

CHAPTER I

INTRODUCTION

1.1 Background

Indonesian National Curriculum of 2013 stated that learning activities should be focused on students with actively seeking learning patterns and also critical learning (Indonesian Ministry of Education and Culture, 2015). Based on the statement of Indonesian Ministry of Education and Culture, we can infer that the learning is now emphasized on critical thinking skills of the students. However, according to an interview with a teacher of a middle school in Indonesia, Physics topics such as vibration and wave are considered hard subject for the students. Vibration and wave, as like as other physics topics, require not only students' knowledge on basic understanding, but also complex thinking, especially to understand the characteristics and types of waves.

Critical thinking ability is the ability to think to solve the problem systematically. The purpose of critical thinking is to achieve a deep understanding which is to uncover the meaning behind an event (Johnson, 2010). Critical thinking ability can be sharpened through laboratory activities, discoveries, homework to develop critical thinking skills, and exams designed to build critical thinking skills. Critical thinking skills can be enhanced through group discussions were organized and guided directly by the teacher. High level questions can encourage of deeper critical thinking (Wardatun, Dwiastuti & Karyanto, 2015).

Critical learning emphasizes on activities to analyze, interpret, and assess a case or an issue and rationally and logically. Such activities are part of the critical thinking skills. These learning activities require high learning motivation from the students themselves. Motivation to learn can help students develop critical thinking skills, because by having the motivation to learn, the students will be more enthusiasm and always feel challenged to keep learning (Ulfah, Asim & Parno, 2014).

Critical thinking as part of thinking skills must to be possessed by every member in the community, because a lot of problems in life that must be done and finished (Wijaya, 2007). Low critical thinking skills will lead learners to have difficulty when faced with a concrete problem in everyday life.

The main goal of the school is to improve the students' critical thinking ability (Slavin, 1997). However, in fact, the students in the school did not have the opportunity to develop critical thinking skills so that students' critical thinking abilities tend to be low. According to Pratama (2012), readiness of students to find the best knowledge from a context, confidence to ask, honesty and objectively seeks for the information are still low. In fact, someone who has readiness to find the best knowledge of a context, confidence to ask, honesty and objectively seeks for the information tends to have the nature of critical thinking.

Learning activities that are done at school are less able to develop critical thinking skills of their students. Learning activities that are designed are still lacking in providing critical thinking activities of students, such as activities to analyze, interpret, assessing a case or an issue and rationally and logically, which have been mentioned above (Ulfah, Asim&Parno, 2014).

Learning is a change in deed through activities, practice, and experience. The paradigm of learning should emphasize on learning itself, is student centered, should be shifted from "teacher" and "what is to be taught" to the direction of "students" and "what to do". Learning must also create meaningful connections with real life (Hilgard& Brower in Hamalik, 2009).

According to Kibirige, Osodo&Tlala (2014), in order to learn, students have to construct knowledge in the learning process. Therefore, teacher must be able to provide supporting learning environments. Before the learning process begins, students may have different opinion or knowledge about what they are going to learn. During the learning process, students might be not satisfied with they have learnt. They may find or seek for an explanation that is more acceptable, understandable and meaningful.

Learning can be done by using the previously existing knowledge for new knowledge. Teacher may let the students to accommodate, assimilate or replace the previously existing knowledge with the new one. However, teachers sometimes perceive the accommodation, assimilation or replacement of the knowledge as misconception. However, in mastering the concept with conceptual change, it is not always the case. In fact, it will become a meaningful learning experience for the students (Kala, Yaman&Ayas, 2012).

In regard to science learning, one model of learning that is capable of developing students' thinking skills including optimally is Predict, Observe and Explain (POE) learning model. POE learning models can include ways that can be taken by a teacher to assist students in improving the understanding of the concept and their psychomotor. POE learning model engages students in predicting a phenomenon, observations through demonstrations or experiments, and finally explain the results of the demonstration as well as their hypothesis. By doing this way, acquired knowledge will be preserved in students' memory and increase students' science processing skills (Zulaeha, Darmadi&Werdhiana, 2014). To make an active teaching-learning process, students need to be able to clearly express themselves in written form and verbal form; teachers need to introduce a new teaching strategy like the Predict-Observe-Explain (POE) that can be used in association with demonstrations and hands-on activities that can help to enhance classroom practice by identifying the learner's conception (Hilario, J.S., 2015). POE is also suited to be applied on physics subjects that can mostly be observed in experiments, and help to solve misunderstanding (Nana et al., 2014). According to the given statements, Predict-Observe-Explain (POE) should be able to be applied as one of the solutions to solve the problem at school regarding the topic of vibration and wave.

The difference of this research from other researches is that this research measures conceptual mastery and critical thinking, also analyzes students' ability to predict, observe and explain in POE stages. From the problems, it is seen that the teaching-learning process in the school is still not very effective to bring out

students' capacity to its full potential. Using the information, the researcher decided to conduct a research titled "The Effect of Predict-Observe-Explain (POE) Strategy on Students' Conceptual Mastery and Critical Thinking in Learning Vibration and Wave".

1.2 Research Problem

The research problem of this study is "How is the Effect of Predict-Observe-Explain (POE) Strategy on Students' Conceptual Mastery and Critical Thinking in Learning Vibration and Wave?". Based on the research problem proposed, the research attempts to explore the following questions:

- 1) How is the effect of Predict-Observe-Explain (POE) strategy on students' conceptual mastery in learning vibration and wave?
- 2) How is the effect of Predict-Observe-Explain (POE) strategy on students' critical thinking in learning vibration and wave?
- 3) How are students' abilities in conducting Predict-Observe-Explain (POE) strategy in learning vibration and wave?

1.3 Research Objective

The objective of this research is limited to:

- 1) To investigate the effect of Predict-Observe-Explain (POE) strategy on students' conceptual mastery in learning vibration and wave.
- 2) To investigate the effect of Predict-Observe-Explain (POE) strategy on students' critical thinking in learning vibration and wave.
- 3) To investigate students' abilities in conducting Predict-Observe-Explain (POE) strategy in learning vibration and wave.

1.4 Research Benefit

1) For teachers

Teachers will be able to hold a class using more active, attractive and effective learning strategy in teaching vibration and wave in consideration for developing students' conceptual mastery and deeper critical thinking.

2) For students

Students will be able to study more effectively and efficiently to understand the concept of vibration and wave as well as their in vibration and wave subject. Students will also be able to improve their critical thinking and conceptual mastery, and have better and meaningful learning

3) For researchers

It will open new research to find how to construct more effective learning model, based on how POE model affects learning activities and thus, develop or make better one.

1.5 Organizational Structure of Research Paper

In purpose of systematic structure of the paper, this research paper is arranged based on the following organizational structure:

1) Chapter I: Introduction

The first chapter includes background of the research, research problem, research objective, research benefit, organizational structure of the paper and limitation of problem.

2) Chapter II: Literature Review

This second chapter includes literature review about students' conceptual mastery, students' critical thinking and Vibration and Wave concept.

3) Chapter III: Research Methodology

This third chapter includes details of research method, research design, population and sample, instrument, procedure, data collection and analysis.

4) Chapter IV: Results and Discussion

This fourth chapter includes the results of the research and the interpretation of the results.

5) Chapter V: Conclusion and Recommendation

The fifth chapter which includes the conclusion of the research and recommendation.

1.6 Limitation of Problem

In order to make the research more focused, the problem is limited as follow:

- 1) Predict, observe and explain (POE) learning is a learning that engages students in predicting a phenomenon, observation through the demonstration, and finally explaining the results of the demonstration and their previous prediction (White and Gunstone, 2014). In this study, the science process skills that are measured include skills predicting, observing and explaining.
- 2) Conceptual mastery (students' understanding) that is measured in this research involves level of cognitive of remembering (C1), understanding (C2), and applying (C3) based on Bloom (2012).
- 3) Critical thinking measured in this research includes the indicators of critical thinking which analyzing arguments, making induction and assess induction, and formulating an action (adapted from Ennis in Slamet, 2014).
- 4) In this research, the topic is vibration and wave, that is limited by competency standard no. 6, which is "to understand the concept and the application of vibration, wave and optics in daily technological products" and basic competence no. 6.1, which is "to describe the concept of vibration and wave and its parameters", that are attached in Badan Standar Nasional Pendidikan (2013). Conceptual mastery test measures students' understanding of the concepts in vibration and wave topics, while critical thinking test measures students' critical thinking only in wave topic.

