Analysis of Critical Thinking Skills of Senior High School Students in Biological Learning

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Abstract. This study aims to describe the critical thinking skills in students of XI (eleventh) grade. The type of this research was descriptive. This research was carried out on students of XI grade (N = 108) by working on tests of critical thinking skills with instruments adapted from Facione including interpretation, analysis, evaluation, explanation, conclusion, and self-regulation. The results showed that students' critical thinking skills in interpretation were in the high category 77%, while in analysis was 46%, evaluation was 51%, explanation was 45%, conclusion was 54%, and self-regulation was 57%, which were classified as low category. For an average of all indicators, it was 55%. The conclusion of this study showed that students' critical thinking skills were still in the low category, so that the development was needed in the learning process to be able to improve several indicators of critical thinking skills.

1. Introduction

The development of 21st century requires high quality human resources to compete in a global world that has critical thinking, communication, collaboration, and creativity skills, which later referred to as "Four Cs" (communicators, creators, critical thinkers, and collaborators) [9]. In line with it, BSNP states that critical thinking skills are one of the competencies that 21st century human resources must possess [1]. Critical thinking is a form of thinking that needs to be developed in every student. Fascione [2] states that critical thinking is an ability that influence a person's future life. This is because critical thinking skills make a person to be a good decision maker. The importance of critical thinking skills is also expressed by Pitt [8] which states that critical thinking skills are important skills for students to process information, solve problems and make judgments [9]. According to critical thinking is important for the future of students, considering the fact that it prepares students to face many challenges that will arise in their lives, careers and at the level of their personal obligations and responsibilities.

Based on the explanation above, it is clear that critical thinking skills are very important. However, the reality in the field shows that students' critical thinking skills are still low. Some studies show that students who have low critical thinking skills tend to get low learning outcomes compared to students who have high critical thinking skills [3, 4]. Problems related to the low critical thinking skills do not only occur on national scale but also occur on an international scale. The results of the PISA’s (Program for International Student Assessment) study showed that students' critical thinking skills are still low. Indonesia ranked 60th out of 65 participating countries in 2009, 64 from 65 participating countries in 2012, and ranked 69th out of 75 participating countries in 2015 [7, 8].

Based on this background, a study is carried out which aims at analyzing critical thinking skills of students of State High Schools in Surakarta Regency. After obtaining the results of the initial research,
it is expected that the teacher will be motivated to design learning activities that are able to empower students' critical thinking skills so that students' critical thinking skills will improve.

2. Materials and Methods
This research was a descriptive study using instruments developed based on aspects of critical thinking skills according to Facione [2] which include interpretation, analysis, evaluation, explanation, conclusion, and self-regulation. The sample in this study used the XI grader students of the Natural Sciences Program and 108 high school students in Surakarta were selected through purposive sampling technique. The data was obtained from the analysis of student answers. Data was obtained by coding each student's answers and printing each student's answers based on the assessment rubric. Based on the rubric, the researcher can determine whether students fulfilled each indicator of critical thinking skills or not in solving the problems contained in the problem. The method for calculating the percentage value was as follows:

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Percentage\ Score = \frac{Obtained\ Score}{Maximum\ Score} \times 100\% \tag{1}
\]

The percentage value of critical thinking skills obtained from calculations was then categorized based on table 1.

| Interpretation (%) | Category        |
|--------------------|-----------------|
| 81.25 < X ≤ 100    | Very high       |
| 71.50 < X ≤ 81.25  | Height          |
| 62.50 < X ≤ 71.50  | Medium          |
| 43.75 < X ≤ 62.50  | Low             |
| 0 < X ≤ 43.75      | Very low        |

3. Results and Discussion
Based on the analysis of the test results, the data obtained was the critical thinking skills of students of XI grade was still relatively low with an average overall indicator of 55%. The test results of students' critical thinking skills based on each indicator in figure 1 showed that there was only one indicator that showed a high category, namely interpretation indicator of 77%. While for the other 5 indicators were still in the low category, namely 46% of analysis, 51% of evaluation, 45% of conclusion, 54% of explanation and 57% of self-regulation.

![Figure 1](image-url)
Critical thinking skills test produced a score on indicator 1 in which it interpreted a high criterion of 77%. This showed that students had competent skills in describing the problems given. Besides, students could write the meaning of the problem clearly and precisely. In indicator 2, the analysis showed a low category of 46%. This showed that the ability of students to identify the relationship of information that was on the problem to express thinking was not maximized. Therefore, it was necessary to have sufficient material understanding because it would influence in determining the concepts used in working on the problem. Furthermore, indicator 3, namely evaluation, showed a low category of 51%. Based on the results of the test, it could be concluded that only some students could do an evaluation. This showed that students had not been able to assess the credibility of the results of the problems that had been resolved.

In indicator 4, the explanation, it showed a low category of 45% of students who did not write conclusions at the end of the answer. They were still confused in identifying and obtaining the elements needed to make a reasonable conclusion. Indicator 5, which was explanation, showed a low category of 54% indicating that students had difficulty understanding the information on the problem so that the outcome of the solution was incorrect and did not know the reason for the solution. And in indicator 6 that was self-regulation, 57% showed low category. The ability of students was low in skill activities to question, confirm, validate, or correct one of the reasons or results of a person.

The low critical thinking skills of student occurred because the learning process that had not yet trained critical thinking skills. It was in line with the results of the PISA’s study from 2009 to 2015 which showed that critical thinking skills of Indonesian students were still low. In fact, critical thinking skills were one of the competencies needed in the 21st century. The achievement of 21st century critical thinking skills could be done by renewing the quality of learning processes that can help students improve and develop participation, encourage collaboration and communication and civilize critical thinking skills so that learning could be centered on students with guidance and supervision from the teacher. The learning process could succeed if the results were able to bring changes in knowledge or understanding, skills, attitudes, and values to students. The interaction between the teacher, content or subject matter, and involving students and infrastructure, such as methods, media, and structuring the learning environment were greatly needed so that the teaching and learning situation was created to achieve critical thinking skills.

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