Implementation of Guided Inquiry Model in Science Learning to Improve Critical Thinking Skills of Junior High School Students: Literature Review

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ABSTRACT. This study aims to examine in depth the implementation of the Guided Inquiry model in Natural Science (IPA) learning at the Junior High School (SMP) level as a strategy to improve students' critical thinking skills. The method used in this study is library research, by reviewing various literature sources such as books, national and international journal articles, and previous research results relevant to the topic. This study focuses on analyzing the basic concepts of the Guided Inquiry model, its implementation stages, and its relationship to the development of critical thinking skills that include the ability to analyze, evaluate, and draw logical conclusions. Based on the results of the literature synthesis, it was found that the Guided Inquiry model is effective in creating student-centered learning, facilitating the process of independent discovery of scientific concepts, and encouraging students to be active in the scientific investigation process. In addition, this model is in line with the spirit of the Independent Curriculum which emphasizes strengthening the profile of Pancasila Students, especially in the dimensions of critical and creative reasoning. However, the implementation of this model requires teacher readiness in designing structured inquiry stages and the support of adequate learning facilities. Thus, the implementation of the Guided Inquiry model in science learning can be a strategic alternative to build critical thinking skills in junior high school students sustainably in the 21st century education era.

Keywords: *Guided Inquiry, Science Learning, Critical Thinking*

INTRODUCTION

Science (science) instruction at the junior high school level plays a crucial role in shaping students' scientific mindsets and developing 21st-century competencies such as critical thinking, creativity, and collaboration. However, many junior high school students still demonstrate low critical thinking skills in science instruction, particularly when focusing on demanding assignments, evaluations, or independent drawing of conclusions. This situation presents a challenge for teachers and educational policymakers in providing truly active, reflective, and student-centered learning.

Conventional learning approaches, which tend to be teacher-centered and lecture-based, are still widely used in science instruction in junior high schools. These methods often provide little space for students to explore, ask their own questions, investigate phenomena, or draw conclusions independently. As a result, the learning process becomes more passive, and higher-order thinking skills such as analysis, inference, and evaluation are underdeveloped. Systematic studies in science

education show that inquiry-based learning approaches have significant potential to develop students' critical thinking skills more effectively than conventional methods.(Arifin et al., 2025)

One inquiry model frequently discussed in the literature is the Guided Inquiry (Guided Inquiry Learning Model). This model positions students as active participants in scientific discussions, with the teacher acting as a facilitator starting with orientation, problem discussion, data collection and analysis, and drawing conclusions.(Safitri, 2023) The advantages of this model include enabling students to ask their own questions, investigate phenomena, reflect, and construct concepts independently. In the context of science learning, the application of guided inquiry can improve students' understanding of scientific concepts while honing their critical thinking skills to evaluate and draw inferences from collected data.(Maknun, 2020)

Previous research has shown that the application of guided inquiry has been shown to improve students' critical thinking skills and understanding of scientific concepts. For example, research in vocational schools (SMK) found that classes using the guided inquiry model showed an average increase in critical thinking skill scores of 0.71, significantly higher than control classes (0.28) using conventional methods.(Sulistyani et al., 2022) Furthermore, a meta-analysis of inquiry-based learning (IBL) research in science education found that the inquiry approach had a large effect size (Hedges' g = 0.893) on students' higher-order thinking skills.(Antonio & Effects, 2024) This strongly indicates that the inquiry model, and with appropriate adaptations of the guided inquiry model, is highly relevant for implementation in junior high schools.

However, implementing the guided inquiry model in science learning in junior high schools also faces several challenges. Several studies have identified teacher readiness, laboratory facilities, time allocation, and student characteristics as key obstacles.(Sulistyani et al., 2022) For example, a literature review noted that although guided inquiry is effective in improving science process skills and critical thinking, teachers need to be creative and innovative in adapting the method to student characteristics for optimal results.(Safitri, 2023) Furthermore, contextual research in Indonesia indicates that there is still a gap between theoretical potential and practical implementation in junior high school classrooms, particularly in aspects of student mentoring and the use of supportive media.

In the Indonesian context, particularly in Bandar Lampung and its surrounding areas, the relevance of the guided inquiry model in science learning is significant. The national curriculum has shifted toward learning that addresses scientific reasoning and 21st-century competencies, including the Pancasila Student profile, which demands students possess critical, creative, independent, and collaborative thinking. Therefore, the integration of guided inquiry in science learning supports not only students' cognitive aspects but also their desired character and student profile. Therefore, an in-depth literature review on how the guided inquiry model can be applied to improve the critical thinking skills of junior high school students is crucial both as a theoretical foundation and as practical recommendations for teachers and learning practitioners.

Based on the description above, this article aims to systematically review the literature on the implementation of the guided inquiry model in science learning, focusing on developing the critical thinking skills of junior high school students. The specific objectives of this study include: (1) analyzing the concepts and stages of the guided inquiry model, (2) examining indicators of students' critical thinking skills in

METHOD

This research method uses a descriptive qualitative approach based on library research (literature study). The study aims to synthesize empirical findings and theoretical foundations regarding the application of the Guided Inquiry Model in science learning and its foundations for

developing critical thinking skills in junior high school students.(Snyder, 2019) A qualitative approach was chosen because the focus of the study is conceptual understanding, patterns of previous research results, and the formulation of conceptual recommendations, rather than experimental hypothesis testing.

Data sources were systematically collected from academic databases such as Google Scholar, ERIC, DOAJ, ResearchGate, and national journal libraries (e.g., the SINTA Portal). The search process used a combination of keywords (e.g., guided inquiry, guided inquiry learning, inquiry-based learning, critical thinking, science education, junior high school) and was limited to publications from 2019–2025, as well as articles that are fully accessible (open access) or available through institutional repositories. Inclusion criteria: (1) discussing the implementation or effectiveness of guided inquiry/inquiry in the context of secondary education; (2) containing data/results relevant to critical thinking indicators; and (3) written in Indonesian or English. Exclusion criteria were applied to studies that were purely conceptual in nature without empirical evidence and to research at the university level that was not relevant to the context.

Data analysis was conducted through thematic content analysis: first, a full reading of each source was conducted to reduce the data into thematic units (inquiry stages, critical thinking indicators, effectiveness results, and barriers/supporters of implementation); second, grouping similar findings to identify patterns of consistency between studies; and third, synthesizing the results into a series of findings and practical recommendations.(Thomas & Harden, 2008) To enhance credibility, source triangulation (comparing international journals and local studies) and cross-checking with basic inquiry learning theory and critical thinking theory were conducted to ensure interpretations remained valid and accountable.

RESULT AND DISCUSSION

Result

The main provisions in writing research or study findings are as follows: 1) present the research or study findings briefly, while still providing sufficient detail to support conclusions, 2) may use tables or pictures, but do not repeat the same information, by providing narration at the bottom of the table or picture so that the reader can understand the tables or pictures presented by the author, and 3) each research finding or study must be interpreted properly using standard spelling.

From the selected and analyzed literature, several key findings were found regarding the implementation of the Guided Inquiry Learning model in science learning and its impact on students' critical thinking skills. First, almost all studies indicate that the inquiry approach generally has a significant positive effect on students' higher-order thinking skills (HOTS) in science. For example, a meta-analysis by Effects of Inquiry-Based Approaches on Students' Higher-Order Thinking Skills in Science: A Meta-Analysis found an overall effect value (Hedges' g) of 0.893 on students' higher-order thinking skills using the inquiry approach compared to conventional methods.(Antonio & Effects, 2024) Furthermore, a systematic study by Science and Inquiry-Based Teaching and Learning: A Systematic Review also showed that inquiry learning strengthens students' scientific reasoning and the development of deeper conceptual knowledge. These findings suggest that not only understanding of scientific facts improves, but also analytical, evaluation, and inference skills core indicators of critical thinking.

Second, specifically related to the guided inquiry model, several studies have shown that when the stages of inquiry (orientation, problem formulation, data collection, data analysis, and conclusion drawing) are implemented effectively, students demonstrate greater improvement in critical thinking skills compared to those using free-form discovery learning or traditional lectures. For example, a study by Implementation of Guided Inquiry Learning to Improve the Critical

Thinking Skills of Students among vocational high school students in Bandung found that the average increase in critical thinking skills was 0.71 (high category) in the class using the guided inquiry model, compared to only 0.28 in the control class. Other local research in Indonesia also supports this for example, a study by Analysis of the Effectiveness of Guided Inquiry Implementation to Improve Students' Science Process Skills analyzed 30 literature articles and found that the implementation of guided inquiry can improve students' science process skills, critical thinking, creativity, and learning motivation.(Funa & Dio, 2025) These findings confirm the relevance of the guided inquiry model in the context of science learning at the secondary level.

Third, specifically regarding critical thinking skills, the literature shows that various critical thinking indicators such as interpretation, analysis, evaluation, inference, and explanation are indeed trained through guided inquiry activities. For example, a study by Implementation of Guided Inquiry Learning Model to Improve Students' Critical Thinking Skills through Guided Inquiry Learning found significant differences in the aspects of basic support and inference between the experimental and control groups.(Yastanti et al., 2025) Furthermore, international studies such as The effect of inquiry-based learning on students' critical thinking skills in science education: a systematic review and meta-analysis reported that although Inquiry-Based Learning (IBL) has generally been shown to improve critical thinking, there is considerable contextual variation ($I^2 = 92\%$), indicating that implementation factors, educational level, learning duration, and teaching strategies have a significant influence on outcomes. This means that the success of guided inquiry is not automatic but rather influenced by how the inquiry stages are implemented in practice.

Fourth, the literature also shows that the effectiveness of guided inquiry implementation in science learning is influenced by various supporting and inhibiting factors. Frequently cited supporting factors include active student involvement, appropriate teacher guidance (scaffolding), the use of contextual and realistic media, and adequate time allocated for collecting and analyzing experimental data. For example, research by Sulistyani, Indana, & Sudibyo shows that teachers who are creative and innovative in designing guided inquiry activities can improve student learning outcomes, including critical thinking skills.(Sulistyani et al., 2022) Conversely, obstacles such as limited time allocation, large class sizes, inadequate laboratory facilities, and students' readiness for critical thinking are factors that reduce the effectiveness of this model.(Nimah & Widodo, 2022) These conditions are important because they indicate that the implementation context is a key variable in the results achieved.

Fifth, in the context of compiling literature for junior high schools, although most research has been conducted at the upper secondary or vocational level, there are indications that the guided inquiry model can be adapted well to junior high schools. For example, international research at the junior high school level

Discussion

From the selected and analyzed literature, several key findings were found regarding the implementation of the Guided Inquiry Learning model in science learning and its impact on students' critical thinking skills. First, almost all studies indicate that the inquiry approach generally has a significant positive effect on students' higher-order thinking skills (HOTS) in science. For example, a meta-analysis by Effects of Inquiry-Based Approaches on Students' Higher-Order Thinking Skills in Science: A Meta-Analysis found an overall effect value (Hedges' g) of 0.893 on students' higher-order thinking skills using the inquiry approach compared to conventional methods. Furthermore, a systematic study by Science and Inquiry-Based Teaching and Learning: A Systematic Review also showed that inquiry learning strengthens students' scientific reasoning and the development of deeper conceptual knowledge. These findings suggest that not only understanding of scientific facts improves, but also analytical, evaluation, and inference skills— core indicators of critical thinking.

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CONCLUSION

highly effective in improving junior high school students' critical thinking skills in science learning. Through structured stages orientation, problem formulation, data collection, analysis, and conclusion students are actively engaged in scientific exploration. This process strengthens their ability to analyze, evaluate, and draw logical inferences, which are core aspects of higher-order thinking skills (HOTS).

Empirical studies consistently show that the guided inquiry approach produces better outcomes compared to conventional, teacher-centered methods. The model encourages student-centered learning, stimulates curiosity, and enhances conceptual understanding through

independent discovery. However, its success depends greatly on teacher competence in facilitating inquiry stages, the availability of laboratory facilities, and the allocation of sufficient time to support investigative learning.

Overall, the Guided Inquiry model aligns with the goals of the Independent Curriculum in Indonesia, which emphasizes the development of the Pancasila Student Profile particularly in fostering critical, creative, and independent thinkers. Therefore, this model is a relevant and sustainable strategy for 21st-century science education. Future studies are encouraged to conduct classroom-based empirical research to further validate its effectiveness across diverse educational contexts.

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