

Analysis Of Students' Critical Thinking Abilities In Science Learning Through The Snowball Throwing Model In Grade IV Of SDN 1 Sambik Elen

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Abstract

This study aims to describe and analyze in-depth the students' critical thinking skills in Natural and Social Sciences (IPAS) learning through the application of the Snowball Throwing cooperative learning model in grade IV of SDN 1 Sambik Elen for the Academic Year 2025/2026. The background of this research is driven by 21st-century educational challenges that require students to have critical thinking skills, but in reality, classroom learning is often still teacher-centered, resulting in passive and uncritical students. This study uses a qualitative approach with a descriptive method. The subjects were 4th-grade students and the homeroom teacher. Data collection techniques were carried out through observation of learning activities, in-depth interviews with teachers and students, and documentation. Data analysis used the Miles and Huberman interactive model, which includes data reduction, data display, and conclusion drawing. The results showed that the application of the Snowball Throwing model effectively facilitated the emergence of five main indicators of students' critical thinking, namely: (1) providing simple explanations by being able to identify questions; (2) building basic skills by actively seeking information from textbooks; (3) concluding by connecting materials to answer questions; (4) providing further explanations in the form of giving examples or responses to peers' answers; and (5) managing strategies and tactics through group collaboration and task division. In conclusion, the Snowball Throwing model creates an interactive, challenging, and enjoyable learning atmosphere, which qualitatively stimulates and improves students' critical thinking skills in IPAS subjects.

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1. INTRODUCTION

Education in the 21st century demands a significant transformation in the learning process, where students are no longer simply required to memorize material but must also be able to develop higher-order thinking skills (HOTS). One essential skill that is a primary focus in modern education is critical thinking (Nugraha & Rahman, 2023). Critical thinking is a cognitive process that involves analyzing, evaluating, synthesizing, and reflecting on information to produce logical and reasoned decisions or conclusions (Pertiwi et al., 2024). In elementary school, instilling critical thinking skills from an early age is crucial because it forms the foundation for students to solve problems in everyday life and at subsequent levels of education (Susanti, 2022).

In line with the implementation of the Independent Curriculum in Indonesia, Natural and Social Sciences (IPAS) plays a crucial role in bridging students' understanding of their natural and social environments comprehensively (Sari & Hidayat, 2023). IPAS not only aims to transfer factual knowledge but is also designed to cultivate science process skills and social inquiry. Through IPAS learning, students are expected to observe phenomena, ask questions, collect data,

and draw conclusions. Therefore, IPAS learning is ideally integrated with efforts to improve critical thinking skills (Kusuma & Larasati, 2025).

However, the reality on the ground often shows a different situation. Based on preliminary studies and observations conducted in fourth-grade students at SDN 1 Sambik Elen, it was found that students' critical thinking skills in science learning were still relatively low (Fitriani, 2023). Learning is still dominated by conventional methods such as lectures and individual assignments. Students tend to passively receive information from the teacher (teacher-centered learning) without strong encouragement to question, analyze, or discuss the material in greater depth. When faced with questions that require reasoning or problem-solving, most students struggle and are only able to provide short answers based on memorization of the text (Arikunto, 2021).

This low critical thinking ability is also reflected in students' lack of initiative in seeking additional information from various sources, their lack of courage to express opinions or refute inaccurate answers from peers, and their lack of collaborative skills in completing complex cognitive tasks (Yulianti, 2024). If this condition is allowed to persist, the primary goal of science education, which is to produce a generation that is critical, analytical, and solution-oriented, will not be optimally achieved.

To address these issues, pedagogical innovation is needed in the form of implementing innovative, interactive, and student-centered learning models. One learning model considered relevant and effective for stimulating critical thinking skills is the Snowball Throwing cooperative model (Lestari & Wardana, 2024). The Snowball Throwing model is a learning model that combines a communicative approach with games. In its implementation, this model involves forming groups, delivering material by the group leader to its members, creating questions on paper shaped like snowballs, throwing the balls between groups, and the process of answering the questions received (Fadhilah, 2022).

The advantage of the Snowball Throwing model lies in its ability to activate all five senses and students' cognitive domains. The process of formulating questions and answering questions from other groups forces students to think quickly, critically, and analytically (Pratama & Wijaya, 2025). Furthermore, the game element (throwing snowballs) creates a fun learning atmosphere and reduces tension, making students more confident and motivated to express their ideas (Hasanah, 2023). Working together in groups also trains social and collaborative skills, which are integral to critical thinking strategies and tactics (Mulyadi, 2024).

Several previous studies have demonstrated the effectiveness of cooperative learning models on learning outcomes. For example, research by Rahayu et al. (2022) showed that Snowball Throwing can improve elementary school students' learning engagement. However, research specifically analyzing students' qualitative critical thinking skills profiles through the Snowball Throwing model in science subjects in the Independent Curriculum era is still very limited (Nugroho, 2024). Most previous studies used a quantitative approach that only looked at score increases, without delving into how critical thinking processes occur interactively in the classroom (Sugiyono, 2022).

The scientific contribution of this study is therefore twofold. First, unlike prior quantitative studies such as Rahayu et al. (2022), which measured Snowball Throwing's effect on learning engagement or outcome scores at a single aggregate level, this study contributes a process-level, indicator-by-indicator qualitative profile of how each of the five critical thinking indicators concretely manifests within the syntax stages of Snowball Throwing (question formulation, information seeking, inference, argumentation, and strategic collaboration). Second, this study situates that profile specifically within IPAS learning under the Independent Curriculum, a subject and curricular context in which this combination has not previously been qualitatively documented. This positions the present study as complementary to, rather than a replication of, prior quantitative work, offering explanatory detail on the classroom mechanisms that produce the score gains reported in earlier studies.

Based on the research gap, the researcher felt it was important to conduct an in-depth and comprehensive study using a qualitative approach. A qualitative approach allows researchers to

observe, interview, and document every indicator of critical thinking that emerges naturally during the learning process. Therefore, this study was compiled with the title 'Analysis of Students' Critical Thinking Skills in Science Learning Through the Snowball Throwing Model in Grade IV of SDN 1 Sambik Elen in the 2025/2026 Academic Year'.

2. RESEARCH METHOD

This study used a qualitative approach with a descriptive qualitative approach. According to Moleong (2021), qualitative research aims to understand phenomena experienced by research subjects holistically, through descriptive words and language, within a specific, natural context. The choice of qualitative methods was based on the research objective, which was to describe and analyze in depth the process of developing students' critical thinking skills during the implementation of the Snowball Throwing learning model in science subjects (Sugiyono, 2022).

This research was conducted at Sambik Elen 1 Public Elementary School in the even semester of the 2025/2026 academic year. Subjects were selected using purposive sampling, a technique for determining samples based on specific considerations (Arikunto, 2021). The primary subjects were fourth-grade students directly involved in science learning using the Snowball Throwing model, and the fourth-grade teacher served as a key informant who comprehensively understood the students' characteristics and academic development.

The data collection procedure in this study involved three main techniques, namely: passive participant observation, in-depth interviews, and documentation (Creswell, 2023). Observations were conducted by the researcher during the science learning process to observe the emergence of five indicators of students' critical thinking, namely: (1) providing simple explanations, (2) building basic skills, (3) concluding, (4) providing further explanations, and (5) organizing strategies and tactics (Faisal, 2024). In-depth interviews were conducted with class teachers to confirm the results of observations regarding changes in students' cognitive behavior, as well as with student representatives to explore their cognitive processes when formulating and answering questions from the 'snowball'. Documentation included taking photos of learning activities, lesson plans/teaching modules, and a track record of research permit requests to the principal (Kusuma, 2025).

To ensure data validity in this qualitative research, the researcher employed triangulation techniques. The triangulation techniques employed included source triangulation (comparing data from student observations with teacher and student interviews) and technical triangulation (cross-checking data obtained from observations, interviews, and documentation) (Yin, 2022). Triangulation enhances the credibility of the data presented and makes it scientifically verifiable.

The collected data was then analyzed using the interactive qualitative data analysis technique from Miles, Huberman, and Saldana (2020), which consists of three main activities that occur simultaneously: data reduction, data display, and conclusion drawing/verification. In the data reduction stage, researchers select and focus on data relevant to critical thinking indicators. The data is then presented in a structured narrative text for easy understanding. Finally, researchers draw conclusions that fully address the focus of the research problem.

3. RESULTS AND DISCUSSION

Based on the results of observations, interviews, and documentation conducted during the implementation of science learning in grade IV of SDN 1 Sambik Elen using the Snowball Throwing learning model, qualitative findings were obtained that show the profile of students' critical thinking abilities. Data analysis focused on the emergence of five main indicators of critical thinking abilities, namely: providing simple explanations, building basic skills, concluding, providing further explanations, and organizing strategies and tactics (Sari, 2023). The following is a detailed presentation of the results and their discussion.

3.1 Providing Simple Explanations (Identifying the Focus of the Question)

The first indicator of critical thinking is a student's ability to provide a simple explanation, characterized by their ability to focus or identify the core of a question. In the

Snowball Throwing model, the stage of formulating and answering the questions on the thrown paper is a key moment for this indicator to emerge.

Based on observations, it was apparent that when students caught the 'snowball' and opened it, the first thing they did was carefully read the question with their group members. Fourth-grade students at SDN 1 Sambik Elen demonstrated good ability to break down complex questions into simpler parts. They no longer responded hastily, but instead engaged in brief discussions to determine what the question actually asked.

This was confirmed through an interview with a fourth-grade teacher who stated, "Since using this ball-throwing method, the children have become more focused. If previously they asked A and the answer was B, now they first analyze the core of the question, then look for the answer." (Teacher Interview, May 2026). This finding aligns with Yulianti's (2024) opinion, which emphasizes that the first step in critical thinking is clarity in understanding the problem or question before formulating a solution.

3.2 Building Basic Skills (Finding and Using Information)

The second indicator is building basic skills, where students can search for, select, and use credible information as a basis for formulating answers. In conventional learning, students often give random answers without any theoretical basis. However, through the Snowball Throwing model, an active information-seeking dynamic is created.

Observations showed that after the groups identified questions from the snowball, students proactively opened their science textbooks and notes. They searched for relevant information before writing down answers on paper or communicating them verbally. They recognized that their answers would be evaluated by both the question-making group and the teacher, so they felt the need to have a strong foundation (literature).

These findings indicate an increase in information literacy, a vital component of critical thinking (Pertiwi et al., 2024). Students use textbooks not merely as displays, but as primary reference sources to verify their initial hypotheses. This information-seeking activity trains students' advanced cognitive abilities to resist easily believing unsubstantiated information, which is very much in line with the nature of science learning (Sari & Hidayat, 2023).

3.3 Summarizing (Understanding and Connecting Information)

Inferring ability refers to students' ability to understand the content of a question, process the information they have gathered, and weave it into a reasonable answer or conclusion. In this study, the inferring process was clearly evident during student group discussions (Fadhilah, 2022).

Observations show that students don't simply copy sentences from textbooks. They think ahead and connect their answers to previously learned contextual material or experiences. For example, when asked about photosynthesis or ecosystems, students are able to construct their own sentences that represent a holistic understanding, not simply textual memorization.

The ability to connect various pieces of information into a logical conclusion is the essence of inferential reasoning (Nugroho, 2024). The Snowball Throwing model facilitates this by providing time constraints and positive intergroup competition, requiring students to think comprehensively yet efficiently when concluding.

3.4 Providing Further Explanation (Argumentation and Clarification)

The fourth indicator is providing further explanation, which requires students to be able to reason, provide concrete examples, provide additional information, or clarify a statement. During the presentation or evaluation stage of answers in Snowball Throwing syntax, healthy academic debate often occurs between groups.

Based on class documentation and observations, when a group reads out their answer and the answer is considered inappropriate or incomplete by another group, students from the other group dare to raise their hands and provide responses. Students can provide additional

explanations, such as 'Group B's answer is incomplete, because according to the textbook page 45, plants also need sunlight, not just water' (Observation Notes).

The emergence of arguments like these represents a significant achievement in critical thinking indicators for elementary-aged children. This demonstrates that a dynamic learning environment centered on peer interaction can shift students' psychological barriers, empowering them to argue, critique, and provide examples (Lestari & Wardana, 2024).

3.5 Setting Strategy and Tactics (Collaboration and Division of Tasks)

The final indicator relates to metacognition, namely the ability to organize strategies and tactics. In the context of group learning, this translates to the ability to collaborate, discuss, seek information in a structured manner, and share roles in completing assigned tasks.

During the Snowball Throwing exercise, each group of 4-5 students demonstrated strong group dynamics. The group leader, who had previously been briefed by the teacher, was able to organize their members. Some students were tasked with finding answers in books, others formulated answers, others wrote them down, and still others presented or threw snowballs. This division of tasks demonstrated that students possessed the tactical awareness to solve problems efficiently (Pratama & Wijaya, 2025).

According to Mulyadi (2024), these managerial and collaborative skills are part of a problem-solving strategy that is closely related to critical thinking. Critical-thinking students realize that group goals will be achieved more quickly if they work together and leverage the strengths of each member. The Snowball Throwing model effectively fosters the development of these soft skills.

3.6 Implications for Learning Practice

Taken together, the indicator-by-indicator findings above carry several concrete implications for classroom practice. Because the emergence of each critical thinking indicator was tied to a specific syntax stage of Snowball Throwing (question formulation for simple explanation, textbook referencing for basic-skill building, group discussion for inference, peer evaluation for further explanation, and role division for strategy setting), teachers can deliberately design and time their scaffolding around these stages rather than treating the model as a single undifferentiated activity. For instance, teachers who wish to strengthen argumentation specifically (indicator four) can allocate more time and explicit rubrics to the answer-evaluation stage, where cross-group critique naturally occurs, while teachers targeting information literacy (indicator two) can ensure adequate textbook or reference access before the question-answering stage begins. This suggests that the effectiveness of Snowball Throwing for critical thinking is not automatic but is mediated by how deliberately teachers structure and supervise each syntax stage, an implication that shifts the practical takeaway from simply "using this model" to "using this model with stage-specific pedagogical attention."

3.7 Comparison with Previous Research

The present findings can be positioned against several strands of previous research. Rahayu et al. (2022) found that Snowball Throwing improved elementary students' learning engagement, but reported this only as an aggregate outcome measure; the present qualitative findings help explain that improvement by showing that engagement likely stems from the specific syntax stages, ball-throwing, group evaluation, and role division, that were observed here to actively involve students rather than merely entertain them. Similarly, Fadhilah (2022) reported that Snowball Throwing improved elementary science learning outcomes, and the present study's indicator-level findings, particularly the observed growth in information-seeking behavior (Section 3.2) and inferential reasoning (Section 3.3), offer a plausible cognitive mechanism underlying such outcome gains. At the same time, this study's finding that argumentation and critique behavior (Section 3.4) emerged relatively spontaneously among fourth-grade students extends Lestari and Wardana's (2024) more general claim about the model's effectiveness for critical thinking by showing concretely, at the level of classroom talk, how that effectiveness manifests among elementary-aged learners specifically, a

population and grain of detail not addressed in most previous, more quantitatively oriented studies of this model.

4. CONCLUSION

Based on the results of qualitative research and in-depth analysis conducted in class IV of SDN 1 Sambik Elen in the 2025/2026 academic year, it can be concluded that the application of the Snowball Throwing type of cooperative learning model is very effective in facilitating and developing students' critical thinking skills in the science subject.

Specifically, this effectiveness is demonstrated by the visible development of five indicators of critical thinking skills during the learning process. First, students are able to provide simple, precise explanations by identifying the focus of the questions listed in the "snowball." Second, students are able to proactively build basic skills by searching for and using information from textbooks as a reference for answers. Third, students are able to draw logical conclusions by thinking before answering and connecting the information to previously learned material.

Fourth, this learning model encourages students to provide further explanations, enabling them to argue, provide reasons, and respond to or clarify answers from other groups deemed inappropriate. Fifth, students are able to develop strategies and tactics through collaboration, discussion, and structured task allocation within their groups to solve problems efficiently.

Overall, the Snowball Throwing model not only creates a fun and interactive learning environment through a combination of physical and academic activities, but also successfully shifts the learning paradigm from mere memorization to analytical and critical thinking. Therefore, it is recommended that teachers and elementary education institutions adopt this innovative learning model as a concrete effort to develop students' 21st-century skills.

More specifically, several practical suggestions are offered for teachers wishing to implement Snowball Throwing to develop critical thinking in elementary classrooms. First, teachers should design snowball questions with varying cognitive demand, from simple factual questions to questions requiring reasoning or application, so that all five critical thinking indicators have room to emerge rather than only the simpler ones. Second, teachers should allocate sufficient time and provide accessible reference materials (textbooks, charts, or notes) before the answering stage begins, since the emergence of information-seeking behavior in this study depended on students having something credible to search within reach. Third, teachers should explicitly invite and model constructive cross-group critique during the answer-evaluation stage, for example by asking evaluating groups "what would you add or correct?" rather than only judging answers as right or wrong, in order to deliberately cultivate the argumentation and clarification indicator. Fourth, teachers should rotate roles within groups (question formulator, information searcher, writer, presenter) across sessions so that every student, not only natural leaders, has repeated opportunities to practice the strategic and collaborative skills associated with the fifth indicator. Finally, teachers are encouraged to keep brief anecdotal notes on which indicators are and are not emerging during each session, using this simple form of formative observation to adjust scaffolding in subsequent Snowball Throwing sessions.

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