



## Critical Thinking Skills Profile in Plant Reproduction Material at the Elementary School Level

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### ABSTRACT

*Education is a continuous process that aims to develop individual potential holistically. With the change in the Pancasila Student Profile component in the educational curriculum in Indonesia, one of the main goals of education in the 21st century is to develop critical thinking skills. The primary aim of this study is to outline critical thinking skills in science education centered around Plant Reproduction materials at the elementary school level. A quantitative descriptive approach is employed, involving seventeen sixth-grade students from SD Negeri Ceweng as participants. The research tool used is a two-tier multiple-choice assessment. The assessment was designed based on six indicators of critical thinking skills: interpretation, analysis, evaluation, inference, explanation, and self-regulation. The finding revealed that students scored 37.05% (low category) in Interpretation, 57.65% (medium category) in Analysis, 79.4% (high category) in Evaluation, 73.5% (high category) in Inference, 57.65% (medium category) in Explanation, and 34.15% (low category) in Self-Regulation. In general, the students' average score for critical thinking was 56.57%, indicating a medium or relatively good level of critical thinking. This finding is expected to be a reference for educators to design more effective learning strategies in developing students' critical thinking skills, especially in science lessons in elementary schools.*

**Keywords:** Critical Thinking; Plants reproduce; Elementary School

### ABSTRAK

Pendidikan adalah sebuah proses berkelanjutan yang bertujuan untuk mengembangkan potensi individu secara holistik. Dengan perubahan komponen Profil Pelajar Pancasila dalam kurikulum pendidikan di Indonesia, salah satu tujuan utama pendidikan di abad ke-21 adalah mengembangkan keterampilan berpikir kritis. Penelitian ini bertujuan utama untuk mendeskripsikan keterampilan berpikir kritis dalam pembelajaran IPA yang berfokus pada materi Perkembangbiakan Tumbuhan di tingkat sekolah dasar. Penelitian ini menggunakan metode kuantitatif dengan pendekatan deskriptif. Subjek pada penelitian ini sebanyak 17 siswa kelas VI SD Negeri Ceweng. Instrumen yang dipakai adalah soal tes *two-tier multiple choice*, yang didesain berdasarkan enam indikator keterampilan berpikir kritis: Interpretasi, Analisis, Evaluasi, Inferensi, Penjelasan, dan Pengendalian Diri. Hasil penelitian menunjukkan bahwa pada indikator Interpretasi, siswa memperoleh persentase 37,05% (kategori rendah), Analisis 57,65% (kategori sedang), Evaluasi 79,4% (kategori tinggi), Inferensi 73,5% (kategori tinggi), Penjelasan 57,65% (kategori sedang), dan Pengendalian Diri 34,15% (kategori rendah). Rata-rata keterampilan berpikir

kritis siswa mencapai 56,57%, yang tergolong dalam kategori sedang atau cukup baik. Temuan ini diharapkan dapat menjadi acuan bagi pendidik untuk merancang strategi pembelajaran yang lebih efektif dalam mengembangkan keterampilan berpikir kritis siswa, khususnya dalam pelajaran IPA di sekolah dasar.

**Kata Kunci: Berpikir Kritis; Perkembangbiakan Tumbuhan; Sekolah Dasar**

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## INTRODUCTION

Education is a continuous process that aims to develop individual potential holistically. This process includes the development of knowledge, values, attitudes, and physical abilities. According to Article 3 of the Indonesian Law No. 20 (2003), national education aims to improve competencies and cultivate the character and culture of a respectable nation that strives to advance the welfare of its citizens. The aim is to develop students' potential to become individuals who possess faith, respect for God Almighty, and exemplary character, good health, knowledge, skills, creativity, independence, and to develop into democratic and responsible citizens. Thus education is a vital factor in a nation's advancement.

21st century education, also known as the era of the industrial revolution 4.0, is closely related to learning skills known as the 4Cs, namely creative thinking, critical thinking and problem-solving, communication, and collaboration (Jannah, D. R. N., dan Atmojo, 2022). Developed countries, which generally have high-quality education systems, require students to develop proficiency in critical thinking skills (Meilani et al., 2020). Critical thinking skills are vital competencies that students must develop in the 21<sup>st</sup> century, because critical thinking is the main tool in dealing with rapid change (Subahan et al., 2022). This dynamic process of thinking enables students to gather, examine, assess, and deduce data as well as recognize discrepancies in information (Anugraheni, 2020). Critical thinking requires students to be more thorough, focus on the main problem, and thoroughly evaluate each piece of complex and challenging claims and arguments. This critical thinking skill is essential for students to possess when confronting real-life challenges, particularly in grasping scientific concepts.

As one of the competencies of the 21st century, the ability to think critically is one of the mandatory and basic competencies to be given to students, so in this case, educators and educators are expected to use all their abilities (Asrowi et al., 2025). Students' critical thinking abilities may be evaluated using critical thinking indicators. Facione (2015) mentions six aspects of critical thinking, namely interpretation, analysis, evaluation, conclusion, explanation, and self-regulation. Interpretation is the ability to understand and explain the meaning of a situation, data, event, procedure, or criterion (Facione, 2015). Analysis is the ability to accurately analyze meaning in the form of statements, concepts, descriptions, arguments, or reasons (Facione, 2015). Evaluation is the skill of judging the reliability of other presentations by offering an overview of perspectives, situations, or decisions using logic in various forms of rational representation (Facione, 2015). Conclusion is the ability to identify and establish the criteria necessary to produce conclusions or hypotheses related to relevant information (Facione, 2015). Explanation is the ability to describe the results, evaluate arguments based on certain evidence or criteria rationally, and present convincing arguments (Facione, 2015). Self-regulation is related to personal awareness to evaluate one's ability to present arguments, make conclusions or decisions with the aim of future improvement

(Facione, 2015). Empowerment of critical thinking is very important in learning to achieve optimal quality.

The execution of learning activities aimed at fostering thinking skills has been incorporated into the framework of the Independent Curriculum through the Pancasila Student Profile. This profile includes six dimensions, namely: (1) having faith, fearing God Almighty, and having noble character; (2) global diversity; (3) independent; (4) working together; (5) critical reasoning; and (6) creative (Sufyadi et al., 2021). These six traits and competencies are intended to be cultivated and integrated into the student's identity. Critical reasoning has four main elements, namely obtaining and processing information or ideas; analyzing and evaluating its reasoning and procedures; reflecting thoughts and thought processes; and making decisions (Sufyadi et al., 2021).

Education in elementary school is the beginning of a child's foothold to hone basic skills such as intelligence, knowledge, personality, and thinking skills are interconnected, with the ability to think being a mental process used to develop and acquire knowledge (Dicky Dermawan & Maulana, 2023). However, in reality, students often face difficulties in developing critical thinking skills, especially at the sixth-grade level of elementary school, which is the final stage of basic education. In its implementation, the desired hope is that science learning can be a means for students to understand themselves, the environment, and the prospect of developing the application of knowledge in daily life (Barus, 2022). Science learning has highly complex characteristics as it necessitates critical thinking skills for problem analysis. One of the expected outcomes of science education is the improvement of students' critical thinking skills. This is because science learning can be a provision for students to face various challenges in the global era (Oktarizka & Abidin, 2024).

At the elementary school (SD) level, material on plants reproduces an important part of the science curriculum for sixth-grade. Understanding plants reproduce helps students understand how plants reproduce and maintain their survival. According to Abidin et al. (2023), This learning is also crucial for raising students' awareness of the significance of biodiversity, which is an important foundation in science learning. However, students' critical thinking ability in understanding the concept of plant propagation material is still low due to several problems. The first problem found was the focus of students' attention during science learning. This is because students have the assumption that science is difficult to learn so that from the existing mindset there is no interest in learning it more deeply. Of course, this has the result of the lack of concepts that are the basis for students. Research conducted by Barun (2017) discusses that there is a positive relationship between interest in learning and critical thinking skills. In addition, the learning methods used by teachers are still conventional and less interesting. Learning at school should motivate students to build the skills to search for, analyze, and critically evaluate information (Susanti et al., 2019). Regrettably, the level of critical thinking skills among Indonesian students remains low and requires enhancement (Azizah et al., 2018). The objective of this study is to describe the profile of students' critical thinking skills in plant reproduction materials in elementary schools (Kurino et al., 2023). These materials can be used as a basis for educators to develop critical thinking skills in their students.

## METHODS

## Type and Design

This study takes a descriptive approach while using a quantitative strategy. The descriptive method is used to create a systematic, factual and accurate description of the existing phenomenon. The data in this study will then be analyzed using inductive qualitative research, focusing on meaning rather than generalization (Zuchri, 2021). The research was carried out in August 2024 at SD Negeri Ceweng, Diwek District, Jombang Regency.

## Data and Data Sources

The subjects in this study are sixth-grade students totaling 17 students. The aim of this study is to determine the profile of students' critical thinking skills when studying material about plant reproduction. The researcher used the test in its data collection. Students who are participants in the study complete test questions using a google form consisting of 12 questions in the Science Lesson with plant reproduction material.

## Data collection technique

The method employed for data collection is a test, with an instrument in the form of a two-tier multiple choice test question in the science subject on Plants reproduce, which is compiled based on the following measures of critical thinking abilities: Interpretation, Analysis, Evaluation, Inference, Explanation, and Self-Regulation, which have been validated by experts (Facione, 2015). This form of two-tier multiple choice requires students to critically analyze and evaluate questions, which leads to problem-solving and critical thinking skills (Rintayati et al., 2020). Two-tier multiple choice questions are modifications of multiple-choice questions consisting of two levels of questions. The first level includes a conceptual question, while the second level asks the reasons underlying the answer in the first level. The application of this two-tier multiple choice test helps improve students' thinking skills through the selection of the most appropriate answers based on the questions asked. The two levels of questions function as stimulus and response, where the first question acts as a stimulus, and the second question is a response to the stimulus.

## Data analysis

The data analysis procedure begins with data reduction, then the data will be presented, and finally conclusions will be drawn (Miles et al., 2019). The final scores from the student test are utilized to assess the achievement of critical thinking ability indicators using the following calculation formula:

$$\text{Percentage (P)} = \frac{\text{Score obtained}}{\text{Total Score}} \times 100\%$$

The criteria for critical thinking skill levels are as follows:

Table 1. Criteria for students' critical thinking skills level

Percentage (%)	Criterion
81 – 100	Very High
61 – 80	High
40 – 59	Medium
20 – 39	Low
0 – 19	Very Low

(Diani et al., 2017)

## RESULTS AND DISCUSSION

According to the research carried out at SD Negeri Ceweng, Diwek District, Jombang Regency, the average percentage of critical thinking skills in each indicator, as well as the average of the overall indicators of 17 sixth-grade students in the plant reproduce material, are shown in the following table 2.

Table 2. Results of the calculation of students' critical thinking skills

It	Indicator	Percentage	Criterion
1	Interpretation	37,05%	Low
2	Analysis	57,65%	Medium
3	Evaluation	79,4%	High
4	Inference	73,5%	High
5	Explanation	57,65%	Medium
6	Self-Regulation	34,15%	Low
	Average	56,57%	Medium

The data presented in Table 2 indicates that the Interpretation and Self-Regulation indicators have percentages with low criteria, namely 37.05% and 34.15%, respectively. Meanwhile, the evaluation indicator showed a percentage of 79.4%, and the Inference indicator reached 73.5%. Overall, students' average critical thinking skills were 56.57%, which was included in the moderate or fairly good criteria.

Based on the data in table 2 regarding the results of the calculation of students' critical thinking skills, it can be seen that the Self-Regulation indicator has the lowest value, which is 34.15%. Here is a table showing the Self-Regulation indicator instruments.

Table 3. Self-Regulation indicator instrument


Indicator	Percentage	Criterion
Students are able to apply their knowledge and skills to solve problems creatively and innovatively	11. You want to plant a mango plant seedling in your yard. In order for the mango plant to thrive and bear abundant fruit, what are the things you need to pay attention to? A. Water the plant daily. B. Choose a large and strong pot. C. Choose the type of mango you like. D. Prepare loose and fertile soil.	D
	12. After doing the thing you chose in question no. 11, what other steps do you need to take in order to take care of the mango plant so that it grows healthy? A. Preparing the soil, planting seedlings, watering regularly, fertilizing regularly, pruning	A

- B. Choosing a location exposed to the sun, planting seedlings, watering, fertilizing.
- C. Buying superior seedlings, planting in pots, watering, pruning.
- D. Watering, fertilizing, fertilizing, pruning.

Self-regulation is the ability related to an individual's consciousness to assess one's ability to present arguments, draw conclusions, or make decisions for future improvement (Facione, 2015). The sub-skills of self-regulation indicators include self-assessment and self-evaluation. Students are anticipated to be capable of assessing a problem and determining actions that are appropriate to the situation they are facing. Critical thinking requires awareness of thought processes and reflection on one's own and others' thoughts, or in other words, metacognition (Aston, 2023). The contextual issues posed in the questions relate to the students' daily lives. However, students still have difficulty solving problems on self-regulation indicators because of the type of questions that are conceptual, while they have not learned the concept of how plants reproduce. Most students choose option A in question 11 and B in question 12.

Additionally, the indicator that holds the highest percentage is the Evaluation indicator, at 79.4%.

Table 4. Evaluation indicator instrument

Indicator	Percentage	Criterion
Students are able to evaluate the positive and negative impacts that humans have on plant reproduction	5. 	D
	The way of propagation of mango plants that Mr. Anton is doing is ... A. Seed B. Sprout C. Cuttings D. Grafts	
	6. Do you think that transplanting mango plants is an effective way to produce new mango plants? A. Yes, because this method is fast and produces plants that are exactly the same as the parent. B. No, because this method takes a long time and the success rate is low. C. Yes, because grafted plants are more resistant to pests and diseases.	A

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D. No, because this method cannot produce new varieties.

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Evaluation is the ability to assess the credibility of information from other sources by describing perceptions, situations, or decisions using logic in various forms of rational representation (Facione, 2015). Each student has a different level of critical thinking skills. Critical thinking skills are not acquired naturally, but rather through a long process that begins at an early age. Some of the factors that affect critical thinking skills consist of psychological and sociological factors. Psychological factors are related to the way of thinking of humans, where critical thinking generally requires independence. Sociological factors include the pressure to adapt, affiliation with a group, and an understanding of the social experiences around them.

According to Aston (Aston, 2023), other factors that affect critical thinking skills are educational factors, which are related to learning methods applied in schools; student factors, which include learning objectives, motivation, desire to learn, and emotions; and childcare factors, which are related to parenting attitudes and habits. One of the factors that affects critical thinking, as mentioned earlier, is the educational factor that focuses on learning activities in school.

Test results indicating that students' average critical thinking skills fall within the moderate or fairly good category should prompt educators to take action to further enhance these abilities. One way educators can empower critical thinking skills is through student-centered learning, such as collaborative learning and constructivist approaches (Aston, 2023). In line with Slameto's (2017) opinion, group learning or cooperative skills are indispensable and are one of the strategies to improve critical thinking skills. In addition to applying a constructivism and cooperative approach, learning based on a scientific approach can also be implemented to practice critical thinking skills. The scientific approach emphasizes the application of scientific methods in the learning process, so it is relevant to hone students' critical thinking skills (Liana, 2020). The empowerment of critical thinking skills in a sustainable manner will shape students to become problem solvers who are able to face challenges in daily life, thereby creating productive and superior Indonesian students in the 21<sup>st</sup> century era, and with character in accordance with the Pancasila Student Profile. In alignment with 21<sup>st</sup>-century education, often referred to as the era of the Fourth Industrial Revolution, learning can also take place alongside the utilization of digital technology and the skills required for the 21<sup>st</sup> century (Jannah, D. R. N., dan Atmojo, 2022).

## CONCLUSION

Critical thinking skills are one of the important skills that elementary school students must have to face challenges in real life, including in understanding science concepts. Critical thinking skills require students to be more thorough, purposeful and deliberately focus on the main problem, and evaluate all parts of its complex and challenging claims and arguments. The preliminary profile of sixth-grade elementary students' critical thinking skills in science lessons regarding plants reproduce material showed an average result of 56.57% which was included in the medium criteria. The outcomes of the student ability assessment for each critical thinking indicator are as follows: the Interpretation indicator recorded a percentage of

37.05% with the low category; the Analysis indicator reached 57.65% with the medium category; the Evaluation indicator got a percentage of 79.4% with the high category; the Inference indicator showed a percentage of 73.5% with the high category; the Explanation indicator recorded a percentage of 57.65% with the medium category; and the Self-Control indicator reached 34.15% with the low category. Teachers can use these findings as a foundation to help children, especially those in elementary school, develop their critical thinking abilities. With the ability to think critically, it can motivate students to have new ideas, ideas or thoughts related to a problem in daily life.

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