Metacognitive Knowledge and Critical Thinking Biology 11th of Public Senior High School in Bogor

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Abstract. The research aims to find out the profile of students level of knowledge, especially in metacognitive knowledge and critical thinking skills eleventh grade students public senior high school in Bogor City on biology subjects. This research used survey method in descriptive research. The population used were all students of eleventh grade students, the sampling technique was used multistage random sampling. Data collection was carried out with test and non-test techniques, then data would be analyzed using descriptive. Descriptive analysis is used to find out metacognitive knowledge and critical thinking skills student. Based on the results obtained from metacognitive knowledge and critical thinking students on biology subject in the low category. Between aspect of Cognition Knowledge and Cognition Regulation is not significantly different, namely 71.95 and 71.48. Metacognitive results show that metacognitive knowledge is in line with critical thinking skills students.

1. Introduction
The quality of learning input affects the output which is part of the learning system so needs to be studied regarding the profile of the level of knowledge and critical thinking skills of students as a form of achievement of the Graduation Competency Standards (SKL). Many factors that influence them are conditions. These conditions can be in the form of a curriculum that is applied or instrumental input, students themselves or raw inputs, and the conditions of the learning environment and infrastructure that support learning activities or environmental input.

The result of TIMSS in 2011, especially in the field of science, received almost 95% and students only reached, this position in the middle level. And the PISA results, shown that students in Indonesia only get level 3rd. The current curriculum is the Kurikulum 2013 developed from the previous curriculum. The standard of graduate competence in the real of knowledge in senior secondary education includes factual knowledge, conceptual knowledge, knowledge, procedural and metacognitive knowledge [1]. Knowledge is separated from cognitive processes, the teacher can immediately find out which types of knowledge have not been measured.

Both the PISA and TIMSS data have provided an illustration that it requires mastery of thinking skills, especially mastery of critical thinking and problem solving which is one of the abilities needed at this time. The thinking ability that is being used in the practice of national education is Bloom's theory. In its development, Bloom's taxonomy was revised by Anderson
and Krathwohl. The purpose of critical thinking is to examine an opinion or idea, including doing a consideration or thought based on the opinion put forward. Existing considerations are usually supported by criteria that can be accounted [2]. The result of thinking is something that produced through the process of thinking and leads to achieve goals and objectives. This high-level thinking allows students to excel and achieve intellectual freedom [3]. When students are able to create and combine these skills in their learning activities, that have been able to demonstrate high-level thinking.

Metacognitive knowledge actively controls and monitors the learning process, performs tasks and handles problem solving activities [4]. Metacognition also includes cognition management. Generally grouped into three: planning, monitoring and regulation, and evaluation [5]. Metacognitive knowledge involves knowledge of one cognitive characteristics (personal knowledge), different cognitive tasks (task knowledge) and strategies that allow the fulfillment of different cognitive tasks (knowledge of strategy). This study aims to determine the level of metacognitive knowledge and critical thinking abilities that have been achieved by students.

2. Method
This research uses a survey method, the population in this study are all students of class XI in Public Senior High School in Bogor City, West Java. Sample in this research is 560 with multistage random sampling and cluster random sampling. Metacognitive instrument used from [20] which is the instrument adapted from Schraw and Denison [14] in the form of a Metacognitive Awareness Inventory (MAI). Instrument consisting of 29 statements. And about the ability critical thinking are 10 descriptive questions with aspects referred by Ennis.

3. Result and Discussion
3.1 Metacognitive Knowledge
Metacognitive results were tested with different instruments to determine the distribution metacognitive aspect. Metacognitive aspects are divided into two parts, namely Cognition Knowledge which includes Declarative Knowledge, Procedural Knowledge, and Conditional Knowledge. Furthermore, the Cognition Regulation includes Planning, Information Management Strategies, Monitoring of Comprehension, Improvement Strategies (Strategic Debugging), and Evaluation.

| Table 1. Metacognitive Knowledge Distribution Data in Bogor City |
|---------------------------------------------------------------|
| Cognition Knowledge                                           |
| Declarative Knowledge                                         | 74,17 |
| Procedural Knowledge                                          | 67,84 |
| Conditional Knowledge                                         | 73,84 |
| **Average**                                                   | 71,95 |
| Cognition Regulation                                          |
| Planning                                                      | 65,40 |
| Management Strategies                                         | 70,84 |
| Monitoring of Comprehension                                   | 72,30 |
| Strategic debugging                                           | 79,20 |
| Evaluation                                                    | 69,60 |
| **Average**                                                   | 71,48 |
3.2 Critical Thinking

Critical thinking ability has five indicators, namely giving simple explanations, building basic skills, concluding, giving further explanations, and developing strategies and tactics [6].

| Student Outcomes | Level Critical Thinking |
|------------------|-------------------------|
| 81.25 < x ≤ 100  | Very good               |
| 71.5 < x ≤ 81.25 | Good                    |
| 62.5 < x ≤ 71.5  | Enough                  |
| 43.75 < x ≤ 62.5 | Less                    |
| 0 < x ≤ 43.75    | Very less               |

Source: Lewy (2009)

The final result of scoring from the critical thinking skills students of 11th grade can be categorized by categories from [7]. Analysis of the average aspects of mastery of critical thinking in class XI students of biological material can be seen in Table 2.

| No | Critical Thinking Aspects     | Average |
|----|-------------------------------|---------|
| 1  | Give simple explanation       | 68 (Enough) |
| 2  | Build basic skills            | 53 (Less)  |
| 3  | Conclude                      | 50 (Less)  |
| 4  | Give further Explanation      | 69 (Enough) |
| 5  | Strategy and Tactics          | 72 (Good)   |

3.3 Discussion

Based on the table 1, the average distribution of metacognitive knowledge between Cognition Knowledge and Cognition Regulation in students in class XI Science in Bogor City was not significantly different, namely 71.95 and 71.48. Each aspect can be known the meanings starting from Declarative Knowledge that is 74.17, Procedural Knowledge is 67.84, Conditional Knowledge is 73.84. In the Regulation of cognition. Aspects of Planning get 65.40, aspect Management strategies is 70.84, Comprehension Monitoring is 72.80, Improvement Strategies are 79.20, and Evaluation is 69.60. The average result shows that the highest metacognitive abilities possessed by students are declarative knowledge and the lowest value is in the Planning aspect.

This knowledge gives different participants the opportunity to use several abilities to improve learning during class. [8]. As for limitations in metacognitive instruments, not yet include specific learning material. In short, the findings of this study support the view that metacognitive processes form complex structures that need to be assessed using a variety of methods [9]. Metacognitive activities ask students to reflect on what they know, care about, and being able to do not only helps learners to develop awareness about themselves, but also provides valuable information for them. Activities that encourage a reflective and strategic attitude towards learning must be regularly embedded in class activities. These reflective activities take from ongoing reflection, evaluation, and revision, and are strategic about work. When the teacher makes aspects of learning and problem solving visible, and helps students identify the strengths and strategies of students [10].

From the explanation of the results of the research above, even though the results were obtained balanced, it can be seen that the knowledge of cognition aspect has a higher average compared to regulation of cognition. This is because knowledge of cognition is the basic thinking to do something or not where knowledge is stored in memory.
Critical thinking skills students have five aspects, namely providing simple explanations, building basic skills, concluding, giving further explanations and manage strategies and tactics. The result of level critical thinking can be see in Table 3. From the average results it is known that in the aspect of giving a simple explanation that is getting 68 which shows that it is in enough category, aspects of building basic skills that is 53 showing less categories, the concluding aspects are 50 with enough categories and aspects of managing strategies and tactics of getting 72 indicate good categories. Aspects that have the lowest average are in the concluding aspects and aspects that get the highest average that is managing strategy and tactics. Similar to [11], regarding educational goals for critical thinking it is necessary for students to develop cognitive abilities. The answers are different in different programs, or not in focus at all. However, the goal can be somewhat different: it can range from allowing students to enter into the demands of liberal markets and contribute to the preservation of existing cultural and social relationships, to enable them to participate in democratic societies for education to change society.

In line [14] that students will be more likely to be involved in business and complex modes of thinking when engaged in new situations that are challenging and occur at this time so it is comfortable to think. High-level thinking skills are one component in creative thinking and critical thinking skills [15]. In the information age, think critical is the main ability that someone to be global community. Someone will be careful in making decisions and solving problems [17].

Mastery of critical thinking is needed by students to face future challenges. Mastery of critical thinking makes participants students can solve social problems, scholarship, science in life daily effective. Facing the challenges of the century 21, knowledge and information alone are not enough so that they are needed the ability to solve problems effectively[19]. Critical thinking is rational testing of ideas, conclusions, opinions, principles, thoughts, problems, beliefs, and actions. Critical thinking is the basis for studying each discipline[18].

Metacognitive knowledge is in line with students’ critical thinking skills. This is in line with the results of the study [12] Metacognitive knowledge of students encourages the ability of students to solve problems and think high-level. Potentially students have the readiness to grow metacognitive knowledge. If in the SKL of Curriculum 2013 requires metacognitive achievement, then the learning approach must be integrated with self-regulated learning methods [13].

Developing this metacognitive ability is not simple about being a reflective learner, but also obtain specific strategies in learning. Metacognitive awareness, metacognitive experience, metacognitive knowledge, metacognitive skills, executives skill, high level skills. Metacognitive awareness means moderate realize how you think. Metacognition is an awareness someone's thinking and strategy that someone uses. This is possible students to pay more attention to what they do, and why, and how skills are learned and can be used in different situations [10]. The results of developing critical thinking skills will increase the ability of students to access information and defining problems based on accurate facts and data. In addition, participants students will also be able to formulate and formulate questions correctly, dare to express ideas, ideas and respect the opinions of others. Through critical thinking students will have social metcognitive awareness and actively participate in society.

4. Conclusion
This research provides an empirical description and can be an evaluation material for the learning process that has been done and provide solutions to be improved so that the metacognitive knowledge of students in Indonesia can be maximally achieved. Teachers who might see this process as a starting point for improving methods to be applied by students. In the information age, critical thinking and metacognitive knowledge is the main ability that
someone needs to be tough global community with this ability one will be careful in making
decisions and problem solvings.

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