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The Critical Thinking Skills of Students Through Guided Inquiry Models in Elementary School

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Abstract

The urgency of this research is driven by the deficiency in students' critical thinking skills, which is rooted in the dominance of lecture-based teaching approaches. These traditional methods restrict student engagement and exploration, crucial for fostering critical thought. The research aims to explore the impact of the guided inquiry learning model on enhancing critical thinking skills among elementary students, specifically focusing on a sample of 40 fifth-grade students at SDN Lonja. Utilizing a quasi-experimental design with pretest and posttest control groups, the study gathered data through tests, observations, and documentation. The Paired Samples Test used for data analysis indicated a significant difference at the 5% level, with a p-value of 0.000. This outcome led to the rejection of the null hypothesis, confirming that the guided inquiry model significantly enhances students' critical thinking skills in Natural Sciences. The findings underscore the potential of guided inquiry as an effective instructional model, which actively engages students in learning, promotes analytical thinking, and reduces dependency on rote memorization, thereby nurturing critical thinking competencies essential for lifelong learning and problem-solving. This research holds implications for educators and curriculum developers seeking to adopt student-centered learning strategies that better prepare students for future academic and personal challenges.

Keywords: *Critical Thinking Skills, Elementary School Students, Guided Inquiry Model, Paired Samples Test.*

Introduction

Natural Science (IPA) is a discipline that studies natural phenomena, with the main goal of developing students' understanding of the world around them through a scientific approach. Students are not only introduced to basic concepts in IPA learning, but are also trained to develop critical thinking skills, which are important in facing everyday life challenges (Gupta et al., 2015). IPA presents knowledge about nature that is systematically arranged, based on experiments and observations made by humans to explain various natural phenomena. Teaching IPA at the elementary school level aims to equip students with a solid foundation in scientific principles that can be applied in their future lives, as well as to encourage problem-solving skills to face challenges. IPA learning needs to be carried out through a scientific inquiry approach that encourages exploration and the development of effective communication skills, two equally important aspects as life skills (Chandra et al., 2020). IPA learning not only focuses on understanding scientific concepts but also on students' ability to analyze and interpret deep experimental results, allowing them to build more meaningful knowledge (Anbiya et al., 2023). Critical thinking is an essential skill for analyzing and evaluating ideas or information objectively. This skill does not rely solely on memorization but emphasizes deep

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understanding and the ability to provide rational and structured answers. Critical thinking is a skill that is crucial in the context of education, particularly in Natural Science (IPA) learning, as it helps students face and solve problems related to the IPA concepts they are learning (Ahaddin et al., 2020). The process of developing critical thinking skills is highly relevant in supporting students' more active and creative learning approaches, where they can learn through personal discovery and exploration. Critical thinking plays a role not only in developing students' conceptual understanding but also in enriching the learning process, encouraging their deeper engagement (Yasin et al., 2019).

Based on observations conducted at SDN Lonja, it was found that the use of teaching methods dominated by lecturing techniques negatively impacts the development of students' critical thinking skills. This is due to the limited opportunities for students to actively engage in experiments or practical activities that can stimulate their critical thinking during the learning process. Students' critical thinking skills are minimal in the subject of Natural Science (IPA), which directly affects their weak understanding of the concepts being discussed. The dominance of teacher explanations without allowing space for students to ask questions, conduct experiments, or express their own ideas results in the lack of development of critical thinking skills, which should be at the core of effective IPA learning (Payu et al., 2023).

The role of the teacher in Natural Science (IPA) learning is crucial for achieving effective learning outcomes. The teacher not only acts as a source of knowledge providing information to students, but also serves as a motivator, inspiring students to be interested and active in the learning process (Indawati et al., 2023). The teacher also plays the role of a facilitator, creating a supportive learning environment; a manager, organizing the learning process; a demonstrator, providing examples or hands-on practices; a guide, helping students develop understanding; and an evaluator, assessing students' progress in learning. The success of IPA learning greatly depends on how the teacher manages these roles and chooses the appropriate approach to support the achievement of learning goals (Sari et al., 2022)

Efforts to achieve optimal IPA learning require teachers to select teaching models that align with the characteristics of the material being taught. The selection of the right teaching model not only facilitates the teacher in delivering the material but also plays a crucial role in building deep understanding in students (Pujiana et al., 2024). The use of the appropriate teaching model is essential in IPA learning, where scientific concepts are often abstract and complex, to help students understand these topics. Teachers need to consider various factors, such as the difficulty level of the material, student needs, and the learning objectives to be achieved (Musyawwir et al., 2023). Choosing the right teaching model can help create a more engaging and interactive learning environment, which in turn can enhance students' understanding and critical thinking skills (Putra et al., 2018).

One highly effective approach in IPA learning is the guided inquiry learning paradigm (Solikah et al., 2022). This paradigm provides an opportunity for students to actively engage in the learning process, not just as recipients of information but as discoverers of knowledge through exploration and investigation. Students are given the chance to formulate questions, conduct experiments, and independently analyze the results under limited guidance from the teacher (Sumiyarti et al., 2019). This approach not only strengthens students' conceptual understanding but also develops their critical thinking skills, as students are encouraged to think logically, systematically, and analytically when facing various scientific problems. Guided inquiry learning transforms students into active learners with a high sense of curiosity, as well as the ability to solve problems independently and creatively (Kusuma et al., 2023).

Teachers can create a more dynamic and interactive classroom environment by using the guided inquiry learning paradigm. Students not only listen to the teacher's explanations but also engage in discussions, collaboration, and the application of concepts they have learned in real-world contexts (Yolida et al., 2023). This approach is highly effective in addressing the challenges faced in IPA learning, where students' understanding is often limited to memorization without active involvement in the thinking and exploration process. IPA learning becomes not only a process of knowledge transfer but also a process that builds important life skills, such as critical thinking, analytical skills, and problem-solving (Payu et al., 2022)

Students show high enthusiasm for collaboration in learning activities that use the guided inquiry model. Several studies indicate that this approach not only enhances student engagement but also facilitates more active and interactive learning (Miftakhurrohmah et al., 2023)). Students are encouraged to work together in groups in this model, conduct experiments, and discuss their findings. Such collaboration allows students to share ideas, solve problems together, and explore IPA concepts in a more applied and enjoyable way (Duran et al., 2016).

Guided inquiry is a teaching model in which the teacher acts as a guide, providing extensive instructions and directions during the learning process, while still allowing space for students to explore and discover knowledge independently (Sari et al., 2023). The teacher does not only provide explanations but also directs students to ask questions, design experiments, and draw conclusions based on the data they obtain during learning. This approach allows students to be more actively involved in the learning process, deepen their understanding, and develop critical thinking skills, which are essential (Opticia et al., 2022).

The main advantage of the guided inquiry model is that students gain hands-on experience in conducting experiments and solving problems scientifically (Safitri, 2023). They do not just receive information, but also participate in activities that involve observation, analysis, and evaluation of experimental results (Saekawati et al., 2021). This process encourages students to think logically and critically when facing natural phenomena, while also sharpening their problem-solving skills. This model is highly effective in developing students' critical thinking abilities, which is one of the main goals in IPA learning (Giovani et al., 2022).

Based on this description, this study aims to explore further how the guided inquiry approach can influence students' critical thinking skills, particularly in the context of IPA learning. This research is expected to provide more concrete evidence regarding the benefits of the guided inquiry approach in enhancing students' critical thinking skills, as well as its contribution to more effective and meaningful learning quality.

Method

This study adopts a quantitative approach using a quasi-experimental design to analyze the effect of the Guided Inquiry model on students' critical thinking skills. A quasi-experimental design is chosen because it allows the researcher to identify causal relationships between the variables being studied without randomly assigning treatments, which is often not feasible in educational research contexts. The researcher formulates the research problem with a focus on changes in students' critical thinking skills resulting from two different treatments: learning with the Guided Inquiry model in the experimental group and conventional learning in the control group. The problem formulated involves the causal relationship between the independent variable (type of teaching method) and the dependent variable (students' critical thinking skills).

The research design used in this study is the pretest-posttest control group design. A pretest is administered to both groups, the experimental group and the control group, before the learning treatment or intervention begins. The purpose of the pretest is to measure students' initial critical thinking skills, so that the extent of improvement in critical thinking skills can be determined after the treatment. After the learning process, both the experimental and control groups then take a posttest to measure their critical thinking skills after the treatment. This design allows the researcher to compare the differences in scores between the pretest and posttest, and to evaluate the significant impact of the applied teaching model. Table 1 shows the detailed research scheme.

Table 1. Research Design

Class	Pretest	Treatments	Posttest
Eksperimen	O1	X1	O2
Kontrol	O3	X2	O4

Description:

O1, O3 = Pretest before learning

O2, O4 = Posttest after learning

X1 = Learning with guided inquiry model

X2 = Learning with conventional methods

The population involved in this study is all students at SDN Lonja. The researcher used a cluster sampling technique to select the sample, which involves choosing samples based on existing groups or classes. This approach was chosen because it allows for the selection of a representative sample from the entire student population without the need to select individuals randomly. The next step was for the researcher to select two classes as research samples, each consisting of 20 students, with a total of 40 students being part of the study. Class VA, consisting of 20 students, acted as the control group that underwent conventional learning. Meanwhile, class VB, also consisting of 20 students, acted as the experimental group and received the treatment using the Guided Inquiry learning model.

Data collection in this study was carried out using three main techniques: tests, observation, and documentation. The critical thinking test is the primary instrument used to measure students' critical thinking skills. This test was given in the form of a pretest before the intervention and a posttest after the intervention. The test questions were the same at both stages to ensure that the comparisons made clearly reflect changes in students' critical thinking abilities. Observations were used to monitor the classroom dynamics and student interactions during the learning process. Observation data helped to provide an overview of the implementation of both the Guided Inquiry and conventional learning models in the classroom context. Documentation was also used to collect supporting information related to the learning process, such as teacher notes and student activities during the learning sessions.

After the data was collected, the analysis was conducted using the paired samples t-test through SPSS version 25. This test was used to determine whether there was a significant difference between the average pretest and posttest scores of both groups, the experimental group and the control group. The researcher was able to determine whether the Guided Inquiry learning model had a greater impact on improving students' critical thinking skills compared to the conventional learning method. The hypothesis testing will provide information regarding the effectiveness of both learning approaches in enhancing the critical thinking skills of elementary school students.

Results

Data regarding the impact of the guided inquiry learning paradigm on the critical thinking skills of fifth-grade students at SDN Lonja in the subject of Natural Science (IPA) is presented in this study. The guided inquiry model was used twice in the experimental class, while the lecture technique was used twice in the control class. The lesson material discussed in class was respiratory diseases in humans. The results of the observation regarding students' critical thinking skills are shown in Table 2 below:

Table 2. Results of Observations of Students' Critical Thinking Skills

	Critical Thinking Ability Indicators	Category			
		VG	G	NE	VL
Experimental Class	Analyze	√			
	Synthesize	√			
	Solution to problem		√		
	Conclude		√		
	Evaluate		√		
	Amount	2	3	0	0
	Critical Thinking Ability Indicators	Category			
		VG	G	NE	VL
Control Class	Analyze		√		
	Synthesize		√		
	Solution to problem		√		
	Conclude	√			
	Evaluate		√		
	Amount	1	4	0	0

Based on Table 2 regarding the observation of students' critical thinking skills, filled out by the teacher during the learning process in class, the following data were obtained: in the experimental class, there were 2 indicators in the "very good" category related to analysis and synthesis, 3 indicators in the "good" category, including problem-solving, conclusions, and evaluation, and 0 indicators in the "poor" and "very poor" categories. In contrast, in the control class, there was 1 indicator in the "very good" category referring to conclusions, 4 indicators in the "good" category, including analysis, synthesis, problem-solving, and evaluation, and 0 indicators in the "poor" and "very poor" categories. These findings indicate that students in the experimental class were more involved in practical activities compared to students in the control group.

The test, consisting of pretest and posttest, was used to measure students' critical thinking skills in both groups, experimental and control. The results from the pretest and posttest, which assess students' critical thinking abilities, are shown in Table 3 below.

Table 3. Results of the Pretest and Posttest of Students' Critical Thinking Skills

Class	Tests Given	Number of Students	The highest score	Lowest Value	Average
Experiment	*Pretest*	20	75	55	60
	Posttest		100	80	85,25
Control	*Pretest*	20	70	40	53,25
	Posttest		90	40	65,25

Based on Table 3, the pretest results for the experimental class showed an average score of 60, with the lowest score being 55 and the highest score 75. The control class had an average score of 53.25, with the lowest score 40 and the highest score 70. Students underwent special instruction after the pretest, then completed the posttest to measure their

final progress. The posttest analysis showed that the experimental class had a lowest score of 80 and a highest score of 100, with an average of 85.25, while the control class had a lowest score of 40, a highest score of 90, and an average of 65.25. There was a significant improvement in the posttest results regarding students' critical thinking skills after learning through the guided inquiry model.

Prerequisite Test

Validity test

The test items were administered to students and then analyzed using SPSS 25. Based on the results of the instrument trial conducted with 20 respondents at a significance level of 5%, the table value of r was found to be 0.444. Consequently, 10 test items were deemed valid because their significance values were less than 0.05.

Reliability Test

The test sheet used in this study served as a reliable data collection tool after undergoing a validity test. The results of the Cronbach's Alpha analysis using SPSS 25 showed that the test questions were reliable, as the 10 questions achieved a Cronbach's Alpha value of 0.821 at a 5% confidence level. The fact that 0.821 is greater than 0.444 indicates the consistency and reliability of these ten test questions.

Normality Test

After conducting the reliability test, a normality test was performed using SPSS 25 with the Shapiro-Wilk method. The results of the normality test for the pretest and posttest in both the experimental and control classes can be seen in Table 4 below:

Table 4. Results of the Normality Test for Pretest and Posttest of Critical Thinking Skills

	Shapiro-Wik		
	Statistic	*Df*	*Sig.*
Experiment Pretest	,766	20	,093
Pretest Control	,931	20	,162
Posttest Experiment	,724	20	,082
Posttest Control	,958	20	,508

Based on Table 4 above, the analysis findings show that the pretest in the experimental class had a Shapiro-Wilk significance value of 0.093, which is greater than 0.05, and the pretest in the control class had a Shapiro-Wilk significance value of 0.162, which is also greater than 0.05. This indicates that both groups' data have a normal distribution. Additional analysis can be carried out with data that is typically distributed. Furthermore, it can be seen that the posttest data are also normally distributed because the Shapiro-Wilk significance values for the posttest in the experimental class and the control class are both greater than 0.05 at 0.082 and 0.508, respectively.

Homogeneity Test

Homogeneity testing in this study was conducted to ensure that the variances between the experimental and control groups are uniform before further analysis is carried out. The Levene's test was operated through SPSS version 25. Levene's test was used due to its ability to test the equality of variances between groups, which is an important assumption in further statistical analysis. The results of the homogeneity test can be seen in Table 5 below, which shows whether the variances between the two groups can be considered homogeneous or not.

Table 5. Homogeneity Test for the Experimental Class and Control Class

	Levene Statistic	df1	df2	sig
Based on Mean	12.153	1	38	,081

Table 5 shows the results of the homogeneity test between the experimental class and the control class, with each having a significance value of 0.081. This significance value is greater than the predetermined alpha threshold of 0.05 (0.081 > 0.05). The results of the test indicate that the variances between the two groups are homogeneous, meaning the data from the experimental and control groups do not show significant differences in terms of variance. This indicates that the assumption of homogeneity of variance is met, allowing further statistical analysis to be conducted with higher validity.

Hypothesis Testing

The purpose of the significance test was to ascertain whether the experimental class's average critical thinking scores increased following the intervention. The Paired Samples Test in SPSS version 25 was used to determine the difference between the two means. The results of the t-test obtained with the help of SPSS 25 can be found below in Table 6:

Table 6. Hypothesis Testing

	Mean	Std.Deviation	Std.Error Mean	95% Confidence Interval of the Difference		T	df	Sig. (2-tailed)
				Lower	Upper			
Pair Pretest-Posttest	-35.000	9.032	2.020	-39.227	-30.773	-17.330	19	,000

Table 6 indicates that H0 is rejected since the significance value at the 5% level is 0.000, which is less than 0.05. This suggests that fifth-grade students at SDN 1 Lonja's guided inquiry learning style had an effect on their capacity for critical thought in Natural Science (IPA.

Discussion

Based on the research statistics, students who used the guided inquiry learning approach demonstrated better critical thinking skills compared to those who used traditional teaching methods. The final data analysis showed that students who used the guided inquiry model had improved their critical thinking skills. Based on the paired samples test between the two variables, it can be concluded that the guided inquiry learning model has an impact on the critical thinking skills of fifth-grade students at SDN 1 Lonja who are studying Natural Science. Twenty fifth-grade students enrolled in the Natural Science subject participated in the implementation of the guided inquiry learning model over two days. The first session covered the human respiratory system, while the second session addressed the causes of respiratory diseases.

The post-test analysis in the experimental class, which used the guided inquiry learning model, showed an average improvement in students' critical thinking skills in Natural Science compared to the control class, which did not receive the intervention (conventional teaching method). This is explained in the presentation of the research results. The teacher's perspective on students' critical thinking skills during lessons and the observation sheets filled with comments about critical thinking skills based on the established indicators provide further evidence of this condition.

The results of the observations from the study show that students' critical thinking skills in the experimental class were categorized as very good, based on the indicators of analyzing and synthesizing. Based on the results in each category and indicator of critical thinking skills, it can be concluded that students in the experimental class became more active in the learning process compared to the control class. The difference in critical thinking skills, particularly in the experimental class, was caused by the use of the guided inquiry learning model, which encouraged students to be more active, innovative, creative, and engaged. This made the learning experience more memorable, as students could directly observe and conduct experiments using tools provided by the teacher. The implementation of the guided inquiry model had a significant impact on students' critical thinking skills in Natural Science at the school.

The guided inquiry model is a learning approach that encourages students to actively engage in the learning process through questioning, exploration, and discovery. In this model, the teacher acts as a facilitator, guiding students in exploring concepts, gathering information, and seeking solutions to existing problems. Critical thinking skills are very important, especially because these skills are needed in the workforce. These skills help students face mental and spiritual challenges and can be used to evaluate individuals, policies, and institutions, thus helping to prevent social problems. Therefore, it can be concluded that students enjoy the guided inquiry learning method because they are given the opportunity to actively participate in the learning process.

Factors influencing students' critical thinking skills include interaction among students, such as increased activity in learning, along with the teaching methods used by teachers, including innovative methods that capture students' attention. This aligns with research stating that “one of the factors that can affect students' critical thinking skills is the interaction between teacher and students” (Sari et al., 2022) and is also supported by other studies suggesting that the use of innovative teaching methods has significant potential to enhance and cultivate students' critical thinking skills in the learning process.

Other factors influencing students' critical thinking skills include: (1) physical factors. For instance, when someone is unwell and faces situations that require careful thought to solve problems, their ability to concentrate and think quickly is significantly affected; (2) motivation. Motivation is an internal drive that encourages individuals to develop their interest in learning; (3) anxiety. Anxiety is an emotional state related to potential risks that could endanger oneself or others; (4) intellectual development. Students' intellectual development varies from one individual to another and is also influenced by the students themselves.

The guided inquiry model has a significant impact on students' critical thinking skills. By emphasizing information analysis and collaboration, this approach helps students develop essential skills for the modern era through active engagement in learning. Implementing guided inquiry in classroom learning is highly recommended to improve the quality of education and prepare students for future challenges. This model provides students with opportunities to think independently in solving problems that arise during the learning process, thereby fostering their critical thinking abilities through problem-solving activities.

Efforts by teachers to create an enjoyable learning environment also support students’ participation levels during the learning process. The guided inquiry model aims to help students refine their critical thinking skills by focusing on scientific attitudes. Through social support, creativity, and encouragement, teachers play a crucial role in the learning process,

fostering creativity, confidence, independence, and active student engagement in the classroom.

Students can have tangible, hands-on learning experiences through the inquiry-based learning paradigm, resulting in significant learning outcomes. This study's findings are supported by research showing that the guided inquiry model positively impacts students' critical thinking skills, as evidenced by the increase in average scores from pre-test to post-test (Solikah et al., 2022). With guided inquiry-based learning, students' critical thinking abilities are higher compared to learning methods that are less complex. This aligns with research indicating that the inquiry-based learning process in guided inquiry models helps students solve problems and find answers, which in turn enhances their critical thinking skills (Putra et al., 2018).

The results of this study reinforce and confirm that students' critical thinking skills in elementary school can be improved through guided inquiry models, enhancing creativity, confidence, independence, engagement, social support, motivation, and teacher innovation. This approach facilitates the educational process to improve the quality of education and prepares students to face future challenges in the primary education system.

Conclusion

Based on the research results where H0 was rejected, as the significance level at 5% was 0.000, which is less than 0.05, this indicates that the implementation of the guided inquiry learning model at SDN 1 Lonja has a significant effect on students' critical thinking skills in the subject of Natural Sciences (IPA). The findings across each category and indicator of critical thinking skills suggest that students in the experimental class demonstrated a higher level of engagement in the learning process compared to students in the control class. The application of the guided inquiry model significantly impacts students' critical thinking skills in science learning. This study reinforces the argument that guided inquiry learning models at the elementary school level can enhance creativity, confidence, independence, engagement, social support, motivation, and innovation among both teachers and students.

This approach not only facilitates the educational process but also contributes to improving the quality of education, preparing students to face future challenges in the primary education system. The limitations of this research include a focus on how the guided inquiry approach in Natural Sciences (IPA) is applied at the elementary school level and the methods for teacher training within this unit. Recommendations for practitioners/teachers in educational institutions: The findings of this study are recommended as a guide for selecting the best learning model for the science curriculum at the elementary level, and to encourage teacher innovation and creativity by utilizing various alternative learning models to help students achieve the required competencies. This study's results are hoped to be further developed by future academics and researchers using more refined assessments to enhance the quality of education, particularly at the elementary school level.

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