



## **Improving Critical Thinking Skills In Physics Learning Through Project Based Learning**

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### **ABSTRACT**

Students' critical thinking skill of class X MIA-1 in SMAN 2 Bukit is very low. There is the effort to improve critical thinking of students applying Project Based Learning model (PjBL). The purpose of this research is to determine whether there is an enhancement in students' critical thinking skills using the Project Based Learning model. This research is Classroom Action Research which was carried out as many as III cycles. The subjects in this research were all students of Class X MIA-1 in SMAN 2 Bukit, consisted of 16 students. The instrument used to collect the data was tests including pre-test, post-test, teacher and student activity sheets, and observation sheets of learning management using Project Based Learning model. The results showed that students' critical thinking skill when Project Based Learning model applied was better than the learning which was not using The Project Based Learning model. It happened because using Project Based Learning model, the students played a role actively as learning center were given an issue in the project then they were asked to solve it.

**Keywords:** Critical Thinking, Project Based Learning.

### **INTRODUCTION**

As a science that studies natural phenomena, physics provides good lessons for humans to live in harmony based on natural laws. According to Giancoli (2001), "Physics is the most basic knowledge because it deals with the behavior and structure of objects".

Based on the results of the researcher's preliminary observations conducted in SMAN 2 Bukit, learning models which are often used by the teachers in learning physics are giving materials, giving assignments, and not asking the students to ask the questions. Therefore, the

students do not think critically. Critical thinking is not a teaching material but it is a process or activity that should be included in any learning material at a certain educational level (Sarwi, 2012). Critical thinking is one of the ways to be critical, the mind must be open, clear, and based on the facts (Harsanto, 2005). Filsaime (2008) said that critical thinking is a disciplined way of thinking used by someone to evaluate the validity of something (questions, ideas, argumentations, research, etc.). It will create a willingness to search for and find the knowledge. In the critical thinking skill, the brain is forced to think seriously for solving the problem faced by the individuals who think about the actions that will be conducted (Sartomo:2012).

Project Based Learning (PjBL) is a learning model that has been developed in developed countries such as United States. According to George Lucas Educational Foundation (2005), Project based learning asks students to investigate issues and topics addressing real-world problems while integrating subjects across the curriculum, project based learning is a learning approach that requires the students to create “a bridge” which connects various learning materials.

The learning model allows students to develop the knowledge, abilities, and skills in an open learning environment in order that the students do not only memorize the theories and concepts but also they are able to think critically in solving the problems obtained. Yang (2012) said that Project Based Learning uses a contextual leaning model where the students play an active role in solving problem, making decisions, examining, creating presentations and documents.

According to Wang, (2015), Project Based Learning is based on constructivism theory related to cognitive psychology and the concept of learning in context. The main purpose of Project Based Learning model is to eliminate the phenomenon of the slow knowledge of the students and encourage them to have an ability to solve problem, improve the students' learning motivation, critical thinking, communication skills, and the ability in collecting the data. Project Based Learning (PjBL) may ensure more effective results by enabling students to actively participate in the learning process, produce something, and work together with others (Bagheri dkk, 2013).

Critical thinking requires one's efforts for collecting, interpreting, analyzing at a reliable and valid conclusion (Chukwuyenum, 2013). Critical thinking is the same as the embodiment of one's high level thinking (Petter,2012). Involving students actively in project-based or collaborative activities can encourage the development of critical thinking if the thinking process model instruction uses effective interrogation techniques and can guide students in the critical thinking process. The effectiveness of critical thinking is influenced by the conditions of the instructional environment consisting of learning variables to some extent of the variables relating to the students.

Fisher (2008) put forward six indicators of critical thinking: (1) Identify the problem, (2) Collect relevant information, (3) Arrange a number of alternatives of problem solving, (4) Make a conclusion, (5) Give an opinion, (6) Evaluate the argument. Hasruddin (2009) said that critical thinking skills aims to achieve assessment that will be done with reasoning. The reasoning ability will affect students' understanding of concepts. Therefore, critical thinking

skills are the most effective way to enhance understanding of concepts because the skills are supported by the ability to interpret, analyze, evaluate, and present the data logically and sequentially (Chukwuyenum,2013).

## METHODOLOGY OF RESEARCH

The study is a classroom action research involving the repetitive self-reflection that is plan, action, observation, and reflection. The study was conducted at the first semester of the academic year of 2019/2020 on the first grade students of MIA in SMAN 2 Bukit. The sample of the study consisted of 16 students.

### Research Instrument

The researcher uses research instrument to obtain the required data. Research instruments are the tools or facilities used by the researcher to collect the data in order that the work is easier, more accurate, complete, and systematic. As a result, the data is more easily processed (Arikunto, 2008).

The instruments used in this study are:

1. Critical thinking skill test
2. Observation sheet activities of teachers and students in learning
3. Observation sheet of teacher skill
4. Students response sheet
5. Data analysis technique

To test criteria of students' critical thinking skill analyzed by using the achievement percentage formula based on the assessment guidelines with the following formula. (Sugiono, 2001)

$$P = \frac{F}{N} \times 100\%$$

Explanation:

P = Percentage

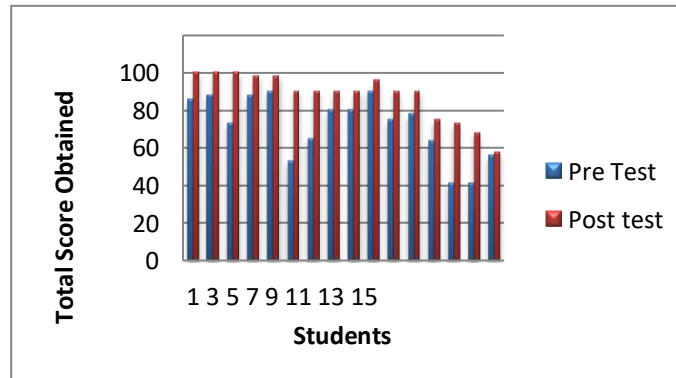
F = Total score obtained

N = Ideal number of scores

## RESULTS AND DISCUSSION

The results were obtained showed that there were the differences between students' critical thinking skills without use Project Based Learning model and the students who use the model in every categories; upper, middle, and lower categories.

The comparison of students' critical thinking skill before getting the treatment and after getting the treatment are as follows:



**Figure 1.** The Results of Comparative Study of Students' Critical Thinking ability

Based on the results the analysis of the pre-test and post-test, students' critical thinking skills have increased in every aspects. These aspects include:

### a. The skill in giving the simple explanation

The indicator is the students' skill in providing the simple explanation. In the pre-test, the percentage of the students skill to give the simple explanation is 8.75% with a low category. Furthermore, after applying Project Based Learning model to the theory *Hukum II Newton*, the students' skill in giving the simple explanation increased from 7.81% to 16.56%.

### b. The skill in developing the basic skill

The indicator is the students' skill in developing the basic skill. In the pre-test, the percentage of the students' skill to give the simple explanation is 13%. Furthermore, after applying Project Based Learning model to the theory of *Hukum II Newton*, the students' skill in giving the simple explanation increased from 4% to 17%.

### c. The skill to conclude

The skill to conclude is the process of thought that empowers students' knowledge to produce a thought. In the pre-test, the percentage of the student skill in concluding is 15.13% with low category. Furthermore, after applying Project Based Learning model to the theory of *Hukum II Newton*, the students' skill in concluding increased from 4.87% to 20%.

#### **d. The skill in creating further explanation**

The indicator is the students' skill in creating further explanation. In the pre-test, the percentage of the students skill in giving the further explanation is 5.62%. Furthermore, after applying Project Based Learning model to the theory of *Hukum II Newton*, the students' skill increased from 10.7% to 16.32%.

The students' skill can enhance because of the learning stages of Project Based Learning. In the stages, the teacher motivated the students to be active students in the classroom such as giving some opinion in the learning and asking the question to the teacher for understanding the lesson and the tools that are used as well as the way how to use the them.

#### **e. The skill in setting strategies and tactics**

The skill in managing the strategies and tactics are the students' skill in finding tactics of a statement. In the pre-test, the percentage of the students' skill in setting the strategies and tactics are 5.31%. After applying the Project Based Learning model on *Hukum II Newton*, the students' skill increased from 8.89% to 14,2%.

Based on the results of analysis, it was obtained that the average percentage of the students' critical thinking skill had increased which were measured by using pre-test and post-test. The average of pre-test score was 47.81% and the average of post-test score was 84.08%.

Project Based Learning is a model to improved students critical thinking and make students more active and understand about the material instead giving them the formula of learning material. Moreover, the students can be more prepared when they faced tickler question. The result of post test is also showed that students make an improvement after they take treatment of PBL model.

The process of asimilating knowledge before they learned and the knowledge that acquired in learning process will be good if the students has sufficient knowledge before. This result is contrast with learning theory of Ausubel about meaningful learninf. Baded on the Ausubel, meaningful learning is a process of relating new information to the relevant concept that found in personal cognotif stucture.

### **CONCLUSIONS**

Based on the results and discussion of the research, the conclusion obtained in this study is an enhancement in the students' critical thinking skills by using PjBL model. It can be seen before the learning applied PjBL model and after the learning applied PjBL model. Students' critical thinking skills improved well when the students did the learning with Project Based Learning model.

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