

CHAPTER I INTRODUCTION

1.1 Background

Curriculum in Indonesia has progressed. During changing of curriculum there is no other purpose than to improve the quality of the learning process and the existing of learning design in the school. Therefore, the curriculum in Indonesia will continue to evolve and change to need of society and demands of the time. The Curriculum 2013 is expected to improve the quality of education in Indonesia. This is in line in the UU 20 of 2016 that the curriculum is an arrangement of objectives, content, and lesson materials and ways used as guidelines for organizing learning activities to achieve specific educational. In the development of 2013 curriculum, there are various problems and challenges among others related to the globalization and free market, environmental issues, the rapid advancement of information and technology, and transformation in the education sector as well as TIMSS and PISA materials that must own by the learner.

Based on the result of Program for International Student Assessment (PISA) showed that the performance of Indonesia students is still relatively low. The achievements of Indonesia evaluated by PISA for science, reading, and math are respectively is ranked 62, 61, and 63 of 69 countries (Kemendikbud, 2016). The rating and average score of Indonesia do not differ greatly from previous PISA 2012 test result and surveys in 2012 which is also in the low material mastery group. However the OECD not only conducts test of those three areas, but also measures a variety of indicators from surveying many matters related to educational activities. The result showed that the index of enjoyment of learning science of Indonesia is quite high than index obtained by countries that scored high such as Singapore and Japan. Many works are attempted to improve Indonesia PISA score. One of the efforts is conducted by introducing the use of technology in order to help students' science literacy.

There are several aspects that can affect the PISA result above, such as the role of parents, socio-economic background, students' attitude and the quality of learning, and school condition and infrastructure facilities (Nizam, 2016). The progress science and technology engages the educational world improving the quality of learning media. For example almost all levels of educational institutions in Indonesia have been using computer-based media education (Fitrianingrum, 2014). In educational process, using technology will make students interested in learning science. The computer simulation is one kind of tools that are always used in teaching process to improve students understanding in difficult concept at the lesser time than traditional method (Alsultanny, et al., 2014). According to Bell & Smetana (2015), the computer simulation is computer-generated dynamic models which can explain the concept or simplified model of real-world component, phenomena, or process of concept consisting of animation, visualization, and interactive laboratory experiences. Technological advance will bring the instructional digital technologies into science classroom to make these types being interactive, authentic, and meaningful learning opportunities.

Learning Physics is one of the many lessons requiring the media to convey or explain the material (Sarofi, 2014). Physics also requires experience directly students. One of the roles instructional media is giving students experiences that can not be obtained directly but it can be presented well using in the learning media. The main problem of teaching and learning of science especially Physics is generally unattractive. Consequently, many students who lack understanding the concept of Physics become passive (Haya, Waskito, & Fauzi, 2014). To handle this problem, an interactive media makes students feel happy and motivated is needed to enhance students' science motivation. Therefore the lesson will not last transfer of verbal knowledge. Motivation can encourages the student to learn or independently. Without motivation, students will not be interested and serious in the learning science.

Physics Education Technology (PhET) will be promoted as a technological media in order to help learning science. PhET is a site that

provides free physics and chemistry learning simulation for download for the benefit of classroom teaching or can be used for individual learning purposes (Wieman et al., 2010). The simulations provided by PhET are highly interactive which invites students to learn by exploring directly. PhET simulation creates an animated for abstract fact or invisible phenomena to be modelled by students, such as atoms, electrons, photons, and magnetic fields. In order to encourage a quantitative exploration, simulation also offers measurement instruments including rulers, stop-watches, voltmeter, and thermometers. Users can manipulate interactive tool, immediate animated responses visualize some related science representations such as motion of objects, graphics, etc.

Based on these problems, the study to investigate of the use PhET simulation as teaching media to improve students' understanding and motivation in learning solar system. The correlation between students understanding and motivation towards implementation of PhET simulation will be further investigated. In this research, learning Solar system with PhET simulation be contrasted to learning Solar system without PhET simulation.

1.2 Research Problem

Based on the background above, the research problem of this study is “How does PhET simulation as teaching media improve students' understanding and motivation in learning Solar System?”

1.3 Research Question

Based on the background that has been explained on above with elaborating the research problem in this paper is “How is the use of PhET simulation as a tool in teaching to improve students' understanding and motivation in Solar System topic?”

To make detail, the research question attempts to explore the following questions:

- 1) How does PhET simulation implement in learning Solar system?

- 2) Does PhET simulation improve students' understanding in learning Solar system?
- 3) Does PhET simulation improve students' motivation in learning Solar system?
- 4) Is there correlation between students understanding and motivation in learning Solar system topic in using PhET simulation?

1.4 Research Objective

The general objective of this study is to investigate the use PhET simulation as teaching tools to improve students' understanding and motivation in learning Solar System topic. The particular objectives of this study are:

- 1) To implement PhET simulation as teaching media in learning Solar system
- 2) To improve students' understanding in learning Solar system using PhET simulation.
- 3) To improve students' motivation after learning Solar system using PhET simulation.
- 4) To investigate the correlation between students understanding and motivation in learning Solar system using PhET simulation

1.5 Limitation of Problem

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

- 1) PhET simulation is one media computer-based simulation was used in this study which is interactive computer simulation for teaching and learning Physics, Chemistry, and game-like environments where the student learns through exploration.
- 2) Conceptual mastery (students' understanding) that is measured in this research involves level cognitive of remembering (C1), understanding

(C2), applying (C3), and analyzing (C4) based on A Taxonomy For Learning Teaching And Assessing (2001)

- 3) Students' motivation involved in this research to obtain the students' response during they learned the content of Solar System by using PhET simulation and without use simulation.
- 4) In this study, the topic is Solar System is limited by competency standard number 3 and number 4 and basic competence number 3.11 and 4.11 that are attached in Kurikulum 2013 in Badan Standar Nasional Pendidikan for Junior High School. The limitation of the topic in this study focuses on planet movement, rotation and revolution of the planet, and gravity force.

1.6 Research Benefit

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

1) Teachers

PhET is one media teaching to compensate the teaching method to be more interactive for a student especially when they learn about Solar System, where the content is abstractly for student understanding. And also hopefully in this research can assist for the teacher to define in which the cognitive level of Junior High School students are, so the teacher can prepare and conduct the teaching process in the topic Solar System in order teacher to be more creative in the delivering topic to students.

2) Students

By using PhET simulation especially in the Solar System topic, students can be more comprehend in a learning activity. Not only comprehending the concept but by using computer simulation can give students a new experience in using the computer-based learning, so students can improve their cognitive skills by practicing the problem solving that provided in PhET simulation. Besides they learn about the concept of Solar system, hopefully, the student can be more

motivated in learning process, so they can improve their creativity about Solar system.

3) Researcher

Hopefully, finding this research can assist and more developed the study about another computer-based learning in the future especially in science education.

1.7 Research Paper Structure

In this research paper consists of five chapters and several appendices. Each chapter consists of sub-chapters. The systematic of this research paper is

1) Chapter I: Introduction

This chapter outlines the background, research problem, research questions, research objectives, limitation of the problem, research benefit, and research paper structure. This chapter is the base of the research. All discussion was based on the research problem and questions stated in this chapter

2) Chapter II: Literature Review

This chapter describes detail information regarding PhET simulation-based learning, students' understanding, students' motivation, Solar system and other things correlated to the science learning under the study.

3) Chapter III: Methodology

This chapter describes the methodology used during the research. It consists of research method and design, population and sample of research, assumption, hypothesis, operational definition, research instruments, instrument analysis result, data processing technique and research procedure.