



## The profil of student critical thinking on science learning

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**Abstract.** Critical thinking skills are crucial proficiency and important to be owned by students to deal with challenges of 21<sup>st</sup> century. It is defined as basic skills that must be provided by everyone to develop thinking skills to be more complex. The presence of those skills made students were able to assess the truth of information, thus they can decide either approved or rejected the information. This research aimed to comprehend the profile of critical thinking skills of students on science learning in secondary school. It used descriptive method, where the instrumentations were develop based on aspects of critical thinking skills. Subject of this research was 30 students in class 8 of secondary school in Bandung chosen using purposive sampling technique. The results showed several aspects accompanied critical thinking skills which are 37.93% of question at issue (low), purpose with 32.76% (low), 18.97% of information (very low), 37.93% of concepts (low), with 22.41% of assumption (low), 18.93% points of view (very low), 35.35% of interpretation and inference (low), and 36.21% of implication and consequences (low). Therefore, it can be concluded that each aspect of critical thinking skills of students was generally stayed on poor lever, so there is important to improve the skills especially on science learning.

**Keyword:** critical thinking skills, students, learning, science

### 1. Introduction

Rapid growth on science and technology in 21<sup>st</sup> century is a development that should be anticipated with education system that will prepare for future generation who has survival to compete among digital era. One of skills that could be prepared by them is critical thinking skills [1]. Then, Ennis explained that critical thinking skills were the way to think reflectively and rationally according to logical reasons focused on determination that will be believed on it [2]. Critical thinking skills were a process that could be used to create assessment about some elements that must be



believed and done [3]. Critical thinking skills become basic skills for students to improve their thinking skills to be more complex or well known as higher order thinking (HOTS). The critical thinking skills are also need to reach learning objectives [4]. Besides that, *Permendikbud* No 58 of 2013 also suggested that students must have critical thinking skills in learning especially on science learning.

Science learning is expected to have a role in order to train the students for problem solving. Problem solving skills can be increased by coached them by using critical thinking skills [5]. When students have critical thinking skills, they would be familiarized to think before take a decision. It was relevant with Kalelioglu & Gulbahar, who mentioned that critical thinking skills were required to check the truth of information, thus it considering to be approved or rejected [6]. In short, it can be explained that critical thinking skills are not separated from education and it must be provided in learning process and will be a provision for students to face the challenges and demands in 21<sup>st</sup> century.

Aspects of critical thinking skills were divided into 8 aspects: (1) question at issue is providing questions to identify problems, (2) purpose is analyzing the objectives and actions have been done, (3) information is giving findings and thorough information, (4) concepts are explaining concepts about materials and phenomena related to several field of studies, (5) assumptions are formulating the assumption from phenomena that have been occurred, (6) points of view are interpreting and understanding others opinion, (7) interpretation and inference are presenting the result of data analysis from observing phenomena as interpretation and making the conclusion, and (8) implication and consequences are making implication from observing phenomena and making correlation with concepts that occurred based on concepts that have been learned [7].

Some researches exhibited that critical thinking skills of students especially for students in Indonesia are standing on low category. The result was founded from analysis of Program for International Student Assessment (PISA). This analysis was conducted using science literacy as instrumentation which is strongly related to higher order thinking including critical thinking skills. In 2009, PISA showed that Indonesia ranked at 60 out of 65 participating countries, ranked at 65 out of 65 participating countries in 2012, then ranked at 69 out of 75 participating countries in 2015 [8,9,10]. According to the results, Indonesian students have not been familiarized yet with higher order thinking in order to solve more complex problems, and it is proved by the test of PISA resulted lower average values. Based on the problems introduction, the researchers aimed to comprehend the profile of critical thinking skills of students on science learning in one of secondary schools in Bandung.

## **2. Method**

It was descriptive research and used reasoned multiple choice question which is developed based on critical thinking aspect explained by Inch, including question at issue, purpose, information, concepts, assumptions, points of view, interpretation and inference, implication and consequences. Subject for this research was 30 students of class 8 in SMP 4 Lembang, Bandung. The sample was elected using purposive sampling. Score obtained by students was then converted in percentages and categorized based on limits of criteria as follows:



Table 1. The Percentage and Criteria for Critical Thinking Skills

The percentage of critical thinking skills aspects (%)	Category
≥ 80	Very high
60-79	High
40-59	Sufficient
20-39	Low
≤ 20	Very low

### 3. Result and Discussion

As presented in Figure 1, there are none of aspects of student critical thinking skills categorized as high or sufficient level. The test for eight aspects of critical thinking skills showed that six of them were classified as low level, 37.93% for question at issue, 32.76% for purpose, 37.93% for concepts, 22.41% for assumption, 35.35% for interpretation and inference, and 36.21% for implication and consequences, whereas two aspects of information and points of view still at very low level with percentage of 18.97% and 18.93%, respectively. The information was presented as follows:

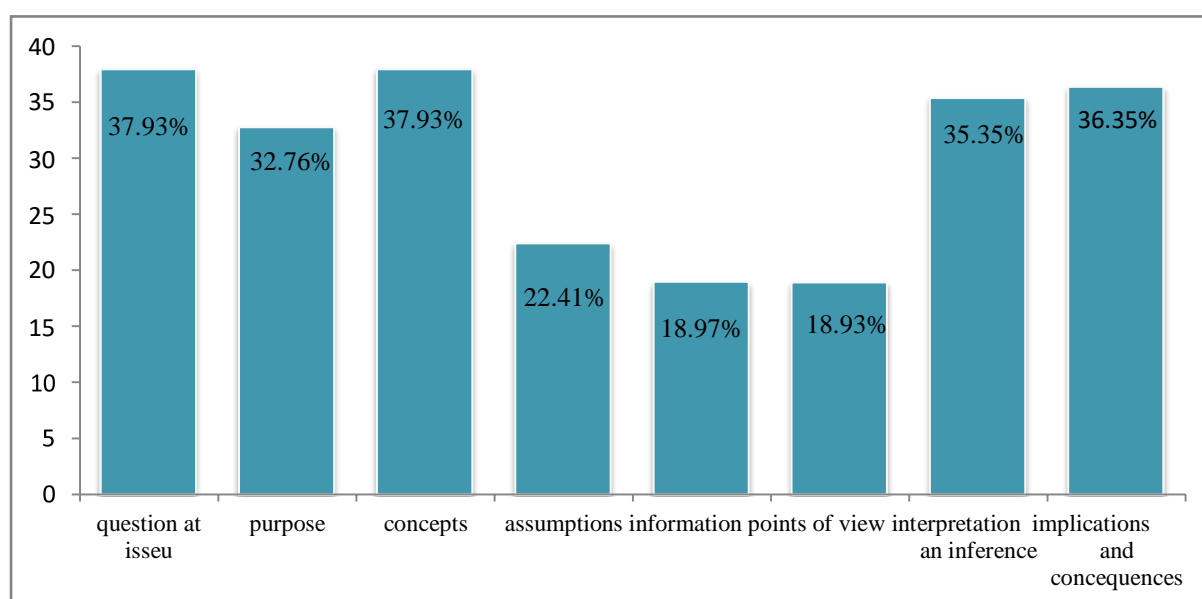


Figure 1. The percentage on aspects of student critical thinking skills

The analysis result exhibited that the average values of critical thinking skills test for students



in class 8 were relatively stand on low level, and also presented by very low level. Therefore, it was need to increase the critical especially on science learning.

There are various factors which taking student critical thinking to be low. First, the differences of quality level and quantity of education between countries which have been developed instrumentations for critical thinking skills, such as developed country and developing country, which are US and Indonesia. US is a developed country with international level, quality standardization with prime education compared to Indonesia as developing country [1]. According to PISA 2015, score gained by United State (US) up to 496 whereas Indonesia only got 403 [10]. This showed that both quantity and quality of education in Indonesia is still very lagging behind compared to developed country like US, especially for critical thinking skills level.

Second factor, the students were not familiarize with kinds of critical thinking questions, so when they was adapted to the question with more complex skills, they found difficulties in term of answering the questions. Besides that, the instrumentation was arranged using reasoned multiple choice questions. Although any of students who success to answer the questions, but they failed in explaining the reasons related to the point of their answer. It referred that they were not frequently answered and analyzed the problems with higher order thinking skills.

Third factor, during learning process including science learning, students were relatively taught to memorize, analyze, thus they were not often asked to think for analysis, explanation, interpretation and making correlation between one concept to another. Learning activities should not prioritize on memorization because it could not be improved critical thinking skills [12]. Then Bayer also described that there are many students who still have lack of information related to science and its experience, and are less able to obtain because it was only transfer for information. In short, students received the experience but they failed when making a correlation [13]. Therefore, learning with stimulus strategy would facilitate the students to probe, build and could familiarize them for critical thinking and also make them to be active participants during teaching and learning process [14].

Learning that facilitate students to be more active in doing an investigation, applying the knowledge, and motivate students in each learning activities will be successful to enhance students critical thinking skills. Synder & Synder also confirmed that learning could make students to do analysis, synthesis, and evaluation for information in order to solve the problems and making a decision to train their thinking skills for higher order thinking [12]. Therefore, student critical thinking is strongly supported by their learning experiences. If students are frequently asked to solve the problems and doing activities with critical thinking, thus it could develop their critical thinking skills. Consequently, as a teacher as the keynote actors for education development, the teachers should find the learning method which facilitate and support students in developing their critical thinking [16]

#### **4. Conclusion**

The results showed that profile of student critical thinking skills on each aspect is relatively standing on low level. Therefore, it is important to some efforts in order to design and develop the learning activity which is facilitate students to improve their critical thinking skills.



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