

CHAPTER I

INTRODUCTION

A. Background

Our daily life cannot be apart with science. Almost all part of life is explained by science. Science change the way people live. Any further, science makes life getting easier through its innovation and development that results technologies. These achievements are obtained from experimental, research, observation, proof of hypothesis and argumentation as the science itself is produced. In line with Trefil and Hazen (2010) that stated science is a way of knowing by asking and answering questions about universe. This explains the importance of learning science to understand nature and life.

Since knowledge of science is formed by observation and experimental activity that results facts, thus highlight the role of argumentation skill in learning science. According to Ozturk and Ucus (2015) argumentation can be categorized as one of the most substantial activity in science education and it's necessary to be explicitly taught. Berland and Hammer (2012) stated that many inconsistencies among ideas and evidence in science are exposed by using argumentation, it is a tool by which the community assesses the validity of hypothesis and claims. Argument is also viewed as a critical aspect of the language practices of science (Jimenez, 2007). In addition, advances in technological innovation, and increasing globalization, require students of the twenty-first century to handle vast, and often complex, sets of information from a variety of different sources. Students are expected to be able to evaluate this information, thus requiring them to engage in argumentation to arrive at evidence-based decisions.

In the context of socio-scientific issues which are open-ended, debatable, and involve multiple perspective and interpretations, there have been disagreements over it for a long period of time. Therefore, it is important for citizens to make arguments and decisions regarding these socio scientific issues, such as fetal tissue implantation, global warming, genetically modified food, cloning, pollution and stem cell research (Khishfe, 2012). Arguing these issues can construct student's mind about the application of science and its impact in real life.

Engaging in argumentation is realized as an important component of scientific literacy, where scientific literacy is one of the main goals of education. Along with the development of technology and science, students should be able to be part of society with good scientific literacy. In line with that, American Association for the Advancement of Science (1989) stated that understanding the nature of science is seen as one of the important keys to achieving scientific literacy. In other word, the understanding of nature of science is hypothesized can increase the argumentation skill. This highlights the relationship of nature of science understandings and argumentation.

Research addressing argumentation in science education has found that students generally have poor argumentation skills. For example, they tend to ignore data and warrants, jump to conclusions, and are unable to evaluate counter-evidence. In addition, Khishfe (2013) stated that teachers generally do not possess adequate skills to teach argumentation to their students even with the many attempts under taken to promote student discourse and argumentation in the classroom while providing teacher training and support.

Bell and Linn (2000) show that junior high school students with better understanding of the nature of science will be able to make more complex arguments. That result is confirmed by Khishfe (2012), he stated that there is a correlation between understanding of science and the quality of argumentation. It means the learning must give explicit attention to the various aspects of Nature of Science, and an emphasis on students' awareness of Nature of Science aspects through student reflection on the activities in which they are engaged. This means that the learning activities should be based on nature of science aspects.

Nature of Science needs to be explicitly taught to learners by deliberately focusing on various aspects of Nature of Science during classroom instruction, discussions, and questioning (McDonald, 2010). The effectiveness of an explicit approach on students' understandings of nature of science has been examined in several contexts such as historical, inquiry, and recently socio scientific issues (Khishfe, 2012). The inclusion of Nature of Science in school science curricula identified the importance of Nature of Science in helping people participate in

argumentation and decision-making regarding socio scientific issues. It also helps student to understand science better through involving them in nature of science based learning.

Moreover, the issue of water pollution is necessary to be fully mastered by students. Based on World Health Organization (2017) there are 2.1 billion people who have no access to safe, readily available clean water at home and around 4.5 billion people has no safely managed sanitation. Around 2.2 billion people die each year because of water-related diseases and 15% of them are children. In Indonesia, as much 119 million people have no access to clean water and 82% of them consume unsafe water (Yuliastuti, 2011). This condition is worsened by the pollution happened in 60% river in Indonesia. Those rivers are mostly contaminated by sewage and organic matter from household waste (Marfai, 2008).

Based on statement above, it is essential to implement research that able to investigate students' concept mastery and argumentation skill through nature of science based lesson. Therefore, the researcher has intention to conduct research entitles, *“The Effect of Nature of Science (NOS) based Lesson on Students' Concept Mastery and Scientific Argumentation Skills in Learning Water Pollution”*.

B. Research Problem

The research problem of this study is “How is the effect of Nature of Science (NOS) Based Lesson towards Students' Concept Mastery and Scientific Argumentation Skill in Learning Water Pollution?”

C. Research Question

Elaborating the research problem, the research is attempted to explore the following questions.

1. How does effect of nature of science based lesson on students' concept mastery in learning water pollution?
2. How does effect of nature of science based lesson on students' scientific argumentation skill in learning water pollution?

3. How does the impression of students after learning water pollution using nature of science based lesson?

D. Limitation of Problem

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

1. Seven nature of science aspects which include in learning process are advanced by Lederman (2002). From seven aspects of nature of science, only four of them that are used in this research namely empirical nature of science, creative and imaginative of scientific knowledge, social and cultural embedded of scientific knowledge, and tentative nature of science.
2. Argumentation that is measured in this research is based on six aspects of argumentation by Toulmin (2003). Those aspects are claim, data, warrant, qualifier, rebuttal and backing.
3. Concept mastery that is measured in this research involves cognitive level remembering (C1), understanding (C2), applying (C3), and analyzing (C4) based on Bloom taxonomy revised (2012).
4. In this research, topic chosen is water pollution which is included in topic of human impact on ecosystem. It is limited by core competency no. 3 and basic competency no. 3.9 for seven grades in junior high school.

E. Research Objective

This research objectives are specified as follow.

1. To investigate effect of nature of science based lesson on students' concept mastery in learning water pollution.
2. To investigate effect of nature of science based lesson on students' scientific argumentation skill in learning water pollution.
3. To investigate the impression of students after learning water pollution using nature of science based lesson

F. Research Benefit

The results of this study are expected to provide the following benefits.

1. For teachers, it can help to find alternative method in teaching science and encourage students to argue in learning process.
2. For students, it can help students thoroughly comprehend science. It makes the learning process fun and doesn't monotone anymore. It also helps students develop their argumentation skill.
3. For other researchers, it can be used as basic for other research of nature of science and scientific argumentation skills.

G. Organization Structure of Research Paper

In order to get organized structure of paper, this research paper is arranged based on this following structure:

1. Chapter I: Introduction. This chapter presents the background of the research followed by the problem and limitation as the basic to conduct this research. In this part also present the purpose of the research and the benefit which is gained from this research.
This chapter present
2. Chapter II: Literature Review. This chapter explains some literatures and theories of nature of science based lesson, concept mastery and scientific argumentation skill. It also consists of some findings of another research in the same field of study.
3. Chapter III: Methodology. This chapter examines the step of the procedures, the type of research and the data analysis include the validation of instrument.
4. Chapter IV: Result and Discussion. This chapter present the interpretation of the data as the result of the research. The result is supported by the other finding and theories raised by another expertise and researcher.
5. Chapter V: Conclusion and Recommendation. This chapter consist of the conclusion as the answer of the research question in chapter I.