An Analysis of Critical Thinking Skills; Global Warming Learning Materials

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ABSTRACT

This study aimed to analyze students’ critical thinking skills levels on global warming materials. This quantitative descriptive study employed the cluster random sampling technique. The analyzed data were the students’ critical thinking skills. Researchers collected the data using critical thinking skills test instruments in the form of description questions and open-ended questionnaires. Furthermore, the data were analyzed using statistical formulas in the form of percentages. Based on the data analysis results, the percentage of students’ critical thinking skills score was 65% and was categorized at a moderate level. Therefore, the researchers concluded that students’ critical thinking skills on global warming learning materials are moderate. Thus, there needs to be an effort to improve students’ critical thinking skills.

INTRODUCTION

In the modern era full of technology and information, life has become more sophisticated with significant changes.
society's life and welfare (Hazami, 2016; Roqib, 2009; Suhaimi, 2016). (Aka, 2017; Ameliola & Nugraha, 2013; Ariani & Festiyed, 2019). The future demands the preparation of skilled and expert personnel in educational technology, especially those related to competencies that must be mastered in the learning process (Bahar, 2019; Budiman, 2017).

The rapid globalization has led to competition in various fields of life and education, especially science education (Langke, 2019; Rahma, 2012; Suriana, 2014). To face tough challenges, it is crucial to improve the quality of education. Increasingly rapid technological advances require education to continue to develop and produce high-quality human resources (HR) who can think critically, creatively, systematically to solve problems and have good morals (Permatasari et al., 2018; Purwati et al., 2016; Sitohang, J. M, 2018). Critical thinking skills are necessary to possess because they can be used to solve all problems. They are also considering making a reasonable decision about what can be trusted and done (Chotimah et al., 2019; Nafiah & Suyanto, 2014; Zubaidah, 2010), (Alifah & Arpin, 2018).

Self-regulation is an aspect to examine self-cognitive activities, the elements, and the results using analysis and evaluation skills. It is ultimately used to confirm, validate, and re-correct reasoning (Alfina, 2014; Hidayat, 2013; Mulyani, 2013). Self-regulation can regulate students in problem-solving and activities (Arismawati et al., 2017).

Problems can be indications of the inappropriate use of the learning model. Therefore, the students’ critical thinking skills cannot be optimized even though critical thinking skills are one of students' skills.

The quality of the skills is very important to achieve goals. Critical thinking skills are used to understand and state the meaning or purpose of experiences, situations, data, events, decisions, conventions, beliefs, rules, procedures, or criteria. They are also used to identify the meaning of the correct conclusion between statements, questions, concepts, belief-based descriptions, decisions, experiences, reasons, information, or opinions. Similar research has been conducted that measures the importance of critical thinking skills (Alifah & Aripin, 2018), critical thinking skills and solving math problems based on the cognitive style (Asmawati, 2015), the guided-inquiry model worksheets on mathematical thinking skills (Christiyanto et al., 2018), and creative thinking using handouts (Hasanah et al., 2018).

Previous research examined global warming on contextual learning-based science magazine development (Asfuriyah & Nuswowati, 2015) and developing a theme module (Asfuriyah & Nuswowati, 2015; Rizqi et al., 2013). Puspita states that critical thinking skills can help someone overcoming his simple to complex daily problems (Puspita & Putri, 2020). Based on several research results, critical thinking skills are needed by students to solve problems. This research's novelty is critical thinking skills in global warming by analyzing critical thinking skills on global warming material.

**METHOD**

This research was conducted at SMP Negeri 7 Tanjung Pinang in the second semester of the 2018/2019 academic year. The study employed descriptive research with a quantitative approach. The research design consisted of two stages: the preparation stage (compiling proposals, preliminary observations, making instruments, validation, and testing) and the implementation stage (data collection, data analysis, and conclusion). The research data were critical thinking skills. The instrument was developed by constructing HOTS questions based on the
level of cognition and the 2013 curriculum. The data were analyzed using the Pearson Product Moment correlation technique. The formula used to calculate the reliability of the data was the Cronbach-Alfa (α) formula.

The population in this study was 200 seventh-grade students. Through a cluster random sampling technique, 127 students were selected as the samples. The data were collected using a test (question) and non-test (open-ended questionnaire) instruments. The test consisted of ten description questions based on the aspects of critical thinking skills, according to Facione (2015). The data analysis technique used was in the form of percentages. The critical thinking skills were categorized into five categories: poor (50%), low (60%), moderate (63%), high (75%), and excellent (80%).

**RESULTS AND DISCUSSION**

The test results are presented in Table 1 below.

| CBC aspects   | Percentage | Category |
|---------------|------------|----------|
| Interpretation| 60%        | Low      |
| Analysis      | 63%        | Moderate |
| Evaluation    | 70%        | Moderate |
| Inference     | 64%        | Moderate |
| Explanation   | 66%        | Moderate |
| Self-regulation| 68%       | Moderate |
| **Average**   | 65%        | Moderate |

Based on Table 1, it can be seen that the students' critical thinking skills were in the medium category. This can also be seen from each aspect of the average percentage obtained in the medium category. Only the Interpretation aspect was in a low category because the students could not classify data in detail. For more details, the percentage of aspects of critical thinking skills can be seen in Figure 2.
The low interpretation category was caused by students’ inability to interpret data in a table or graph formats. Based on the students’ answers, they did not understand how to interpret the data correctly. Only several students can group the data based on graphs. Some other students only provided conclusions based on the questions presented about the increased carbon dioxide concentration that is not always followed by temperature changes. However, the relationship between the carbon dioxide increase and the temperature on the earth’s surface is that the increased concentration of CO2 gas will affect the level of heat on earth.

The following are the aspects of critical thinking skills used to measure one’s critical thinking skills:

![Critical Thinking Skills Aspects Diagram]

The students’ second aspect of critical thinking skills, Analysis, was categorized as moderate. The students could analyze problems in a given discourse. They were given information related to the causes of the melting of the north polar ice. In the analysis aspect, some students could answer the questions correctly because they followed the appropriate steps in analyzing a question. However, some could not analyze the problem based on the information because, during the learning process, they did not understand how to analyze the teacher's problems (Pratiwi, 2014). They could not understand and find problems in a question. The open-ended questionnaire found out that they did not know how to analyze a problem properly. They have difficulty solving problems. Thus, when the test was administered, some students could not answer correctly.

The students’ third aspect of critical thinking (Evaluation) was in the the moderate category. However, the
The percentage of students’ fifth critical thinking aspect (explanation) was in the moderate category. The students were given a question about cities that produce the same number of molecules. The idea must be accompanied by analysis beforehand so that it is easy to explain. From the students’ answers, some of the students were wrong in explaining the discourse’s content. Before explaining, they had to analyze first. Some students could not do the analysis. Some answers were inappropriate with the question’s instructions. These results were in line with research conducted by Ayuningtyas (Ayuningtyas et al., 2017; Sajidan Susilowati & Ramli, 2017) that in the Explanation aspect, students need many practices in formulating problems. Based on the questionnaire’s responses, it can be concluded that some students did not know how to describe the concept correctly, and according to the procedure.

In the sixth aspect (Self-regulation), the students were categorized in the moderate category. They were given ideas that must be developed in protecting the environment. Based on their answers, they poured their ideas correctly and clearly. The idea was relevant to the everyday life application. However, several students had not implemented these ideas. Based on the questionnaire’s responses, many of the solutions have been applied in everyday life. The research results in this aspect are in line with research conducted by Indriawati (Indriawati et al., 2016; Susilowati Susilowati, 2018) in the aspect of self-regulation. Averagely, the students could apply this aspect in the learning process and monitor their learning controls. The proportion of answers was not evenly distributed caused by weaknesses of the textbooks used even though many supporting books presented in encouraging students to use higher-order thinking (critical, creative, and analytical thinkings) (Febrian et al., 2013; Giani et al., 2015). Simultaneously, it is related to
higher-order thinking skills, one of which is analyzing and solving problems in everyday life.

CONCLUSIONS AND SUGGESTIONS

Based on the analysis results, it can be concluded that students’ critical thinking skills on global warming learning material were in the medium category. It can be seen in the students’ average percentage score and their critical thinking skills indicators’ achievement. The average of students’ category was moderate, with the Evaluation as the highest aspect and the Interpretation as the lowest aspect. Future researchers who want to research critical thinking skills analysis can develop even better test instruments. They should use words that are effective and easy for students to understand. It is also suggested to use indicators of critical thinking skills based on other experts, different materials, and different subjects. The suggestions should be made so that the research can be more varied. This study could be used as a reference for further research.

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