Analysis of Critical Thinking Skills on The Topic of Static Fluid

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Abstract. This study aimed to know the critical thinking skills profil of senior high school students. This research using a descriptive study to analysis student test results of critical thinking skill of 40 students XI grade in one of the senior high school in Bogor District. The method used is survey research with sample determined by purposive sampling technique. The instrument used is test of critical thinking skill by 5 indicators on static fluid topics. Questions consist of 11 set. It is has been developed by researcher and validated by experts. The results showed students critical thinking skills are still low. Is almost every indicator of critical thinking skills only reaches less than 30%. 28% for elementary clarification, 10% for the basic for decisions/basic support, 6% for inference, 6% for advanced clarification, 4% for strategies and tactics.

1. Introduction
Static fluid is a physics concept always related to daily life. Therefore, it takes Critical thinking (CT) to be able to understand the concept well. The pressure exerted by a static fluid depends only upon the depth of the fluid, the density of the fluid and acceleration of gravity. The pressure in a static fluid from the weight of the fluid and is given by the expression:

\[ P_{\text{static fluid}} = pg h = \frac{mgh}{V} \]

because \( V = Ah \), so \( P_{\text{static fluid}} = \frac{mg}{A} \)

CT is a process of challenging the individual to reflect reflective, reasonable, rational thinking to collect, interpret and evaluate information in order to obtain a decision [2]. Reflective here means to actively consider carefully and cautiously against all alternatives before making a decision. CT skill has five indicators [7] and become a key component of recent education [4]. So CT skill is very important to be controlled by all people to be able to protect themselves and make decisions wisely in everyday life [5] And able to compete in the global world [1]. Therefore the most important final goal in the curriculum of 2013 is to print graduates who have critical, logical and creative thinking [6].

The economy of the 21st century, has shifted into a service economy. The shift is due to the development of information, knowledge, and innovation. The economic shift caused all countries to compete globally. This completion spawned challenges that took place in the workplace and working communities. Because it is, demanding and encouraging everyone as citizens to have ingenuity, alertness and skill. To compete as a nation to advance the economy and its industry [1]. It is same as what Greenspan said in the global competition requires everyone to have 21st century skills to be able to hold new technology in order to survive in that era.

2. Experimental Method
Researcher conducted a descriptive study to analysis CT skill of 40 students XI grade in one of the senior high school in Bogor District. The subjects taken are XI class students who have not received static fluid
lessons in senior high school. This study was conducted once. The method used is survey research with sample determined by purposive sampling technique. The instrument used is a CT skill test by 5 indicators on static fluid topics. Questions consist 10 essay sets. It has been developed and validated by team of experts.

Meanwhile, to investigate score of CT skill using score the rubric was developed based on the answer each item and validated by experts (Table 1).

After scoring, the next step is do the percentage of each CT skill indicator, the percentage of the process id done by using the following formula:

\[
\% = \frac{\text{score each indicator}}{\text{total score each indicator}} \times 100\%
\]

There after do the performed categorization \[11\] for each indicator, namely grouping scores obtained by students in the category of very high, high, fair, low and very low. Guidelines for the categorization of students' CT skill such as in Table 1 below.

| Percentage score (%) | Category       |
|----------------------|----------------|
| 81 – 100             | Very high     |
| 61 – 80              | High          |
| 41 – 60              | Fair          |
| 21 – 40              | Low           |
| 0 – 20               | Very low      |

Data student score and the percentage will be used by the researcher to conduct descriptive analysis. Descriptive analysis was conducted to provide an overview and obtain complete information related to profile of CT skill.

3. Result and Discussion

3.1 Results

Figure 1 below shows the average percentage of students' critical thinking skills on the concept of hydrostatic pressure, pascal principles, and Archimedes principles. At the time of learning related concepts are taught in high school but at least have been taught in the previous ladder. The average percentage of all indicators is still low. It is seen that the elementary clarification indicator is the highest indicator compared to other indicators. Followed by the basic for decisions / basic support, advanced clarification and strategy and tactics.
Figure 2 shows the average percentage of students in answering each item. The average student can answer high enough for item 2 item compared to the result of student answer on other item. However, when compared to the total ideal value that should be in the value, this value is still relatively low. Problem 2 is a matter related to the concept of hydrostatic pressure. Meanwhile, very few items answered by the students are no 7 and no 11, which items that contain hydrostatic concepts with the basic indicators for the decisions and strategies and logic. These are questions that relate to the process of discovery.

3.2 Discussion

Critical thinking skills are part of high-level thinking skills and 21st century skills that the best way to tackle 21st century skills is to apply discovery-based learning processes that focus on real global problems [8]. Similarly, physics as a process, which views that physics is a science that contains natural phenomena are processed in the physical and empirical assessment which became known as the concepts, principles, law and principles which then used its application in technology, so that physics can be said there Because of the process of the invention [1]. Concerning the concept of hydrostatic pressure, the principles of Archimedes, and the pascal principle have at least been studied while at lower levels of junior high school, but that does not necessarily make them able to criticize the related issues of those concepts.

Is a challenge learning model (CBL) which is one of the learning models that can facilitate students actively involved in the process of discovery of real global problems (related to daily life). Because if students are active in learning, it can train students’ scientific reasoning in developing their critical thinking skills [8]. This model is the first model developed by the education team at Apple Inc. Where CBL is built on experimental learning that upholds freedom, this model is effective in learning to solve real-world challenges that have efficient and effective frameworks that are organized into 3 phases: Engage, investigate, and act [9]. The phases consist of collaborative and hands-on, asking students to identify big ideas, asking good questions, identifying and solving challenges, deepening the realm of knowledge, and developing 21st century skills, and sharing experiences gained to audiences. CBL is an innovative learning model that combines the three learning models that are problem based learning, project based learning, and contextual teaching and learning modes. In this challenge based learning problem related to real world problem is said as challenge. Meanwhile, [10] concluded that the project undertaken in learning with the integration of CBL approaches in it can improve the retention of long-term student information.

4. Conclusion

Critical thinking skills need to be trained on students in one of the high schools in the Bogor district. And the best way to practice them is by applying active learning that facilitates students in the process of discovery of global problems, namely CBL which is integrated with the project.
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