



DISCOVERY LEARNING MODEL IN OPTIMIZING CRITICAL THINKING SKILLS AND COLLABORATIVE SKILLS OF ELEMENTARY SCHOOL STUDENTS

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ABSTRACT

This study aimed to analyze the Discovery Learning model in optimizing the critical and collaborative thinking skills of fifth-grade students at SD Negeri 4 Nisam, North Aceh. The background of the study was based on the low level of students' critical and collaborative thinking skills, which were caused by teacher-centered learning and the limited opportunities for students to actively discover concepts independently and work collaboratively. This study used a descriptive qualitative approach with the fifth-grade teacher, students, and the principal as research subjects. Data collection techniques included interviews, observations, documentation, and focus group discussions (FGDs), while data analysis was conducted through data reduction, data display, and conclusion drawing. The findings of the study revealed that the implementation of Discovery Learning, encompassing the stages of stimulation, problem formulation, data collection, data processing, verification, and generalization, effectively enhanced students' active participation in the learning process. The model demonstrated its effectiveness in strengthening students' critical thinking abilities, particularly their capacity to identify problems, analyze relevant information, and formulate conclusions. However, students' ability to conduct in-depth evaluations still needed further development. Furthermore, the application of Discovery Learning positively supported the development of students' collaborative skills through group activities, discussions, effective communication, and mutual respect among peers. Therefore, Discovery Learning was effective as an innovative learning model to improve the quality of the learning process in elementary schools.

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1. INTRODUCTION

Education emphasizes the development of higher-order thinking skills and collaborative competencies to prepare students for global challenges. Critical thinking and collaboration are among the most essential skills required for elementary school students to adapt to rapid social and technological changes (Kafka & Papageorgiou, 2025); (Elvianasti et al., 2021; Kartikawati et al., 2023; Susanti et al., 2025). However, learning practices in many elementary schools continue to be dominated by teacher-centered approaches, which restrict students' opportunities

to explore, analyze, and independently construct knowledge. As a student-centered instructional approach, Discovery Learning promotes active student engagement in problem-solving and inquiry-based learning activities. Through systematic exploration, investigation, and experimentation, students are encouraged to identify and construct concepts independently, which can contribute to the development of both their cognitive abilities and social skills (Clarck & Mayer, 2016). Previous studies indicate that discovery learning can improve students' reasoning abilities and promote cooperative learning behaviors (Brooks et al., 2011). In the Indonesian educational context, the implementation of the Merdeka Curriculum emphasizes active learning and student autonomy. Therefore, integrating discovery learning into elementary education is highly relevant to support national education goals. Optimizing critical thinking and collaborative skills through discovery learning is urgent to ensure that students are well-prepared for lifelong learning and social participation.

One of the most essential skills is critical thinking, which enables students to analyze, evaluate, and make informed decisions. Furthermore, conceptual understanding is also an essential foundation for students to connect learned concepts to real life. According to (Walter, 2024), modern education must utilize digital technology as a means to foster an engaging and interactive learning environment in which students are not merely passive recipients of information but actively involved in constructing their own understanding. At the elementary school level, the learning process is currently confronted with various rapid and dynamic changes across multiple dimensions of education. The challenges of learning are increasingly apparent, namely with the characteristics and different learning methods of students in the current modern era. Changes in learning patterns occur quickly and massively (Firmansyah et al., 2023). Recognizing and understanding student characteristics is one of the very important foundations in providing learning with various models that are appropriate to the characteristics of these students. Therefore, it is something that teachers must strive to recognize and understand things related to their students (Siti Rahimah Ikhsani et al., 2023).

Although numerous several studies have investigated the effectiveness of Discovery Learning in enhancing students' academic achievement, limited research focuses specifically on its impact on both critical thinking and collaborative skills simultaneously at the elementary school level. Most existing studies emphasize cognitive outcomes, such as conceptual understanding and test scores (Aulia et al., 2025). Furthermore, previous research often applies discovery learning in science or mathematics subjects, while its implementation across integrated thematic learning remains underexplored. There is also a lack of empirical evidence regarding how structured discovery learning activities influence peer interaction, group problem-solving, and collective decision-making among young learners (Phelps, 2025). Additionally, many studies are conducted in controlled experimental settings, which may not fully represent authentic classroom conditions. Therefore, Further research is necessary to explore the practical implementation of Discovery Learning, particularly in real classroom settings and across diverse learning contexts in real classroom environments and its comprehensive impact on students' critical thinking and collaborative competencies.

Several studies have investigated the impact of Discovery Learning on students' cognitive development and academic achievement. Demonstrated that guided discovery learning could significantly improve students' conceptual understanding and problem-solving skills when compared with conventional teaching approaches (Muhali et al., 2021). Likewise, (Hmelo-Silver

et al., n.d.) indicated that inquiry-based and discovery-oriented learning environments could facilitate higher-order thinking by providing learners with appropriate and structured scaffolding. Collectively, these findings indicate that Discovery Learning can foster meaningful learning experiences by encouraging students to actively construct knowledge and develop a deeper understanding of concepts. Recent research has also emphasized the role of discovery learning in developing critical thinking skills among elementary school students. (Kune, 2025) demonstrated that students who participated in discovery-based instruction showed higher levels of analysis, evaluation, and reasoning skills. In line with this, (Aritonang & Astuti, 2021) revealed that discovery learning significantly improved students' ability to interpret information and solve complex problems. These studies indicate that discovery learning is effective in fostering critical thinking, yet most of them focus primarily on cognitive outcomes without considering social learning aspects. Research by (Khoir, 2024). Discovery Learning encourages students to explore, ask questions, and test hypotheses, which align with critical thinking indicators such as providing logical reasoning, evaluating information, and drawing conclusions. According to research by (Sagita et al., 2025), Discovery Learning creates group-based learning opportunities, so that students engage in discussions, share ideas, and solve problems together. This aligns with collaborative skill indicators: effective communication, cooperation, tolerance, and shared responsibility.

In addition to cognitive development, collaborative skills have become a major focus in contemporary educational research. (W. Johnson & T. Johnson, 2019); (Seherrie, 2026) emphasized that cooperative and discovery-based learning environments enhance students' communication, responsibility, and teamwork abilities. Furthermore, OECD (2019) highlighted that collaborative problem-solving is a key competency for 21st-century learners. However, empirical studies that integrate discovery learning with structured collaborative activities in elementary classrooms remain limited, especially in developing countries. More recent studies have attempted to integrate discovery learning with digital and contextual learning environments. (Trilling & Fadel, 2009) emphasized that technology-supported discovery learning can promote both critical thinking and collaboration when properly designed. Meanwhile, (Ahmad et al., 2026); (Novita, 2022) found that discovery learning combined with interactive media significantly improved students' engagement and group performance. Nevertheless, most previous studies still examine these variables separately. Therefore, this study is relevant because it integrates discovery learning to simultaneously optimize critical thinking and collaborative skills in authentic elementary classroom settings. Therefore, the research question is how analyze the Discovery Learning model in optimizing the critical and collaborative thinking skills of fifth-grade students at SD Negeri 4 Nisam, North Aceh.

2. METHOD

Research designs this study seeks to analyze the Discovery Learning model in optimizing the critical and collaborative thinking skills of fifth-grade students at SD Negeri 4 Nisam, North Aceh. This study employed a qualitative research approach with a descriptive case study design. The qualitative method was chosen to explore in depth the implementation of the discovery learning model and its influence on students' critical thinking and collaborative skills in natural classroom settings. This approach allows the researcher to understand participants' experiences,

perceptions, and interactions during the learning process. The research was conducted at SD Negeri 4 Nisam, North Aceh Regency. The schools are located in adjacent areas, so the characteristics of the school community are similar. The research procedure employed in this study consisted of several systematic stages to investigate the effectiveness of the Discovery Learning model in optimizing elementary school students' critical thinking skills and collaborative skills. The initial stage involved identifying the research problem through classroom observations, interviews with elementary school teachers, and a review of previous literature related to Discovery Learning, critical thinking, and collaborative skills. Based on the findings, the researcher formulated the research objectives, hypotheses, and research instruments. The learning materials, lesson plans, and assessment instruments were validated by experts to ensure their content validity and suitability for elementary school students.

Participants: The research participants consisted of one classroom teacher and students selected through purposive sampling. **Instruments and Data collection:** The main research instrument was the researcher, who planned, conducted, and interpreted the study. Supporting instruments consisted of observation forms, interview protocols, field notes, and document analysis checklists.

Table 1. Interview Guidelines Based on Research Variables

Variable	Indicator
Discovery Learning	Teacher's role in guiding students to discover concepts
Discovery Learning	Students' response to the learning model
Discovery Learning	Students' activities in the discovery process
Discovery Learning	Students' activities in the discovery process
Discovery Learning	Information processing process
Discovery Learning	Student engagement
Critical Thinking	Ability to identify problems
Critical Thinking	Ability to analyze information
Critical Thinking	Ability to provide logical arguments
Critical Thinking	Ability to provide logical arguments
Critical Thinking	Ability to draw conclusions
Collaborative Skills	Ability to work cooperatively
Collaborative Skills	Ability to share tasks
Collaborative Skills	Communication skills
Collaborative Skills	Respect for others' opinions
Collaborative Skills	Role in the group
Collaborative Skills	Improvement of collaborative skills

Table 2. Observation Sheet

No	Variable & Indicator	Observed Aspect
1	Stimulation	Students respond to the teacher's triggering questions
2	Problem Statement	Students are able to formulate problems
3	Data Collection	Students collect information from various sources
4	Data Processing	Students process and compare information
5	Verification	Students verify hypotheses or ideas

6	Generalization	Students draw conclusions from learning activities
7	Simple Explanation	Students answer the teacher's questions clearly
8	Using Evidence	Students provide reasons based on data or facts
9	Drawing Conclusions	Students draw logical conclusions from discussions
10	Advanced Explanation	Students connect ideas with other contexts

Qualitative data validity testing encompasses credibility, transferability, dependability, and confirmability. Data analysis is conducted using a qualitative descriptive approach, comprising data reduction, data presentation, and drawing conclusions.

3. RESULTS AND DISCUSSION

The Achievement Level presents research results regarding student skill achievement after implementing the Discovery Learning model at SD Negeri 4 Nisam, North Aceh. The Achievement Level presents the research findings regarding students' skill development after the implementation of the Discovery Learning model at SD Negeri 4 Nisam, North Aceh. The findings indicate that most students demonstrated a high level of achievement. This suggests that the majority of students developed critical and collaborative thinking skills effectively through active engagement in the learning process, including identifying problems, analyzing information, participating in group discussions, and communicating findings both independently and collaboratively. Meanwhile, some students demonstrated a moderate level of achievement. This indicates that they had developed fairly good critical and collaborative thinking skills but still required guidance and reinforcement, particularly in consistently analyzing problems and actively participating in group activities. These differences suggest that students' initial abilities, self-confidence, and communication skills influenced their achievement in the Discovery Learning process.

Meanwhile, only a small number of students fall into the low category, with achievement levels below 50%. This indicates that some students still experience difficulties in following the stages of Discovery Learning, particularly in identifying problems, integrating information, and collaborating effectively with group members. However, the existence of this group does not dominate the research results, so in general it can be concluded that the application of the Discovery Learning learning model has a positive impact on improving the critical and collaborative thinking skills of fifth grade students at SD Negeri 4 Nisam North Aceh, with variations in achievement influenced by the characteristics and learning readiness of each student. The interviews were conducted with three elementary school teachers who have implemented the Discovery Learning model in their classrooms. The teachers have more than five years of teaching experience and actively apply student-centered learning approaches. Overall, the teachers reported that Discovery Learning encourages students to become more active, independent, and curious during the learning process. They emphasized that this model helps shift the learning atmosphere from teacher-centered to student-centered.

The first teacher explained that the stimulation and problem statement stages play a crucial role in motivating students to participate in learning. By providing real-life problems and thought-provoking questions, students become more interested in exploring the lesson. The teacher observed that students were more willing to ask questions and express their opinions (Uswatul

Hasni et al., 2025). This initial stage was considered effective in building students' confidence and encouraging critical thinking from the beginning of the lesson. The second teacher highlighted the importance of data collection and data processing activities. According to the teacher, students actively searched for information from textbooks, digital media, and peer discussions. During these activities, students learned to compare different sources and evaluate the accuracy of information. The teacher noted that this process significantly improved students' analytical skills and helped them understand learning materials more deeply (Weidlich et al., 2025). The third teacher focused on the impact of Discovery Learning on students' collaborative skills. The teacher stated that group discussions and problem-solving activities trained students to work together, share responsibilities, and respect different opinions.

Although some students initially faced difficulties in communicating effectively, continuous practice helped them develop better teamwork and social interaction skills. All teachers agreed that the implementation of Discovery Learning positively influenced students' critical thinking and collaborative abilities. They observed noticeable improvements in students' ability to provide logical arguments, draw conclusions, and contribute to group discussions. However, the teachers also mentioned several challenges, such as limited learning time and varying student abilities. Despite these obstacles, they believed that Discovery Learning remains an effective approach for developing essential 21st-century skills in elementary education (Ningsih et al., 2025).

Classroom observations were conducted during the implementation of the Discovery Learning model in several learning sessions. The observations focused on students' learning activities, critical thinking behaviors, and collaborative interactions. Overall, the learning process was student-centered, with the teacher acting as a facilitator who guided students through each stage of discovery learning (Terpadu Yajamila, 2025). Most students showed enthusiasm and active participation, especially during stimulation and problem statement activities. During the stimulation and problem statement stages, students responded positively to the teacher's triggering questions and real-life problem scenarios. Many students were able to identify key issues and formulate relevant questions related to the lesson. Some students initially hesitated to express their ideas, but gradually became more confident after receiving encouragement from the teacher. This stage successfully stimulated students' curiosity and prepared them for deeper learning activities. In the data collection and data processing stages, students actively searched for information from textbooks, worksheets, and group discussions (Irdalisa et al., 2021). They compared different sources and discussed their findings with peers (Fauziah & Bani Ahmad, 2025).

These activities helped students develop analytical and reasoning skills. Several students were able to explain their ideas using simple evidence, although a few still relied heavily on the teacher's guidance. Nevertheless, most groups demonstrated meaningful engagement in processing information. At the verification and generalization stages, students worked collaboratively to test their ideas and draw conclusions. Group members shared responsibilities, respected different opinions, and communicated their thoughts clearly. The majority of students were able to present logical conclusions and relate them to the learning objectives. However, some groups experienced time management difficulties (Sun et al., 2022). Despite this challenge, the overall observation results indicate that Discovery Learning effectively supports the development of students' critical thinking and collaborative skills.

The findings of this study indicate that the implementation of the Discovery Learning model effectively promotes active learning and student engagement in elementary classrooms. Through stimulation and problem identification activities, students were encouraged to observe, question, and explore learning materials independently. This result supports the constructivist perspective, which emphasizes that learning occurs through active knowledge construction. When students are involved in discovering concepts by themselves, they tend to develop deeper understanding and stronger learning motivation (Zhao & Watterston, 2021). Furthermore, the observation and interview results demonstrate that Discovery Learning contributes significantly to the development of students' critical thinking skills. Students were able to analyze information, use evidence, and draw logical conclusions during learning activities. According to (Facione, 2015), critical thinking involves interpretation, analysis, evaluation, and inference, which were clearly reflected in students' learning behaviors. Similarly, (Furszpaniak, 2025) emphasized that systematic inquiry-based learning strengthens students' reasoning and decision-making abilities. The structured stages of discovery learning provided meaningful opportunities for students to practice these essential cognitive skills.

In addition to cognitive development, this study reveals that Discovery Learning positively influences students' collaborative skills. Group discussions, shared tasks, and joint problem-solving activities encouraged students to communicate effectively and respect different opinions. This finding aligns with Vygotsky's social constructivist theory, which highlights the role of social interaction in learning (as discussed by Daniels, 2016). Moreover, Dillenbourg (2018) stated that well-designed collaborative learning environments enhance students' social competence and collective responsibility. Continuous interaction among peers helped students develop teamwork and conflict-resolution skills.

Despite its positive impact, the implementation of Discovery Learning also faced several challenges, such as limited instructional time and differences in students' learning abilities. These obstacles sometimes hindered the optimal exploration and discussion processes. However, as suggested by (Dillenbourg, 2013), effective teacher facilitation, adaptive instruction, and formative feedback can minimize these limitations. Teachers play a crucial role in providing scaffolding and creating supportive learning environments. Therefore, consistent professional development and instructional planning are necessary to maximize the benefits of Discovery Learning in developing critical thinking and collaborative skills.

This study has several limitations that should be taken into account when interpreting the findings. First, the research was conducted at only one elementary school and involved a relatively small number of participants. Consequently, the findings may not adequately reflect the conditions of schools with different social, cultural, and academic characteristics, thereby limiting the generalizability of the results. Second, the study adopted a qualitative research approach that relied primarily on observations, interviews, and document analysis as the main sources of data. This approach provided in-depth insights into the learning process but may have been influenced by the researchers' interpretations and the subjective nature of qualitative data. Although these methods provide in-depth information, the findings are subject to the researcher's interpretation. Personal bias and subjective judgment may influence data analysis, despite efforts to ensure validity through triangulation and member checking. Third, the duration of the research was relatively short. The implementation of the Discovery Learning model was observed within a limited time frame, which may not capture long-term changes in students' critical thinking and collaborative skills (Marmoah

& Poerwanti, 2022). As a result, the sustainability of the observed improvements cannot be fully determined. Finally, variations in students' learning abilities, motivation levels, and prior knowledge may have affected the research results. Some students required more guidance and support than others, which influenced their participation in discovery and collaborative activities. In addition, external factors such as time constraints, curriculum demands, and classroom management issues also limited the optimal implementation of the learning model.

The research offers practical guidance for elementary school teachers in designing and implementing student-centered learning. The findings are expected to provide an effective instructional model for improving students' critical thinking and collaborative skills; assist teachers in creating inquiry-based classroom activities that encourage active participation, problem-solving, and teamwork; serve as a reference for developing lesson plans, classroom assessments, and learning materials aligned with Discovery Learning principles; and improve students' engagement, learning motivation, and academic achievement through meaningful learning experiences. Educational policy impact, the results of this study may support school leaders and education authorities in strengthening the implementation of competency-based curricula that emphasize Higher-Order Thinking Skills (HOTS) and 21st-century competencies (Anchunda & Kaewurai, 2025). The evidence generated can inform curriculum development, teacher professional development programs, and instructional policies that promote inquiry-based and collaborative learning approaches in elementary schools.

4. CONCLUSION

This study concludes that the implementation of the Discovery Learning model at SD Negeri 4 Nisam was generally carried out effectively and consistently through a series of systematic stages, namely stimulation, problem statement, data collection, data processing, verification, and generalization. The application of these stages reflects a student-centered learning orientation in which the teacher primarily serves as a facilitator who guides and supports students throughout the learning process. Discovery Learning fosters a challenging, interactive, and meaningful classroom environment by encouraging students to move beyond passive reception of information and actively construct their understanding through exploration, discussion, and problem-solving activities. This learning process also contributes to the development of students' critical thinking and collaborative abilities, as students are encouraged to analyze information, formulate solutions, exchange ideas, and work cooperatively in groups. Thus, the Discovery Learning model has proven effective as an innovative learning approach that integrates the development of cognitive and social skills in elementary school students, particularly in fifth grade at SD Negeri 4 Nisam. The research results show that the implementation of Discovery Learning significantly contributed to improving students' critical thinking skills. Students demonstrated progress in several critical thinking indicators, such as the ability to identify problems, analyze information, provide logical reasoning, and draw conclusions based on the data obtained. The problem statement and data processing stages are crucial phases in developing students' critical thinking skills. In these stages, students are trained to formulate problems independently, process information, compare various sources, and test the validity of findings. This process encourages students to think reflectively, logically, and evidence-based. Teachers are advised to consistently develop and implement the Discovery Learning model with careful planning. They need to provide

contextual and challenging stimuli and strengthen the verification and reflection stages to optimally develop students' critical thinking skills, particularly in evaluation and conclusion-drawing. Furthermore, teachers are expected to effectively manage group work to ensure all students actively participate and collaborative skills develop equitably.

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