

CHAPTER I

INTRODUCTION

1.1 Background

Science is considered as one of the hardest subject matters in the school. It requires many theoretical readings, calculation, and formulas, difficult terms, and content memorization. According to Cimer (2012), students have difficulties in learning biological concepts because of the nature of science itself, its teaching methods, and lack of facilities, media, and resources. While in learning chemistry, Cardellini (2012) stated that students have difficulties in chemistry because of the nature of science, the methods of teaching, and the methods by which students learn. Whereas students have difficulties in learning physics because of the nature of physics, the way in which a physics course is taught, and the physics problems which are sometimes very vague and cumulative (Ornek, Robinson, & Haugan, 2008). Those factors make students pay less attention in the class, easily lose concentration, feel bored, and uninterested in learning science.

The nature of science becomes one of the reasons why sciences are hard and difficult to learn. The nature of biology usually includes a lot of concepts, various biological events that cannot be seen by the naked eye, abstract concepts, and there are a lot of foreign / Latin words. These nature of biology leads them to memorize the biological facts in order to learn them (Cimer, 2012). The nature of chemistry tends to the alphabetic and symbolic language, abstract concepts, and structural properties which couldn't be seen by the naked eyes (Cardellini, 2012). The nature of physics composed of many theoretical readings (such as laws and rules), alphabetic language, formulas and calculations that requires good mathematics, very abstract things, and hard to grasp the next concept when one of the concepts is missing (cumulative) (Ornek, Robinson, & Haugan, 2008). Thus, the nature of science requires very detailed knowledge and covered topics or concepts that were difficult to learn. When this topic does not appear to be relevant to the students'

daily lives and does not include practical work or experiments, students will learn the topic by memorization (Cimer, 2012).

The way the teacher taught is another common reason behind the “science is hard”. According to the Cimer (2012), science lessons are generally carried out through the teacher-centered lesson. Teacher transfer the knowledge that they have without involving students in the classroom activity. The concept is also rarely connected to the daily lives so that students losing their motivation to learn science. As a result, science lesson becomes boring and uninteresting for students.

The role of the teacher becomes an important part to help students in learning science, especially in the way they deliver the concept (teaching strategy). The teaching strategy is an important thing to create an environment in the classroom become more active, engaging, and increasing the students’ participation. Fives, Huebner, Birnbaum, & Nicolich (2014) stated that science should be a recursive, dynamic process of asking questions, investigating, and then asking more questions. Akinoglu & Tandogan (2007) suggests that the student-centered active learning process within will makes students take the responsibility and involvement in the learning process. Active-learning techniques motivate students and maintain their attention by requiring them to engage in course content (Wenger, 2014). There are a lot of teaching strategies that can be used in the science teaching and learning process, such as Discovery-Based Learning, Problem Based Learning, Project Based Learning, Inquiry-Based Learning, and so on. These strategies promote student-centered learning in which they will involve in the learning activities.

In order to overcome students’ problem in science, the teacher needs a teaching strategy which is able to connect their knowledge with the real-life phenomenon, able to involve them in the classroom activity and reflect on the abstract knowledge. The strategy that meets these criteria is Problem-Based Learning (Akinoglu & Tandogan, 2007). Problem Based Learning is an active learning technique that helps students to develop higher-level cognitive abilities, such as critical thinking and problem solving, through collaborative group work and reflection on their own learning (Wenger, 2014). Clayton & Pierpoint (2004) adds

that PBL is a student-centered and self-directed learning model which begin the lesson with a problem, not a knowledge. Students will find the knowledge by themselves through the process of solving problem and the teacher acts as a facilitator to guide them to find the solution to a problem (Akinoglu & Tandogan, 2007). Akinoglu & Tandogan (2007) are also said that by using PBL model in a learning activity, students will involve more in the process of learning and since they do some research in solving the problem, students will more understand the lesson rather than memorization.

In constructing the theories that represented by the problems presented, students work collaboratively using a variety of informational resources (Akinoglu & Tandogan, 2007). The information itself is gained from various media such as books, internet, magazine, or direct interview with the expert. Therefore, it is necessary for students for being information literate so that they would be able to effectively filter information that they get through the Internet, television, newspaper, and other sources. Students also need information literacy so that they are able to locate, evaluate, and use the information effectively and efficiently, especially in science content (Association of College and Research Libraries, 2000; Foo, et al., 2010).

The seeking of science content in many resources is also forced students to have scientific literacy instead of having information literacy. Scientific literacy itself is the ability to understand scientific processes and to engage meaningfully with scientific information available in daily life (Fives, Huebner, Birnbaum, & Nicolich, 2014). However, the implementation of scientific literacy itself has not been a concern in all countries, such as in Indonesia. This statement is supported by the data of OECD (2016) which shown that scientific literacy for Indonesian students in 2015 is in the position of 62 from 70 participated countries. This report means that the scientific literacy of the students in Indonesia is still low. The low ability of students' literacy is influenced by several factors, they are curriculum and educational system, the method and model of learning that is used in the

instructional process, learning facility, and learning sources (Kurnia & Fathurohman, 2014). The strategies to enhance students' performance in scientific literacy is by engaging them in learning activity which is student-centered such as questioning, creative exploration to find the answer, and the communication skills to present the result (Latip & Permanasari, 2015).

There are a lot of studies tried to find the relationship of Problem-based learning, scientific and information literacy. Ardianto & Rubini (2016) stated that Problem-based learning can improve students' scientific literacy by connecting their knowledge with real-life phenomenon. Diekema, Holliday, & Leary (2011) stated that students' information literacy was improved positively by using Problem-based learning. Students were motivated by working on authentic problem, and engaged deeply with the information and discovered new questions for their learning process. Thus, these studies inspired the researcher to implement a Problem-based learning as an approach to teach the human excretory system topic in 8 grade of Junior High School. The human excretory system itself is one science topic that can be connected to the real-life phenomenon for the content. Besides, this topic has many difficult terms and concepts that requires memorization. So, this study will focus on the implementation of Problem Based Learning with the project in the end of class meeting in the science concept specifically human excretory system topic.

1.2 Problem Statement

According to the background which has already stated, the problem of this research is formulated into: "How is the effect of Project in Problem Based Learning (PBL) on students' scientific and information literacy in learning the human excretory system?"

1.3 Research Question

Elaborating on the research problem, the research attempts to explore the following questions:

- 1) How is the effect of Project in Problem-based learning on students' scientific literacy in learning the human excretory system?
- 2) How the effect of Project in Problem-based learning on students' information literacy in learning the human excretory system?

1.4 Limitation of Problem

The problem stated is limited to the certain aspects as follow:

- 1) Project in Problem based learning is limited to the creating a project in the form of article about human excretory system during learning by using Problem-based learning.
- 2) Students' scientific literacy is the ability to engage with science-related issues, and with the ideas of science (Thomson, Hilman, & Bortoli, 2013). The scientific literacy will be limited to three domains from four domains which are science knowledge, competencies, and attitudes domain in the context of the Human excretory system.
- 3) Students' information literacy is the ability to locate, evaluate, and use effectively the needed information (Association of College and Research Libraries, 2000). The information literacy is using the standards by Montana Office of Public Instruction for 8th grade. The standards are limited into three from five standards, those are the student will identify the task and determine the resources needed; the student will locate sources, use information, and present findings; and the student will use information safely, ethically and legally.

1.5 Research Objective

According to the research problems and questions that are stated above, this research aims to investigate several aspects as follow:

- 1) Investigate the effect of Project in Problem Based Learning on students' scientific literacy in learning the human excretory system.
- 2) Investigate the effect of Project in Problem Based Learning on students' information literacy in learning the human excretory system.

1.6 Research Benefit

It is expected that the results of this study able to fulfill the following benefit aspects:

- 1) For science teachers, this study may use as the reference to develop the learning process in the classroom.
- 2) For students, this study might become the new experience in learning science in an active way by exploring the knowledge by themselves.
- 3) For other researchers, this study may use as a reference in analyzing how Project in Problem Based Learning affects students' scientific and information literacy in learning the human excretory system.

1.7 Organizational Structure of Research Paper

Generally, the organization structure section explains the details of the research paper structure based on the Universitas Pendidikan Indonesia's regulation 2016. The organization structure of this research paper is divided into five chapters. The chapters are resembled and explained as following paragraph.

Chapter I explains about the background and problem identification which are elaborated into research problem and research questions. This research problem is also limited into limitation of problem. In this chapter, the research objectives and benefits are determined. This chapter is crucial to determine the following chapters, such as literature review and methodology.

In line with the Chapter I, Chapter II of this research paper explains about the theories and relevant research needed by the researcher to analyze the result and the finding. In this chapter, there are some literature reviews that support the argument and the result analysis in this research. Some literature reviews that included in this chapter are about problem-based learning, scientific literacy, information literacy, and human excretory system topic.

Chapter III is about the methodology of this research. This chapter explain the details of research method and design used in this research. Furthermore, research sample and population, research procedure, operational definition, and assumption are also explained in this chapter. A set of instruments applied in this research is also explained concisely.

Chapter IV explains the research result and discussion. This chapter explains about the findings and analysis concerning on this research. The research problem described in the first chapter is answer in this chapter. Through discussion, each finding is analyzed using the previous findings of other researchers that have already described in the second chapter.

Chapter V is the closure chapter which includes the conclusion of the research and recommendation for the next research.