Analysis of Science Students Critical Thinking Skill in Junior High School

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Abstract. This study aims to determine the analysis of critical thinking skills of junior high school students in science lessons. This study uses descriptive qualitative research to analyze the results of tests of students of critical thinking skills of seventh-grade students in one of the junior high schools in Sukoharjo Regency, Indonesia. The method used is survey research with samples determined by purposive sampling technique. Subjects of the study sample consisted of 240 students of class VII Junior High School 2018/2019 academic year. The instrument used is a test of critical thinking skills that are adapted to aspects of critical thinking skills according to Facione. The question consists of 6 test items that have been developed by researchers and validated by experts. The results showed that critical thinking skills in every aspect were still in the low category. The results of the acquisition of each aspect of critical thinking skills are interpretation aspects by 33.84%, aspects of analysis by 33.79%, aspects of evaluation by 32.00%, aspects of inference by 34.93%, aspects of explanation by 36.59%, aspects of self-regulation by 34.29%. This is the conclusion of the critical thinking skills of junior high school students in natural science subjects in the low category.

Keywords: Analysis; Critical thinking skill; Junior high school.

1. Introduction
The progress of the 21st-century has seen a shift in various fields caused by the development of information, knowledge, and innovation [1], [2]. This shift causes all countries to compete globally. Global competition requires every individual to have 21st-century skills to use new technology to survive in the globalist era [3], [4], [5]. Therefore, it requires the contribution of competent and knowledgeable Human Resources [6]

Education is one of the institutions that play a role in advancing science and technology. Education must continually adapt to changes in the development of increasingly modern science and increasingly sophisticated technology. Science is a science concept that is always related to everyday life [7], [8], [9]. Critical thinking skills are an important part of educational goals [10], [11]. Therefore, critical thinking is needed to be able to understand the concept well [12], [13].

Critical thinking skills are the process of challenging individuals to reflect reflective, systematic, logical, scientific, clear and rational, rational thinking to collect, interpret and evaluate information in making decisions [14], [15], [16]. Reflective means actively considering carefully all alternatives before making a decision. Critical thinking skills have six aspects which include aspects of interpretation, aspects of analysis, evaluation aspects, aspects of inference, aspects of explanation, aspects of self-regulation [17] and become a key component of current education [18].
Critical thinking skills are very important to be owned by everyone so that they can protect themselves and make decisions wisely in everyday life [19], [20] and are able to compete in the global era. Therefore, the most important final goal in the 2013 curriculum is to produce graduates who have critical, logical and creative thinking. Critical thinking skills build concept understanding, therefore by understanding the concept appropriately students are expected to be able to explore their critical thinking as well as vice versa [21], [22].

Students can be trained in critical thinking skills so that they are trained and adept at using their thinking skills [23], [24], [25]. Critical thinking skills have a very important role in developing knowledge, understanding, ideas of ideas, relevant perspectives and intellectual thinking skills [26], [27], [28]. Natural Sciences learning needs to develop critical thinking skills because it can improve critical thinking, reasoning, understanding students and solve an existing problem [29], [30].

Science learning process is expected to explore the development of critical thinking skills to the maximum [31], [32], [33], [34]. Teachers as educators can use appropriate methods, strategies, techniques and learning models to promote the development of critical thinking [35], [36]. Learning effective science that encourages students to strengthen their critical thinking through problem-solving skills [37], [38].

Science learning in school is in fact learning teacher-centered, still theoretical, students who have difficulty explaining objects, cannot identify an object, students are less active in learning process activities. Students are not given the space to construct knowledge, develop concepts, experiences, skills, and skills that are lacking so that it is necessary to develop exploration of the potential for improving critical thinking skills. Based on the above, the research was conducted in order to determine of analysis the critical thinking skills students middle school to science.

The rest of this paper is organized as follow: Section 2 describes the proposed research method. Section 3 presents the obtained results and following by discussion. Finally Section 4 concludes this work.

2. Research Method

This study used descriptive research qualitative to analyze the results of the test of skilled students and critical thinking of seventh grade students in one of the junior high schools in Sukoharjo Regency, Indonesia. The method used is survey research with samples determined by purposive sampling technique. Subject research sample were 240 students of class VII academic 2018/2019. The instrument used is a test of critical thinking skills that are adapted to aspects of critical thinking skills by Facione [39]. The question consists of 6 test items that have been developed by researchers and validated by experts. An essay test instrument was developed to measure students' critical thinking skills in each aspect explored with a test item. The assessment of the results of the critical thinking skills test using the scoring rubric of 1-4 for each item of the test questions was analyzed and then categorized. Calculation of the percentage of critical thinking skills with the formula:

\[
NP = \frac{R}{SM} \times 100\%
\]

Where NP = expected percentage value, R = raw value obtained, and SM = maximum score.

| Score limit | Criteria          |
|-------------|-------------------|
| ≤ 59%       | Less once/low     |
| 55 - 59%    | Less              |
| 60 - 75%    | Sufficient        |
| 76 - 85%    | Good              |
| 86 - 100%   | Very good         |
3. Results and Discussion

3.1 Data analysis of students’ critical thinking skills in Junior High School

The results of the data obtained from the study are presented in Figure 1. Figure 1 shows the results of measurement data in the form of tests of critical thinking skills of junior high school students in science lessons.

The histogram image can be seen in Figure 1. The figure shows the histogram results of the analysis of the percentage of critical thinking skills of junior high school students in science lessons.

![Histogram Results](image-url)

**Figure 1.** Histogram results of the analysis of the percentage of critical thinking skills of junior high school students in science lessons.

Critical thinking skills in aspects of interpretation have three sub-skills including categorization, solving meaning, and clarifying meaning. Categorization is used to capture and formulate categories, differences, frameworks, and describe information so that it can understand its meaning, for example sorting and sub-classifying information, making reports about things experienced, and classifying findings or opinions data. Coding signification is used to detect, present, and explain the content of information presented in a communication-based convention. Clarifying meaning is used to make explanations through determination, description, an analogue of the meaning of words, ideas, concepts, numbers, images, symbols, charts, graphs and certain events [39].

The emergence of aspects of skills in learning Science is still in the category low because the majority of students show skills in understanding and expressing the meaning or meaning of a given learning experience but are still limited and still weak and construct the meaning or meaning of their own knowledge. It can be seen from the activities of the students answered questions pada aspect of interpretation obtains percentage results of 33.84%. Students have mostly answered questions still limited interpretation bias against the evidence, statements, graphics, questions, information, or viewpoints that are less relevant to many students who still have the critical thinking skills pada aspect of the interpretation in the category of low student [40].

Critical thinking skills on aspects of the analysis have three sub-skills include reviewing ideas, detecting arguments and analysis of the argument. Assessing ideas is used to identify terms, compare ideas, concepts or statements and identify problems and determine the relationship of component parts of the problem. Identifying the argument is used to determine a statement, description, question and graph representation that has revealed a particular point of view/explanation or not. Analyzing
arguments is used to provide reasons for responding to or supporting certain statements, opinions, or points of view [39]. It can be seen from the activities of the students answered questions on the aspect of analysis obtains percentage results of 33.97%. Student answers clearly show that students cannot analyze and evaluate questions correctly. Students cannot analyze the problem correctly because they do not find a relationship between concepts that can be used in solving problems. Students also appear to be able to determine important information, can formulate it, and can find concepts that can be used in solving problems so that critical thinking skills and analysis of students can also be said to be the majority at the category low level [40].

This can be seen from the students' skills in analyzing the items that are still lacking in the majority of students seen from the students' answers on the questions sheet and the statements submitted by most students are still weak. Students are also still very poor at identifying or quickly rejecting strong and relevant counter-arguments. In addition, students are lacking in identifying strong and relevant counter-arguments. The aspect of analysis should be categorized as good if students are able to identify, analyze a relationship regarding questions, concepts, descriptions or other intended to express trust, judgment, experience, reasons, information or opinions [41, 42].

Critical thinking skills on aspects of evaluation are having two sub-skills, namely assessing questions and assessing arguments. Evaluation aspects are used to assess the credibility of other questions or presentations by assessing or describing a person's preparation, experience, situation, decision, trust, and assessing the logical strength of the expected inferential relationship or actual inferential relationship between statements, descriptions, questions or forms of representation others [39]. It can be seen from the activities of the students answered questions pada aspect of evaluation obtains percentage result of 32.00%. There are students still many who are wrong in completing items about the problem and have difficulty working on it, so students are not able to evaluate the problem properly, if students have not been able to reproduce the statement to conclude. Students are many who still have the critical thinking skills pada aspect of evaluation in the category of low student [40], [43].

Critical thinking skills on aspect inference are to have three sub-skills include asking the evidence, alleged alternative and make conclusions. Conclusion aspects are used to identify and select elements needed to form reasonable conclusions or to form hypotheses by paying attention to relevant information and reducing the consequences of data, questions, principles, evidence, judgments, beliefs, opinions, concepts, descriptions, questions or other forms of representation [39]. It can be seen from the activities of the students answered questions pada aspect conclusion obtain percentage results of 34.93%. These results indicate that students' skills in new conclusions are limited to the basic conclusions of what is obtained. Students have not been able to explore conclusions that are deeper than what is observed and analyzed in science learning. This is supported by the students' arguments which are written on the item question sheet which is only able to bring the basic conclusions and statements expressed by students in concluding also still lacking [40]. Therefore, the conclusion aspects that appear in students are generally still at the category low level.

Critical thinking skills on explanation are to have three sub-skills include stating results, justifying procedures and presenting the arguments. Explanatory aspects to state the results of one's consideration process, ability to justify that a reason based on evidence, concept, methodology, a certain criterion, and reasonable consideration, and the ability to present one's reasons in the form of convincing arguments [39]. It can be seen from the activities of the students answered questions pada aspect obtaining explanations percentage results of 36.59%. Students are still less skilled and less accustomed to making explanations describing methods and results, justifying procedures, proposing and giving with good reason [43]. The conceptual explanation of events or points of view, and well-reasoned presentation, arguments in the context of seeking the best understanding [59]. Students who still have a lot of critical thinking skills pada aspect of the explanation in the category low

Critical thinking skills on self-regulation have two sub-skills include self-regulation and self-correction. The self-regulation aspect is used to monitor a person's cognitive activities, the elements used in the activity, and the results developed, especially by applying skills in analysis, and evaluation
to someone inferential judgment himself with a view towards the question, confirming, validating, or correcting good reasoning [39]. It can be seen from the activities of the students answered questions pada aspect conclusion obtain percentage results of 34.29%. Students are still less able and skilled at self-regulation and self-correction in solving problems related to everyday life [40]. Therefore, students’ critical thinking skills on aspects self-regulation of is still at a level category lower.

Students in general have critical thinking skills in the category low. This matter illustrates that students’ critical thinking skills are still in the form of pieces that are sometimes not relevant to facts and less comprehensive so that most students have not been able to construct a critical argument or even a conclusion answering problem items in solving problems [39], [17], [45], [41].

The results generally show that the analysis of science student’s critical thinking skills in junior high school. Automatically in every aspect of critical thinking skills are not met because they are less able to solve problems. This shows that aspects of analytical skills, evaluation aspects, aspects of inference, explanatory skills, and aspects of self-regulation in every aspect of critical thinking skills of students are still classified as low [37], [46].

Based on the results of the percentage of tests about critical thinking skills that have been given. The results of the students’ interviews regarding their obstacles when working on the questions given. Students said that they found it difficult because they forgot the material and the students claimed they did not pay attention to important things in the questions given, so their answers were still incorrect. Students lack skills because they only memorize, and forget the material in solving the problem and lack of training so students experience difficulties in solving problems. Students know a concept but not necessarily students can apply how to use it. Many students are unconscious and confused to apply their knowledge and concepts to solve a problem [40], So students need to exercise frequently so that trained students apply the concepts they have [23], [24], [47], [5], [48]. Critical thinking skills are skills which can be empowered in many ways such as through learning models, teaching materials, open-ended, questions conceptual questions, socratic questions, assignments, use of stories, and literature [49], [50], [51], [52]. Students are given the opportunity to reflect on their questions, problems and experience experiences so as to improve critical thinking skills in each aspect [53], [54].

The level of critical thinking skills can continue to be empowered because these skills get a lot of influence from the learning experience so that activities that can develop these skills need to be trained to students more often [55], [21], [56]. The hope is that when the level of critical thinking skills that students already have been identified, the teacher can prepare ways to improve properly so that students can have skills that are one of the demands of the 21st-century development [57], [58], [59].

4. Conclusion
The results of the study can be concluded that the critical thinking skills of Grade VII students of State Junior High School are still categorized as low. Students have critical thinking skills with a lack of understanding. Teachers as educators hope to be able to design learning activities that can improve students’ critical thinking skills in every aspect maximally.

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