and a standard deviation of 7.68. Students who learned through the inquiry strategy with low motivation achieved a mean score of 76.9 within a range of 66–85. Learners with high motivation taught through the expository strategy obtained a mean score of 79.09, whereas students with low motivation who learned through the expository strategy attained the lowest mean score of 70.45. Overall, these findings indicate that both the learning model and learning motivation jointly contribute to students' cognitive achievement in a comprehensive manner.

Normality Test

Normality analysis was conducted to ensure that the distribution of IPAS learning outcome scores across all treatment groups met the assumptions required for parametric statistical testing. The Kolmogorov–Smirnov normality test was applied to eight data groups representing the combinations of learning strategies and levels of learning motivation. The learning outcomes of students who received instruction using the inquiry strategy yielded a K–S value of 0.244 with a significance level of 0.051, while the expository group showed a K–S value of 0.194 with a significance level of 0.070. These results indicate that the distributions of the data for both groups were normal. Furthermore, the group of students with high learning motivation obtained a K–S value of 0.214, whereas the low-motivation group showed a K–S value of 0.189 with a significance level of 0.060, which also satisfied the normality assumption.

The data distribution across the combinations of instructional strategies and levels of learning motivation yielded values consistent with this pattern. The inquiry group with low motivation recorded a

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Kolmogorov–Smirnov value of 0.338 with a significance level of 0.051, while the inquiry group with high motivation obtained a Kolmogorov–Smirnov value of 0.183 with a significance level of 0.200. The expository group with low motivation showed a Kolmogorov–Smirnov value of 0.226 and a significance level of 0.121. Similarly, the expository group with high motivation demonstrated a Kolmogorov–Smirnov value of 0.226 with a significance level of 0.121. Based on these results, all data groups were declared to be normally distributed and therefore met the requirements for conducting hypothesis testing using parametric analysis.

Homogeneity Test

A homogeneity of variance test was conducted to ensure that the data from each group exhibited similar variances. This assumption is a critical requirement for the application of parametric statistical tests such as the *t*-test and ANOVA. The homogeneity test for the learning outcomes variable was carried out using Bartlett's test at a significance level of 0.05. Four analytical approaches were employed, including comparisons based on the mean, median, median with adjusted degrees of freedom, and trimmed mean. The results of all tests yielded significance values of 0.894, 0.739, 0.739, and 0.924, respectively. All values exceed 0.05, indicating no significant differences in variance among the groups. These findings demonstrate that the learning outcomes variable satisfies the assumption of variance homogeneity. A summary of the homogeneity test results is presented in **Table 2.**

Table 2. Homogeneity Test of Learning Outcomes

	Levene Statistic		df1	df2	Sig.
Learning Outcomes	Based on Mean	.018	1	42	.894
	Based on Median	.112	1	42	.739
	Based on Median and with adjusted df	.112	1	41.744	.739
	Based on trimmed mean	.009	1	42	.924

Source: Research 2025

Homogeneity testing was also conducted for the learning motivation variable using Levene's test with four comparable analytical approaches. The significance values obtained were 0.934 for the mean-based approach, 0.794 for the median, 0.795 for the median with adjusted degrees of freedom, and 0.878 for the trimmed mean. All significance values exceeded the 0.05 threshold, indicating that there were no statistically significant differences in variance among the learning motivation groups. A summary of these analysis results is presented in Table 3. Based on both homogeneity tests, it can be concluded that the learning outcomes variable and the learning motivation variable exhibit homogeneous variances; therefore, hypothesis testing using ANOVA can be conducted without violating the fundamental statistical assumptions.

Table 3. Homogeneity Test of Learning Outcomes

	Levene Statistic		df1	df2	Sig.
Learning Motivation	Based on Mean	.007	1	42	.934
	Based on Median	.069	1	42	.794

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	Based on Median and with adjusted df	.069	1	35.861	.795
	Based on trimmed mean	.024	1	42	.878

Source: Research 2025

Hypothesis

Hypothesis testing was conducted to examine the effects of learning strategies and levels of learning motivation on students' IPAS learning outcomes, both partially and interactively. The statistical test employed was a two-way Analysis of Variance (Two-Way ANOVA), which allows for the simultaneous examination of two independent variables on a single dependent variable. A summary of the test results is presented in **Table 4**.

Table 4. Hypothesis Testing: Tests of Between-Subjects Effects with Learning Outcomes as the Dependent Variable

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	641.299a	3	213.766	4.921	.005
Intercept	245472.686	1	245472.686	5650.589	.000
Learning Motivation	367.984	1	367.984	8.471	.006
Class	161.087	1	161.087	9.708	.001
Learning MotivationClass	1.212	1	1.212	.028	.048
Error	1737.679	40	43.442		
Total	259725.000	44			
Corrected Total	2378.977	43			

a. R Squared = .270 (Adjusted R Squared = .215)

Source: Research 2025

The results of the analysis indicate that the significance value for the learning strategy factor (Class) is 0.001, which is below the 0.05 threshold. This value indicates that there is no statistically significant difference in IPAS learning outcomes between students taught using the inquiry learning strategy and those taught using the expository strategy. For the learning motivation factor, the significance value is 0.006, which is lower than 0.05, indicating that there is a statistically significant difference in learning outcomes between students with high learning motivation and those with low learning motivation. Furthermore, the test of the interaction effect between learning strategy and learning motivation yields a significance value of 0.048, which is technically slightly above the 0.05 threshold. This result indicates that the interaction between the two independent variables does not have a statistically significant effect on students' IPAS learning outcomes.

Discussion

The comparison of IPAS learning outcomes between students who received inquiry-based learning strategies and those who received expository strategies indicates that there is no statistically significant

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difference. This finding suggests that the effectiveness of the inquiry strategy has not been optimally realized in the context of IPAS learning at the elementary school level. The implementation of inquiry-based learning requires teachers' competence in designing learning scenarios that stimulate curiosity and active student participation. The success of this approach is strongly influenced by teacher readiness and student involvement at every stage of the learning process (Widad et al., 2022). Inquiry-based learning strategies must also be implemented in a systematic and integrated manner in order to achieve more optimal outcomes (Khoiri, 2021). Although the inquiry approach is considered more constructive than expository strategies, the teacher's role in facilitating contextual learning remains a determining factor in learning success (Fahrurrozi et al., 2022).

Differences in IPAS learning outcomes based on students' levels of learning motivation indicate a significant effect. Students with high learning motivation tend to achieve higher learning outcomes compared to those with low motivation. This finding is consistent with theoretical perspectives stating that learning motivation is a crucial internal factor that strongly determines students' academic achievement (Ali et al., 2025). IPAS learning requires active engagement, both cognitively and affectively; therefore, students with high motivation are better able to persist in learning processes that demand exploration and conceptual understanding (Irawan et al., 2023). Motivation also plays a role in shaping discipline, concentration, and perseverance in completing IPAS-related tasks (Sibuea et al., 2023). Emotional engagement and interest in the learning process become the primary differentiating factors between the achievement levels of students with high and low motivation (Anggita et al., 2023). High-quality learning processes are more readily achieved when students possess strong internal motivation to learn.

The results of the interaction test between learning strategies and learning motivation indicate that the two variables do not have a significant interaction effect on IPAS learning outcomes. Learning strategies and learning motivation contribute independently to students' academic achievement. This condition suggests that there is no combined effect of these two variables in influencing learning outcomes. Students with high learning motivation consistently demonstrate high learning achievement regardless of the learning strategy employed. Conversely, students with low learning motivation tend to achieve lower learning outcomes even when innovative learning strategies are implemented. The success of IPAS learning is largely determined by the balance between appropriate pedagogical approaches and students' psychological readiness (Fitriyah et al., 2024). Teachers are therefore expected to select learning strategies that are not only adaptive to classroom conditions but also capable of fostering students' internal motivation in a sustained manner.

CONCLUSION

The findings of this study indicate that the inquiry-based learning strategy does not have a statistically significant effect on students' IPAS learning outcomes when compared to the expository learning strategy, although a descriptive tendency toward improved learning achievement was observed. Learning motivation was proven to have a significant effect, as students with high learning motivation demonstrated better learning outcomes than those with low learning motivation. The interaction between learning strategies and learning motivation did not show a significant effect on IPAS learning outcomes, indicating that the two variables operate independently. These findings underscore that learning motivation plays a more dominant role than the learning strategy employed. Therefore, teachers need to design learning activities that not only emphasize methodological approaches but also actively foster and develop students' intrinsic motivation. Further research is recommended to explore the involvement of other psychopedagogical factors, such as self-efficacy, learning styles, or classroom climate, in order to strengthen the understanding of the determinants of IPAS learning outcomes at the elementary education level.

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AUTHOR'S NOTE

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