

CHAPTER I INTRODUCTION

A. Background

Indonesia National Curriculum of 2013 states that teaching learning process at school should guide the students to experience five learning aspects which are being emphasized in this curriculum, they are observing, questioning, experimenting, associating, and communicating (*Kementerian Pendidikan dan Kebudayaan*, 2015). Those five learning experiences are used by the government to support Indonesia in reaching the education objectives.

The mission and orientation of Indonesia National Curriculum of 2013 is translated in educational practice with the specific purposes so that learners have the necessary competences to the lives of society today and in the future. The competences are included: (1) foster religious attitude and high social ethics in the life of society, nation and state; (2) the acquisition of knowledge; (3) have the skills or the ability to apply knowledge in order to conduct scientific inquiry, problem solving, and the making of creative works related to everyday life (*Kementerian Pendidikan dan Kebudayaan*, 2016).

But unfortunately, government's expectations have not been reached yet. Because in reality, the students' acquisition of knowledge and ability to apply knowledge is still low. It can be seen from international comparative survey such as PISA (Programme for International Student Assessment), the score of Indonesia in science is only 403, while the average score is 497 (OECD Data, 2015).

According to Olubu (2015) the poor performance of students attests to the fact that the teaching and learning process have not been effective enough. The implementation of this curriculum considered as has not been optimal and correspond with the expectation. It depicts lack of acquisition of the required skills and understanding about nature of science, which may be as a result of inadequate exposure of learners to an inquiry laboratory activities. It is an

indication of a gap in the system of teaching and learning of science in Junior High School which may require investigation and remediation (Olubu, 2015).

The low score of Indonesian students in science is also occurred because natural science subject is considered as one of the subjects that has special difficulties for many students included for Junior High School students as teenagers (BBC News, 2005). These difficulties then could lead students to have low motivation in learning science, although actually in this school level they should have a good conceptual mastery and understanding about nature of science, in order to be their foundation for learning natural science in the next school level. As what stated by Anderman and Sinatra (2008) that the state of science education for teenagers is at an important crossroad.

As one of the main part of science subject, light and optics topic is also hard to be learned by the students. Tural (2015) stated that light and optics is a rapidly developing and often encountered its technological practices in everyday lives. However teaching and learning the subject of lights and optics is challenging for teachers and students (Tural, 2015).

Teaching the teenagers or adolescents will also emerge unique challenges for science educators. It is because in the adolescent phase students are facing the transition phase means that students are in the process of trying to understand the abstract concepts where in the previous school level or child phase they only learn the concrete one (Anderman and Sinatra, 2008).

To solve those problems, educators should provide a form of teaching and learning activity which can attract the interest of students (Brookes Publishing, 2012). Teacher could facilitate students with learning activity which engage students to think deeply about the learning material in appropriate level. Appel et al. (2014) stated that the conceptual mastery of the students can be enhanced when the students were provided with “learn-by-doing” or kinesthetic modes of knowledge acquisition. Learning science including physics is not only the acquisition in the form of facts, concept, principles or theory but learning will be more meaningful if the students experience or observe it directly (Ausbel, 1968).

A focus on meaningful learning is consistent with the view of learning as knowledge construction, in which students seek to make sense of their experiences (Anderson and Krathwohl, 2001). Olubu (2015) also stated that science is better to be taught using experimentation, it should be taught through inquiry-based approach in a well-equipped laboratory learning environment. Inquiry-based learning is one approach using more student-directed, interactive methods of learning and focusing on learning how to learn (Wolf and Fraser, 2007). The laboratory experiments can help the teachers to demonstrate practically some of the principles taught in theory.

But however, based on a survey done by the researcher in 2016, it showed that in Indonesia there is still lack inquiry based laboratory activity conducted to support the learning process. So, inquiry based laboratory activity is expected to have positive effects toward Junior High School students' conceptual mastery and also students' understandings about nature of science (NOS).

Previously, there are several reseaches already conducted to test the effectiveness of inquiry based laboratory method, such as a research conducted in Autralia and Turkey (Wolf and Fraser 2007; Sesen and Tarhan 2011), these reseaches investigated the effect of inquiry based laboratory activity in the term of Attitudes and Achievement. Also a research conducted by Tuan et al. (2005) which evaluate the 8th grade students with different learning styles toward their motivation outcomes after implementing 10 weeks inquiry based laboratory activity. And, the research conducted by Kipnis and Hofstein (2008) empirically investigated the development of metacognitive skill through inquiry based laboratory activity.

Such research could further suggest changes to educational standards and practices. If inquiry-based learning can improve students' outcomes in several topics of science, then similar strategies hopefully could work in other topics and for other age groups. So, different with those previous research this research was initiated to evaluate the effectiveness of using inquiry-based laboratory activities among 8th Grade students in terms of students' conceptual mastery and understanding about nature of science (NOS) in lights and optics topic.

B. Research Problem

The research problem can be formulated as “How is the effect of Inquiry based Laboratory Activity on students’ understanding about lights and optics and understanding about Nature of Science (NOS)?”.

Based on the research problem, the research attempts to investigate the following questions:

1. How is the effect of Inquiry based Laboratory Activity on students’ understanding about lights and optics?
2. How is the effect of Inquiry based Laboratory Activity on students’ understanding about Nature of Science (NOS)?

C. Research Objective

According to the problem that has been proposed, the objectives of this research are:

1. To investigate the effect of Inquiry based Laboratory Activity on students’ understanding about lights and optics.
2. To investigate the effect of Inquiry based Laboratory Activity on students’ understanding about nature of science (NOS).

D. Research Benefit

1. For teachers

This research can help the teachers to get the information about Inquiry based Laboratory Activity in order to increase the attractiveness of teaching learning process in science instruction especially in lights and optics topic. The teachers may also evaluate the procedures and develop this learning model in a more creative way or apply it to other subjects or topics in order to get better learning outputs.

2. For students

This research can help the students to have new experience of learning in class in order to improve the learning quality especially in lights and optics topic. Through Inquiry based Laboratory Activity, it is expected that the

students can have good conceptual mastery and understanding about Nature of Science (NOS) in learning science by involving the students to the experiment or practical class.

3. For other researchers

This research can help the other researchers to find out more or deeper about Inquiry based Laboratory Activity; other advantages, variations, or perhaps the inadequacy. Thus, this research could motivate the other researchers about Inquiry based Laboratory Activity which can be done to science learning, or other subjects.

E. Organizational Structure of Research Paper

The structure of this reseach paper consists of five chapters:

1. Chapter I. Introduction. This chapter contains the background of the research, research problem, research objectives, research benefits, organizational structure of research paper and limitation of problems.
2. Chapter II. Literature Review. This chapter contains the literature review about experimental learning model which is Inquiry based Laboratory Activity, and the other variables which are Conceptual Mastery, Nature of Science (NOS), lights and optics and relevant reseach.
3. Chapter III. Research Methodology. This chapter contains the method that is used to finish this research paper, which are research method and research design, population sample, operational definition, research instrument, instrument annalysis, data collection, data analysis technique, research procedure, and research scheme.
4. Chapter IV. Result and Discussion. This chapter containse the result as well as the discussion and explanation about the result of this research paper.
5. Chapter V. Conclusion and Recommendation. This chapter contains the conclusion of research paper as well as the recommendation for the future or next research.

F. Limitation of Problem

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

1. Inquiry based Laboratory Activity that conducted in this research is referred to a learning model which provide opportunities for students to interact directly with the material world, using the tools and data collection techniques (Singer; Hilton; and Schweingruber, 2006). Specifically, it adopted the five phase of inquiry instruction by Joyce, Weil and Calhoun (2004).
2. Understanding that assesed in this research involves the cognitive process dimension in the categories of remembering (C1), understanding (C2), applying (C3), analyzing (C4) and Evaluating (C5) based on The Revision of Bloom Taxonomy (2001).
3. Students' Understanding about Nature of Science (NOS) that assesed involve six aspects which are observation and inferences, change of scientific theories, scientific laws and theories, social and cultural influence on science, imagination and creativity in scientific investigation, and methodology of scientific investigation. To asses those aspects, the researcher adopts the questionnaire developed by Liang et al. (2008).
4. In this research the learning topic is about lights and optics, specifically the Inquiry based Laboratory Activity was implemented based on Indonesia National Curriculum of 2013 in the core competence number 3 which is "*Memahami dan menerapkan pengetahuan (faktual, konseptual, dan prosedural) berdasarkan rasa ingin tahunya tentang ilmu pengetahuan, teknologi, seni, budaya terkait fenomena dan kejadian tampak mata.*" and basic competence number 3.6 "*Mendeskripsikan sifat-sifat cahaya, pembentukan bayangan, serta aplikasinya untuk menjelaskan penglihatan manusia, struktur mata pada hewan, dan prinsip kerja alat optik.*" as attached in *Kementerian Pendidikan dan Kebudayaan* (2015).