

Analysis of Students' Critical Thinking Skills in Secondary Schools on Plants' Structure and Functions Material

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Abstract: The purpose of this study was to find out the initial profile of students' critical thinking skills on plants' structure and function materials. The research method used is a descriptive quantitative method. The sample used was 259 students. The instrument used for data collection is multiple choice test questions based on critical thinking skills indicators on plants' structure and function materials that have been validated from the expert evaluation team and statistics parameters including validity, reliability, discriminating power, and difficulty level. Questions were created based on 6 indicators of critical thinking skills, namely interpretation, analysis, evaluation, explanation, and self-regulation. The results showed that students' critical thinking skills in the interpretation indicator had a percentage of 58.3% with less categories, analysis indicators had a percentage of 35.1% with less categories, evaluation indicators had a percentage of 38.2% with less categories, inference indicators had a percentage of 39, 7% with less categories, explanatory indicators have a percentage of 38.2% with less categories, and self-regulation indicators have a percentage of 39.7% with less categories. Based on the results, it can be seen that the average critical thinking skills of students is 41.53% which shows students' critical thinking skills on plants' structure and function materials are still low.

Keywords: *critical thinking skills, plants' structure and function materials, the 21st-century*

INTRODUCTION

The development of the 21st century requires humans to be able to adjust themselves related to the development of science and technology. A very complex challenge for national education in the current global era is preparing HR (Human Resources) who are qualified and able to compete. One effort to prepare high-quality human resources is through education. Education is expected to be able to develop the competencies needed in 21st-century skills in learning, namely the skills of communication, collaboration, critical thinking, and creativity (Trianto, 2011). The 21st-century human resources must have the ability to think (critical, creative, learner, able to make decisions), the ability to collaborate, the ability to communicate, independently, and master the knowledge and technology that is formed through the learning process. Critical thinking ability is one of the fundamental competencies that students must possess to solve various problems in all aspects of life (Moeloek, et al., 2010).

Critical thinking is the ability to make decisions that will be carried out or believed by logical and reflective thinking (Ennis, 2011). The ability to think critically includes two things, namely critical thinking disposition and critical thinking ability. Critical thinking ability consists of 6 indicators, namely interpretation, analysis, explanation, inference, evaluation, and self-regulation (Facione, 2015). Critical thinking ability is one of the Higher Order Thinking Skills (HOTS) that is needed to make objective, reflective, and fair thinking

judgments (Brookhart, 2010). Critical thinking ability has long-term benefits in the field of education because it can help students solve problems faced in the learning process and its application in daily life (Kaddoura, 2011). Critical thinking is an attempt to test knowledge based on evidence that supports and is believed to be true to conclude (Asmawati, 2015). One interesting science learning to train students' critical thinking skills is material about plants (Rusli, 2014). So far, grade VIII science subjects in junior high school are considered to be one of the subjects with a high level of difficulty. One material that is considered by students is quite difficult to understand is the material structure and function of plants. Based on the results of interviews with students, the material structure and function of plants are considered material that is difficult to understand, especially memorizing the Latin names of plants and various types of plant tissue. According to the teacher, students are still having difficulty understanding the relationship between the structure and function of plant tissue. Based on these problems, it is necessary to research students' critical thinking skills in plant structure and function material. The purpose of this study was to analyze the initial profile of students' critical thinking skills in plant structure and function material.

METHOD

The research method used is quantitative descriptive methods. This research was conducted in one of junior high school in Surakarta. The population of the research were all students from VIII grade through the academic year 2018/2019. The sample used in this study was 259 students. The instruments used for data collection were multiple-choice test questions critical thinking skills in plants' structure and functions materials that had been validated from the expert evaluation team. The content of the test has been through fit and proper study by main field testing to find the validity, reliability, discrimination power and difficulty level. The test was made according to 6 indicators of critical thinking skills, namely interpretation, analysis, evaluation, explanation, and self-regulation (Facione, 2015). The data analysis was done by tabulating data obtained to quantify the percentage scores for each component of matter consisting of 8 about the critical thinking skills to 259 students of class VIII. The results of the percentage scores for each component are indicated by the criteria in Table 1 below (Prastowo, 2014).

Table 1. Profile of Students' Critical Thinking Ability Criteria

Percentage (%)	Criteria
90% -100%	Very good
80% - 89%	Good
70% - 79%	Enough
<70%	Less


(Prastowo, 2014)

RESULTS AND DISCUSSION

Results

The study of the initial profile analysis of students' critical thinking skills has been conducted in one of junior high school in Surakarta with a sample of 259 students in plants' structure and function materials. The instrument used to measure students' critical thinking skills was 8 multiple choice test questions. One example of the questions used can be seen in table 2.

Table 2. Test Questions for Students' Critical Thinking Skills

Facione's Indicator of Critical Thinking Ability, 2015	Sample Questions
Analysis	<p>Pay attention to the cactus image below.</p>  <p>Do cacti have leaves? One of the functions of leaves is as a place to regulate evaporation. Then what about cactus plants in regulating evaporation?</p> <ol style="list-style-type: none"> Cactus has no leaves so the plant regulates evaporation through the roots Cactus has no leaves so the plant regulates evaporation through the stem Cactus has leaves in the form of thorns, but these plants regulate evaporation through the stem Cactus has leaves in the form of thorns to regulate evaporation

Based on Table 2. it can be seen one example of critical thinking skills test questions on the indicator analysis is analyzing the structure and function of roots, stems, leaves, and flowers. The problem encourages students to be able to analyze a problem related to daily life. After the test questions are given to students, it can be seen the results of students' critical thinking skills based on 6 Facione's indicators. The test results of the students' initial profile of critical thinking skills can be seen in Table 3.

Table 3. Analysis of Students' Critical Thinking Skills in one of junior high school in Surakarta

No.	Indicator of Critical Thinking Skills	Percentage (%)	Category
1	Interpretation	58.3%	Less
2	Analysis	35.1 %	Less
3	Evaluation	38.2%	Less
4	Inference	39.7%	Less
5	Explanation	38.2%	Less
6	Self-regulation	39.7%	Less
Mean Score		41.53%	

Discussion

Based on Table 3, it can be seen the results of the percentage of achievement of each indicator of critical thinking skills of class VIII students in one of junior high school in Surakarta on plants' structure and function materials. The percentage of each indicator obtained based on the initial profile test critical thinking skills on 259 students then analyzed the data

by way of tabulating data obtained and then calculated the percentage scores from each indicator. The formula used to calculate the percentage score is:

$$\text{Percentage (\%)} = \frac{\text{Score of indicator}}{\text{total score of each indikator}} \times 100\%$$

The results of each indicator achievement percentage are then converted into several criteria namely very good, good, sufficient, and not in accordance, with the criteria of critical thinking skills analysis in Table 1. The results of the percentage of indicators of critical thinking ability are said to be good if they reach 80% or more. The facts obtained based on the results of the study are the initial profile of students' critical thinking skills in plants' structure and function materials are still relatively low.

Indicators of critical thinking skills include interpretation, analysis, evaluation, inference, explanation, and self-regulation (Facione, 2015). While the indicator of interpretation is to understand and express the meaning of various experiences or events. Analysis is an activity of identifying problems that will be solved in accordance, with the information provided and all the concepts needed in preparing a problem-solving plan. Evaluation means interpreting the statement of the problem analysis activity and evaluate the argument. Inference, namely identifying and selecting the elements needed to make conclusions accompanied by giving rational reasons. Explanation, namely expressing an opinion or statement based on the results of reasoning. Self-regulation, namely testing independently and correcting the results of self-reasoning.

The percentage of achievement in each indicator shows that the indicator of analysis has the lowest percentage of 35.1%. The low indicator of analysis is because many students have difficulty in analyzing the structure and function of plant tissues related to daily life. The interpretation indicator has the highest percentage of 58.3%. Interpretation is understanding and expressing the meaning of various experiences or events. This shows that most students can understand meaning but are less able to analyze problems. Most students are only able to answer correctly less than 50% and there are even some students who are not able to answer the questions at all. Students who are not able to answer questions because students do not associate concepts with facts (Zhou *et al.*, 2013).

The similar research regarding the initial profile analysis of critical thinking skills of grade XI high school students conducted by Elisanti, *et al.* (2018) states that students' critical thinking skills are still in the low category. Percentage of acquisition from each indicator of critical thinking ability includes interpretation aspects of 46.03% with low categories, analysis aspects of 60.20% with medium categories, evaluation aspects of 42.82% with low categories, inference aspects of 40.16 % with a low category, explanation aspects of 53.65% with a low category, and self-regulation aspects of 32.20% with a low category. These results indicate that self-regulation aspects have the lowest percentage. It happen because students have difficulty in classifying, categorizing, assessing arguments, and making self-corrections.

Students who have critical thinking skills tend to be more competent than less critical students (Fong *et al.*, 2017). The low level of critical thinking skills of students is caused by passive students in learning, teachers often use the lecture method in learning and learning is done only centered on the teacher so that the teacher does not train critical thinking skills to students (Wartiningsih, *et al.*, 2016).

Learning on plants' structure and tissue functions materials should be carried out practicum activities on plants' structure and tissue functions materials so that learning is more meaningful, encourages students to be more active because students are directly involved in investigations, and students gain understanding by gathering information from various sources

independently (Firdos, *et al.*, 2013). Learning that involves active students in making observations or practicums can then train students' critical thinking skills.

CONCLUSIONS

The conclusions of this study are the profile of critical thinking skills of junior high school in Surakarta students in science subjects especially the plants' structure and function materials included in the less or low category. Students' low critical thinking skills need to be empowered so that students can understand the material well and get good learning outcomes. The plants' structure and function materials need to be learned by using various methods, models and learning strategies that can improve students' critical thinking skills to enhance mastery learning.

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