



The Effect of the Probing Prompting Learning Model on Elementary Students' Learning Outcomes in Science and Social Studies

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Abstract: Students' low learning outcomes in Natural and Social Sciences (IPAS) remain a significant educational issue, as reflected in their limited conceptual understanding and reasoning skills. This condition is partly caused by teacher-centered learning practices that do not actively engage students in the learning process. This study aimed to examine the effect of the Probing Prompting learning model on the learning outcomes of fourth-grade students at MI Al Hikmah Bandar Lampung. The study employed a quantitative, quasi-experimental design with a pretest-posttest control group. The sample comprised 60 students, divided into an experimental and a control group. Data were collected through learning outcome tests and analyzed using normality and homogeneity tests, an independent-samples t-test, and N-Gain analysis. The results revealed a significant difference between the experimental and control groups ($p = 0.023$), indicating that the Probing Prompting learning model had a significant effect on students' learning outcomes. Descriptively, the experimental group showed a greater improvement in learning outcomes than the control group. These findings suggest that the Probing Prompting learning model can enhance students' active participation, reasoning skills, and conceptual understanding in IPAS learning. Therefore, this model can serve as an effective instructional strategy for improving students' learning outcomes in IPAS. The findings also highlight the importance of implementing active and student-centered learning models to enhance the quality of elementary education.

Keywords: Probing Prompting Learning Model; Learning Outcomes; Conceptual Understanding; Science and Social Studies; Islamic Elementary Education

Abstrak: Rendahnya hasil belajar siswa dalam mata pelajaran Ilmu Pengetahuan Alam dan Sosial (IPAS) masih menjadi persoalan penting dalam pendidikan, sebagaimana tercermin dari terbatasnya pemahaman konseptual dan keterampilan bernalar siswa. Kondisi ini sebagian disebabkan oleh praktik pembelajaran yang masih berpusat pada guru dan belum melibatkan siswa secara aktif dalam proses pembelajaran. Penelitian ini bertujuan untuk menguji pengaruh model pembelajaran Probing Prompting terhadap hasil belajar siswa kelas IV di MI Al Hikmah Bandar Lampung. Penelitian ini menggunakan pendekatan kuantitatif dengan desain kuasi-eksperimen tipe pretest-posttest control group. Sampel penelitian terdiri atas 60 siswa yang dibagi ke dalam kelompok eksperimen dan kelompok kontrol. Data dikumpulkan melalui tes hasil belajar dan dianalisis menggunakan uji normalitas, uji homogenitas,

uji-t sampel independen, dan analisis N-Gain. Hasil penelitian menunjukkan adanya perbedaan yang signifikan antara kelompok eksperimen dan kelompok kontrol ($p = 0,023$), yang mengindikasikan bahwa model pembelajaran Probing Prompting berpengaruh signifikan terhadap hasil belajar siswa. Secara deskriptif, kelompok eksperimen menunjukkan peningkatan hasil belajar yang lebih besar dibandingkan kelompok kontrol. Temuan ini menunjukkan bahwa model pembelajaran Probing Prompting dapat meningkatkan partisipasi aktif, keterampilan bernalar, dan pemahaman konseptual siswa dalam pembelajaran IPAS. Oleh karena itu, model ini dapat menjadi strategi pembelajaran yang efektif untuk meningkatkan hasil belajar siswa dalam IPAS. Temuan ini juga menegaskan pentingnya penerapan model pembelajaran aktif dan berpusat pada siswa untuk meningkatkan kualitas pendidikan dasar.

Kata kunci: Model Pembelajaran Probing Prompting; Hasil Belajar; Pemahaman Konseptual; Ilmu Pengetahuan Alam dan Sosial; Madrasah Ibtidaiyah

Introduction

The low quality of students' learning outcomes at the elementary school level remains a fundamental problem in the education system, especially in subjects that require critical thinking, such as the Natural and Social Sciences (IPAS). This condition indicates that the learning process is not fully capable of optimally developing students' cognitive capacity. Nationally, the results of the National Assessment (AN) show that around 50-60% of elementary school students are in the minimum literacy category, meaning they are not able to understand information and perform simple reasoning fully. This phenomenon is reinforced in a global context by the results of the 2022 Program for International Student Assessment (PISA), which place Indonesia 68th out of 81 countries, with reading and science literacy scores below the OECD average. The data indicate that most students still have difficulty understanding concepts, interpreting information, and engaging in scientific reasoning. Thus, it can be concluded that low learning outcomes are a systemic phenomenon that occurs nationally and globally and requires structured and sustainable pedagogical interventions (Efriyenef & Fitria, 2021; Harni, 2021; Kusumah, 2019; Ulandari et al., 2020; Putri et al., 2024; Rambe et al., 2023; Melatiya et al., 2020; Sukaisih et al., 2020; Sariastuti & Mawardi, 2021; Pratiwi et al., 2025).

This phenomenon has direct implications for the emergence of various problems in classroom learning practices. The condition arises from the dominance of teacher-centered learning approaches, which leave little room for students to actively engage in the thinking process. As a result, learners tend to be passive, participate little, and have difficulty developing deep conceptual understanding. This condition is reflected empirically in social studies learning at MI Al Hikmah Bandar Lampung, where grade IV students' learning outcomes remain relatively low. Based on daily test data, as many as 30 out of 60 students (50%) have not reached the Learning Goal Achievement Criteria (KKTP), while only 50% have achieved completeness. The inequality in achievement indicates that the learning process has not been effective in meeting learning goals. Thus, it can be concluded that there are real problems with the quality of the learning process that directly contribute to students' low learning outcomes (Struyf et al., 2019; Tang, 2023; Bhardwaj et al., 2025).

As a reinforcement of the problem, the results of initial observations show that the learning process in grade IV at MI Al Hikmah Bandar Lampung has not fully encouraged students' active cognitive involvement. The learning interaction pattern remains teacher-dominated, and the instructional methods used have not sufficiently explored students' thinking processes in depth. Although teachers have applied a

variety of methods such as discussions, questions and answers, and lectures, their implementation has not been effective in stimulating students' critical thinking skills. Students tend to give short answers without elaboration and are unable to relate the concept of learning to real-life experiences. This condition indicates that learning has not provided a constructive space for students to build knowledge independently. Therefore, the results of this observation reinforce the mismatch between learning practices and the demands of 21st-century learning.

Various studies in the last five years have consistently shown that low student learning outcomes are closely related to the lack of optimal use of innovative and student-centered learning models. Research shows that most learners experience difficulties in critical thinking, which is caused by learning that is not yet question-based and lacks active cognitive engagement. It shows that learning outcomes are influenced not only by cognitive factors but also by students' active involvement in the learning process, with low participation leading to less-than-optimal learning outcomes (Nurjihan & Wawan, 2025; Rohman et al., 2025).

Rahmawati et al. (2023) shows that IPAS learning still tends to be dominated by conventional approaches, leading to low student participation and impacting understanding of concepts. found that students still have difficulty understanding the concept of IPAS, especially in materials that require them to analyze and relate concepts to real life. Meanwhile, it shows that the lack of implementation of differentiated learning leads to inequality in student learning outcomes because differences in individual abilities are not optimally accommodated in the learning process. Azzahra et al. (2023), Setyoningtyas et al. (2025), and Zakarina et al. (2024) revealed that the integration of science and social studies in science learning faces various challenges, especially in designing learning strategies that can connect the two disciplines in an integrated and relevant manner for students.

Ramadhan & Sentosa (2023) show that the integration of values in social studies learning has been sought. However, its implementation is not optimal due to various obstacles, such as limited teacher competence, learning resources, and learning management. Zhaima & Viratama (2026) show that passive learning affects students' low levels of collaboration. Meanwhile, it demonstrates that the probing prompting learning model can significantly improve learning outcomes compared to conventional methods. The overall findings show that question-based active learning has a strategic role in improving the quality of student learning outcomes (Silvyana & Setiawan, 2023).

However, previous research generally treated the probing prompting model only as a questioning strategy to improve learning outcomes, without explaining in depth the pedagogical mechanism by which the probing and prompting process gradually builds students' conceptual thinking structure. In addition, most research still focuses on final cognitive achievement, so there has been little study of the relationship among the graded question pattern, the process of elaborating student answers, and the formation of conceptual understanding in integrative science learning. Thus, a theoretical gap remains regarding how the probing prompting model serves as a cognitive scaffolding mechanism connecting the processes of questioning, scientific reasoning, and concept construction in elementary school science learning.

Based on these gaps, this study not only examines the influence of the probing prompting model on learning outcomes but also offers a new pedagogical perspective on probing prompting as a dialogical-reflective mechanism for building students' conceptual understanding. This research develops a learning framework that places graded questions (probing) and reinforcement of student responses (prompting) as

structured cognitive scaffolding processes to help students connect IPAS concepts with real-life contexts. Thus, the novelty of this research does not lie solely in the context of madrasas or science subjects, but in efforts to explain the pedagogical mechanism of the probing prompting model in shaping students' critical, elaborative, and conceptual thinking processes in the integrative learning of the Independent Curriculum.

The urgency of this research stems from the need to improve student learning outcomes as part of efforts to improve the quality of national education. Strengthening these competencies is essential because critical thinking, problem-solving, and social science literacy are fundamental skills that enable students to respond effectively to global challenges. If this problem is not addressed immediately, it will worsen students' competitiveness at the national and international levels. Therefore, implementing innovative learning models that can engage students is a need that cannot be postponed.

Based on this description, the purpose of this study is to identify and analyze the influence of the probing-prompting learning model on the learning outcomes of grade IV science students at MI Al Hikmah Bandar Lampung. In addition, this study aims to explain how the probing prompting mechanism can serve as a cognitive scaffolding strategy to help students build conceptual understanding in a more reflective, critical, and contextual manner. This research is expected to contribute theoretically to the development of innovative learning models and, practically, to serve as a reference for educators seeking to improve the quality of learning in elementary schools.

Method

This study uses a quantitative approach with a quasi-experimental design to test the influence of the probing prompting learning model on students' learning outcomes in science subjects. This approach was chosen because it allows testing the causal relationship between independent and bound variables using numerical data and statistical analysis. Thus, this study is oriented towards empirical testing of the effectiveness of learning models in improving student learning outcomes (Lim, 2025).

The research design used was a pretest-posttest control group design, which allowed comparison of learning outcomes between the experimental and control groups before and after the treatment. In this design, the two groups were first given a pre-test to measure initial ability. The experimental group received treatment using a probing-prompting learning model, while the control group used conventional learning (Fraenkel, Wallen & Hyun, 2012). After treatment, both groups were given a post-test to measure changes in learning outcomes. The study involved 60 fourth-grade students, comprising 30 in the experimental class and 30 in the control class. The distribution of participants and research design is presented in Table 1.

Table 1. Research Design and Participant Distribution

Group	Number of Students	Pretest	Treatment	Posttest
Experimental class	30 students	O ₁	Probing Prompting Learning Model	O ₂
Control class	30 students	O ₃	Conventional Learning	O ₄
Total	60 students			

This research was carried out from November to December 2024 at MI Al Hikmah Bandar Lampung. The selection of the research location was based on the school's representative IPAS learning program. Initially, 30 multiple-choice items were developed based on the learning indicators and content objectives of the IPAS curriculum. Prior to implementation, the instrument underwent analyses of validity,

reliability, item difficulty, and discrimination index. Item validity was assessed using the Pearson Product-Moment correlation technique by comparing each item's correlation coefficient with the critical value at the predetermined significance level. Based on the validity analysis, 23 items were declared valid for the pre-test and 25 for the post-test; the remaining items that did not meet the validity criteria were excluded from further analysis.

Instrument reliability was assessed using Cronbach's alpha to determine the test's internal consistency. The reliability coefficients obtained were 0.868 for the pre-test and 0.901 for the post-test, indicating high reliability. Furthermore, item difficulty analysis showed that most items were classified as moderate, while the discrimination index analysis indicated that most items had good discriminative power. These results demonstrate that the instrument was appropriate for measuring students' learning outcomes accurately and consistently. The pre-test and post-test were developed from the same competency indicators and learning objectives to ensure comparability of measurement. Although both tests measured the same cognitive constructs, the post-test items were reviewed and adjusted to minimize potential testing effects while maintaining equivalent content coverage and difficulty. (Muliadi et al., 2019).

In addition, documentation was used to obtain supporting data, including school profiles and student scores, while interviews were conducted to gather initial information on learning conditions. The research procedure was carried out systematically through several interconnected stages, from preparation to data analysis (Mota et al., 2021). To provide a clearer picture of the research stages, the research flow is presented in Figure 1.

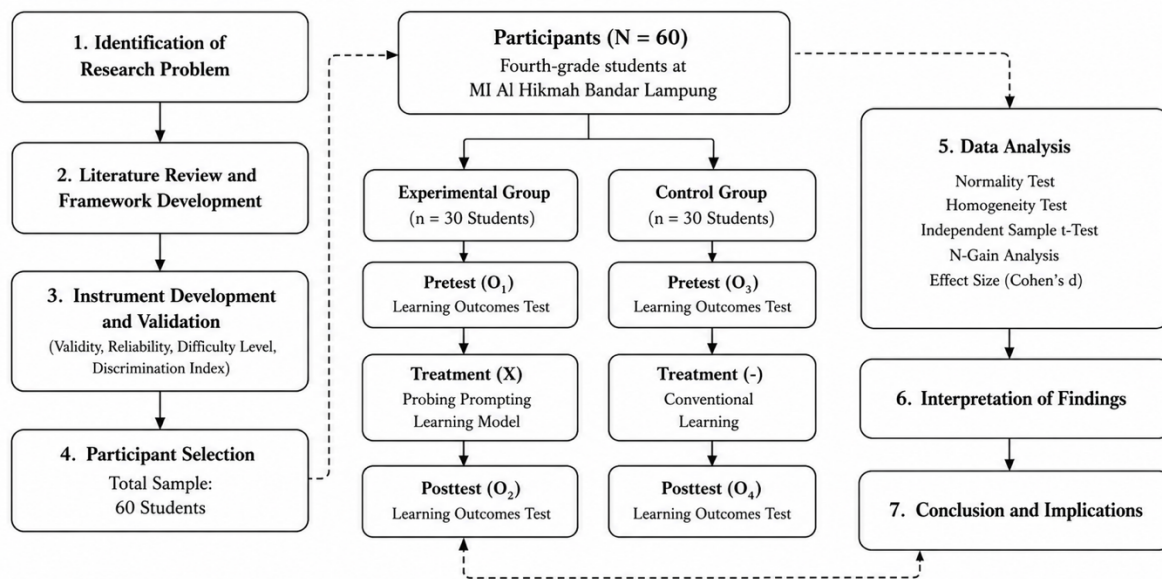


Figure 1. Research Flow

The image shows that the research begins with the instrument preparation stage, followed by pre-test, group division, treatment, post-test, and ends with data analysis. This flow describes a systematic research process in testing the effects of treatment. Data analysis was carried out using prerequisite tests (normality and homogeneity tests), followed by hypothesis tests with independent-samples *t*-tests to determine differences in learning outcomes between the experimental and control groups. In addition, the N-Gain test was used to measure the improvement in students' learning outcomes after treatment. Methodologically, this research is

grounded in the principle of experimentation in education, which emphasizes testing causal relationships empirically. The use of pseudo-experimental designs, tested instruments, and systematic statistical analysis allows for valid, reliable, and accountable findings (Suryani et al., 2024; Salmah et al., 2025; Gribbons & Herman, 2020).

Results

The results of this study are presented systematically and structured to provide a comprehensive overview of the influence of *the probing prompting* learning model on student learning outcomes. The presentation of results began with descriptive analysis, followed by instrument tests, prerequisite tests, and hypothesis testing. This approach aims to ensure that research findings are not only descriptive but also supported by valid and reliable statistical analysis.

1. Students' Learning Outcomes Before and After the Intervention

Descriptively, students' learning outcomes increased in both the experimental and control classes. This analysis was conducted to obtain a preliminary picture of the learning outcomes before and after treatment. A summary of the pre-test and post-test results is presented in Table 2.

Table 2. Summary of Pretest and Posttest Results

Classes	Prates rata-rata	Post-level	Highest Score	Lowest Score
Eksperimen	59	88	100	75
Controls	53	84	97	65

Based on Table 2, both groups demonstrated improvements in learning outcomes after the instructional intervention. The experimental group increased from a mean score of 59 to 88, a raw gain of 29 points, whereas the control group increased from 53 to 84, a raw gain of 31 points. Although the control group showed a slightly larger raw gain, the experimental group achieved a higher final mean post-test score (88) than the control group (84). In addition, the experimental group attained a maximum score of 100, compared to 97 in the control group. These findings suggest that students in the experimental group achieved higher levels of final learning attainment. Furthermore, the inferential statistical analysis indicated a statistically significant difference between the two groups. Therefore, the effectiveness of the probing prompting learning model is assessed not solely by the magnitude of raw gain scores but also by students' final achievement and significant differences in post-test performance.

Before further analysis is conducted, the research instrument is tested to ensure its feasibility. This test includes validity, reliability, difficulty, and differentiation. A summary of the instrument test results is presented in Table 3.

Table 3. Summary of Instrument Tests

Test Type	Pre-test	Post-test	Remarks
Validity	23 valid questions	25 valid questions	Worth using
Reliability	0,868	0,901	Height
Difficulty level	Medium dominant	Medium dominant	Proportional
Differentiation	Majority of good	Majority of good	Good

Based on Table 3, the research instruments demonstrate good quality. The number of valid items indicates that most questions measured the intended competencies, while the high reliability coefficients reflect strong internal consistency. The predominance of items in the moderate-difficulty category suggests that the

instrument assessed students' abilities proportionally. Moreover, the generally good discrimination indices indicate that the items were effective in distinguishing between students with different ability levels. Therefore, the instruments used in this study are considered appropriate and feasible for data collection. Furthermore, an analysis prerequisite test is conducted to ensure that the data meet statistical assumptions before the hypothesis test is performed. The results of the normality test are presented in Table 4.

Table 4. Normality Test Results

Data	Experimental Classes	Control Class	Remarks
Pre-test	0,167	0,224	Normal
Post-test	0,911	0,316	Normal

Based on Table 4, the entire significance value is greater than 0.05, so the data are considered normally distributed. The results indicate that the data are normally distributed and meet the basic assumptions for parametric statistical analysis. A homogeneity test was then conducted to assess the similarity of variances between groups, as presented in Table 5.

Table 5. Homogeneity Test Results

Data	Sig.	Remarks
Pre-test	0.032	Not Homogeneous
Post-tests	0.213	Homogeneous

Based on Table 5, the pre-test significance value of $0.032 < 0.05$ indicates that the initial ability variance between the experimental and control groups was not homogeneous. This finding suggests that the two groups did not begin the study with fully equivalent levels of prior knowledge. Consequently, the interpretation of post-test differences should be approached with caution because variations in initial ability may have contributed, at least in part, to the observed outcomes.

However, the post-test homogeneity value of $0.213 > 0.05$ indicates that the variance of learning outcomes after treatment was homogeneous. Although the independent-samples t-test remained appropriate for comparing post-test means under this condition, the lack of pre-test homogeneity represents a methodological limitation of the study. Future research is therefore recommended to employ more advanced statistical procedures, such as Analysis of Covariance (ANCOVA), using pre-test scores as covariates to control for initial group differences and provide a more robust estimate of the treatment effect.

Table 6. Hypothesis Test Results (Independent Samples Test)

Variabel	Variant Assumptions	F	Sig.	t	df	Sig. (2-tailed)	Average Difference	Std. Error Difference	Lower	Top
Value	The same variance is assumed	0,074	0,786	2,342	58	0,023	5,10000	2,17722	0,74183	9,45817
Value	Equal variance not assumed	-	-	2,342	57,793	0,023	5,10000	2,17722	0,74150	9,45850

Based on Table 6, a significance value of 0.023, which is smaller than 0.05, is obtained, so H_1 is accepted. These results show a significant difference in learning outcomes between students in the experimental and control classes. Thus, *the probing prompting learning model* has been shown to influence students' social studies learning outcomes significantly.

2. Magnitude and Practical Effectiveness of the Learning Model

To determine the level of improvement in learning outcomes, an N-Gain test was conducted, and the results are presented in Table 7.

Table 7. N-Gain Test Results

Criteria	Minutes	Max	Means
Skor N-Gain	0.00	1.00	0.669
N-Gain Percentage	0.00	100.00	66.90

Based on the re-verification results, the average N-Gain of 0.669 falls in the medium-to-high category. This value shows that the probing prompting learning model provides a fairly effective increase in learning outcomes in experimental classes. In addition, converting the N-Gain value to a percentage yielded 66.90%, so the previous reporting figure of 6.6896% was declared a data conversion error. Thus, the results of the improved N-Gain analysis show the consistency between the gain score value and the gain percentage.

Although the increase in raw scores in the control class appeared to be slightly higher than in the experimental class, the effectiveness of learning could not be inferred based solely on the difference in initial and final scores. The experimental class showed a higher post-test average, achieved the optimal maximum score, and yielded statistically significant results (Sig. 0.023 < 0.05). To complement the statistical significance analysis, Cohen's d was calculated to estimate the practical magnitude of the difference between the experimental and control groups. The result showed a Cohen's d value of 0.61, indicating a moderate practical effect of the Probing Prompting learning model on students' learning outcomes. However, this result should be interpreted with caution because the pre-test homogeneity assumption was not fully satisfied. Therefore, the effect size is used as supporting evidence rather than as the sole basis for claiming the treatment's effectiveness.

Therefore, the effectiveness of the probing prompting learning model is supported by three complementary indicators: (1) higher post-test achievement in the experimental group, (2) statistically significant differences between groups, and (3) a moderate practical effect size. Taken together, these findings suggest that the probing prompting learning model contributes meaningfully to improving students' conceptual understanding and learning achievement, while interpreting its effect should still consider the limitations associated with the non-homogeneous pre-test condition.

Discussion

The results of this study show that the probing prompting learning model significantly improves student learning outcomes in science subjects. This finding is based on the results of a hypothesis test with a significance value of 0.023 (< 0.05), indicating a significant difference between the experimental and control classes. Although the control class showed a slightly higher raw gain score, the experimental class achieved a higher post-test mean score and demonstrated a statistically significant difference in learning outcomes. Therefore, the discussion focuses on three main aspects: the cognitive scaffolding mechanism of the probing prompting model, its consistency with previous studies, and its implications for IPAS learning in elementary education.

The findings suggest that the effectiveness of the probing prompting model can be explained through the concept of cognitive scaffolding. Through a sequence of structured and gradual questions, students are guided from basic understanding toward higher-order reasoning processes. Rather than merely receiving information

from the teacher, students are encouraged to explain, justify, and refine their responses. This process enables learners to connect prior knowledge with newly acquired concepts, thereby facilitating deeper conceptual understanding.

From a constructivist perspective, learning occurs when students actively construct meaning through interaction with learning experiences. The probing component explores students' thinking processes through analytical and reflective questions, whereas the prompting component provides cognitive support when students encounter difficulties. The combination of these components creates a learning environment that promotes sustained cognitive engagement, reasoning, and conceptual development. Consequently, the improvement in learning outcomes observed in the experimental class can be understood as the result of enhanced cognitive involvement during the learning process.

The findings of this study are consistent with prior research showing that question-based learning models are effective in improving students' learning outcomes and critical thinking skills. Research shows that the application of the probing prompting model (Silvyana & Setiawan, 2023), can significantly improve learning outcomes compared to conventional methods, especially in concept understanding. Furthermore, it was found that question-based learning can improve students' critical thinking skills by encouraging independent analysis and knowledge construction. Previous studies further support these findings, showing that students' active involvement in learning directly improves learning outcomes (Rohman & Maski, 2024; Nurjihan & Wawan, 2025). Conversely, the continued dominance of conventional methods in IPAS learning tends to limit students' conceptual understanding. This pattern aligns with the results observed in the control class of this study. Meanwhile, it was found that students' learning difficulties stemmed from a lack of learning strategies for relating concepts to real-world experiences. The effectiveness of the probing prompting model in this study can be attributed to its capacity to guide students through systematic questioning, thereby helping them construct a deeper and more meaningful understanding (Rahmawati et al., 2023; Azzahra et al., 2023).

The present findings also extend previous studies by showing that the Probing Prompting model produced a moderate practical effect on students' learning outcomes. However, this practical effect should be interpreted carefully because the initial variance between groups was not fully homogeneous. Therefore, the findings indicate a promising contribution of the model, while future studies should use ANCOVA or other procedures to control baseline differences more rigorously.

From the perspective of cognitive engagement theory, the probing prompting model improves learning outcomes because students engage in more in-depth mental processes than conventional learning. This cognitive involvement can be seen in activities such as identifying problems, connecting concepts, explaining reasons, evaluating answers, and revising understanding in response to teacher questions. This process causes students to be not only physically active but also mentally active in processing information for learning. The higher students' cognitive engagement, the more likely they are to form conceptual understandings that persist in long-term memory. Thus, the improvement in learning outcomes in the experimental class can be understood as a consequence of increasing the quality of students' cognitive involvement during the learning process.

On the other hand, this finding is also reinforced by other studies outside of background studies that show a similar trend. Affirming that question-based learning strategies have a high effect size on learning outcomes (Arnold, 2011), because they

activate higher-order thinking processes. Furthermore, it shows that using questions in science learning can improve the quality of students' reasoning and argumentation. Research also found that guided questioning techniques are effective in improving conceptual understanding and learning retention (Chin & Osborne, 2010; Lichtenberger et al., 2025). In addition, the study emphasizes the importance of questions as part of effective learning principles that strengthen learners' cognitive engagement (Salmon & Barrera, 2021).

Taken together, these findings demonstrate strong consistency between the results of the present study and previous empirical evidence. The convergence of findings across contexts suggests that questioning strategies, particularly those embedded in the probing prompting model, constitute a robust pedagogical approach for improving conceptual learning and higher-order thinking skills.

The implications of this study are particularly relevant for IPAS learning in MI/SD, where students are expected to develop conceptual understanding, reasoning abilities, and problem-solving skills. The probing prompting model provides teachers with a practical strategy for transforming classroom interactions from teacher-centered instruction into student-centered learning. Through guided questioning, students become more actively involved in exploring concepts, expressing ideas, and reflecting on their understanding.

In the context of the Merdeka Curriculum, which emphasizes active participation, critical thinking, and meaningful learning experiences, the probing prompting model offers a suitable instructional alternative. Its implementation can help teachers create interactive learning environments that encourage inquiry, reflection, and conceptual exploration. Therefore, the model has the potential to improve the quality of IPAS learning at the elementary school level.

However, the results of this study also show variation in improvements in student learning outcomes. Some students in the experimental class showed a not-so-significant improvement, while some in the control class experienced a fairly large increase. This condition indicates that the effectiveness of the learning model is not entirely deterministic but is influenced by factors such as initial ability, motivation to learn, and the learning environment. These findings are consistent with the constructivist perspective, which asserts that students' prior experiences and individual characteristics shape the learning process. Accordingly, the implementation of a learning model should account for individual differences as an essential component of learning dynamics.

The findings of this study indicate that the probing prompting learning model can be used as an alternative learning strategy that effectively improves student learning outcomes, especially in science subjects. In practice, this model can help teachers create more interactive learning experiences, encourage student involvement, and develop critical thinking skills. In addition, within the context of the Independent Curriculum, this model aligns with the principles of student-centered learning and emphasizes exploration and reflection. Therefore, the application of the probing prompting model can be an innovative strategy for improving the quality of learning in elementary schools.

On the other hand, this study has limitations that should be considered. First, this study was conducted at a single school with a limited sample size, so the generalizability of the results remains limited. Second, this study focuses only on the cognitive aspect (learning outcomes) and therefore has not examined students' affective and psychomotor aspects in depth. Third, other variables, such as learning motivation, learning style, and learning environment, have not been adequately

controlled for in this study. In addition, the non-homogeneous pre-test results indicate differences in initial ability between groups, which should be considered when interpreting the magnitude of the treatment effect. Future studies are encouraged to employ larger sample sizes and more advanced statistical procedures, such as ANCOVA, to control for baseline differences and strengthen causal inference.

Overall, the results of this study confirm that the probing prompting learning model has a significant contribution in improving student learning outcomes. The contribution of this study lies in demonstrating how cognitive scaffolding through structured questioning can enhance conceptual understanding in IPAS learning. The findings strengthen constructivist learning theory, align with previous empirical studies, and provide practical guidance for implementing more active and meaningful learning in MI/SD classrooms.

Conclusion

Based on the research results, it can be concluded that the probing prompting learning model has a significant effect on the learning outcomes of students in class IV science subjects at MI Al Hikmah Bandar Lampung. A significance value of 0.023 (< 0.05) indicates that the difference in learning outcomes between the experimental and control classes is statistically significant. Descriptively, the experimental class showed greater improvement in learning outcomes than the control class, indicating that question-based learning can increase student engagement and deeper understanding. This research contributes to strengthening the empirical evidence on the effectiveness of the probing prompting model for science learning in elementary schools, especially in the context of madrasah ibtidaiyah. In addition, this research supports a constructivist approach that emphasizes the importance of students' active role in building knowledge through questioning. However, this study still has limitations in its sample size and in its focus on the cognitive aspect. Therefore, further research is recommended to involve a broader sample and examine other aspects, such as students' critical thinking skills, social skills, and learning attitudes.

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