CHAPTER I

INTRODUCTION

1.1 Background

Start from 2000, Indonesia has actively participated in the test of Program for International Student Assessment (PISA). Since 2000 until now, the score obtained by Indonesia in participating in the PISA test has never reached an average of the Organization for Economic Co-operation and Development (OECD) standard. This achievement can be proven by the average value of Science obtained by Indonesia in 2018, showing a score of 396 where the score is lower than the average value of the OECD in Science, which is 489. This result puts Indonesia in the 70th position out of 78 countries in Science (OECD, 2019). The ranking shows that the outcome of Science Learning in Indonesia is still relatively low.

Based on Indonesian Government Regulation No. 19 of 2005, groups of Science and Technology subjects in Junior High Schools or other equivalent level are intended to obtain essential competencies in Science and Technology and to cultivate thinking critically, creatively, and independently (Government Regulation, 2005). As well as in the Indonesian Ministry of Education and Culture Regulation No. 20 of 2016, more accurately explains the skills that must be possessed by students are to think and act. Those two skills include creativity, productivity, critical, independent, collaborative, and communicative (Ministry of Education and Culture Regulation, 2016).

Referring to the Government and Ministry of Education Regulation, Head of Research and Development Officer of Ministry of Education and Culture explained in more detail that in recent years, questions that measure Critical Thinking Skills had been tested in the National Examination (UN). The composition of the problem is based on the cognitive level with a range of 10%-15% for reasoning, 50%-60% for applications, and 25%-30% for knowledge and understanding (Ministry of

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Education and Culture, 2019). But unfortunately, with the composition of the questions that have been arranged, the average score of Science for Junior High School still occupies the low category. This is in line with data obtained from the Education Assessment Center from Ministry of Education and Culture, where the average value of Science in 2019 National Examination for Junior High School is only 48.79 with a minimum passing score of 55 (Education Assessment Center, 2019).

As mentioned earlier, the Ministry of Education and Culture has tested the questions in National Examination which measures Critical Thinking Skills. According to Ministry of Education and Culture (2019), the assessment with this critical thinking model was carried out to catch up on the backwardness of Indonesia in international surveys, precisely the results of PISA. A study examining 21st Century Skills (Binkley et al., 2012) discovered that science and technology advancement in the 21st Century requires several life skills that everyone must learn, one of which is Critical Thinking Skill.

Furthermore, Critical Thinking Skills are often defined as a process of metacognitive, which consists of some sub-skills (e.g., analysis, inference, and evaluation) that increase the chances of solving a problem or a logical conclusion to an argument. Critical Thinking Skills are the key in educational settings as they allow individuals to go beyond merely retaining knowledge, to gain a more sophisticated understanding of the information they receive (Dwyer et al., 2014). Critical thinking also belongs to High-Order Thinking Skills (HOTS). Thinking critically is synonymous with higher-level problem solving and reasoning as it is a key factor in the success of Science (Lamb et al., 2018). Besides, Facione (2015) defined critical thinking is a way of thinking that has the aim to prove a point, interpret something, or solve a problem. There are some indicators in Critical Thinking Skills according to Facione (2015), which are interpretation, analysis, inference, evaluation, and explanation.

Thinking critically is closely related to learning Science. According to Tiruneh et al. (2017), the development of critical thinking has an important role as the main goal of science education. Therefore, several stakeholders in education have long called for comprehensive science curricula revisions focusing on student acquisition of Critical Thinking Skills (Halpern, 2014). The same concern is also shown in several Science curricula of different countries as it strengthens the need to encourage critical thought (Tiruneh et al., 2017). The Science Indonesian Curriculum for Secondary Level is no exception. It is proven based on the 2013 Curriculum which is officially updated by the Indonesian Ministry of Education and Culture Regulation No. 24. of 2016. According to Ministry of Education and Culture Regulation (2016), 51.5% of Basic Competencies in Science subjects for Junior High School are formulated as a word of "to analyze". This clearly demonstrates that the 2013 Indonesian Curriculum emphasizes the creation of critical thinking among students. It is because that analyzing is belong to the category of measuring the higher levels of thinking skills (HOTS) based on Bloom's Taxonomy with the two other higher levels which are evaluating and creating (Saido et al., 2018).

In Science, Critical Thinking Skills are important since it is synonymous with research practices on issues ranging from observing, formulating questions, gathering data, analyzing data, and concluding (Bhakti et al., 2019). However, DiBiase & McDonald (2015) stated that Science classrooms are still strongly teacher-centered where the teaching and learning process is primarily a form of knowledge transmission that does not promote critical thought. According to Barak (2015), many teachers still do not encourage thinking skills. In some cases, Science teachers lack the resources, one of which is technology-integrated learning as innovative ways of teaching Science. Whereas much of science learning concerns abstractions and theoretical entities that cannot be easily observed or handled only through lecture-based instruction since they may too large a scale (Ekanayake & Wishart, 2014). For instance, in learning Solar System. The phenomena that exist

in Solar System could not be discussed and presented explicitly in the classroom, such as Solar System occurrences, day and night variation, moon phases, and eclipse. Accordingly, students only get knowledge about the theories of Solar System based on explanations from the teacher without obtaining a real illustration of actual phenomena that existed in Solar System scope (Bhakti et al., 2019).

Swandi et al. (2018) stated that one alternative to enhance the Science learning process on abstract concepts is to involve relevant information technology such as the utilization of interactive multimedia which consists of text, hypertext, sound, animation, video, and graphics. By using interactive animation and simulation, Science particular concept is easily described. On the other hand, multimedia provides interactive ways of representing information and invokes learner thinking by explicitly presenting the abstract concept through learning processes of reasoning and critical thinking (Weay & Masood, 2015). Also, according to Djamas & Tinedi (2018), using interactive multimedia can improve the ability of critical thinking. Interactive Multimedia is student-centered, allowing students to play an active role in deciding how to learn, to promote critical thinking of students.

Regarding the explanations above, the previous researches have been conducted. Djamas & Tinedi (2018) have concerned the research about developing media to improve critical thinking of students. But, the study focuses on Newton's Law and Accelerated Linear Motion topic. Meanwhile, the other researcher has also concerned the same study about interactive multimedia. Marina (2020) focuses research on utilizing the Stellarium in Learning Solar System which only measuring students' understanding.

Thus, in this work, the researcher focuses on the research which aimed to enhance Students' Critical Thinking in learning Solar System by applying NASA Science as Interactive Multimedia. This prior research will be conducted by designing and analyzing the lesson plan, the worksheet, and the objective test

instrument of Facione's Critical Thinking on Solar System that will be implemented to 7th-grade of Junior High School Students.

1.2 Research Problem

Based on the background that has already been stated, this research problem is formulated as follows: "How does NASA Science as interactive multimedia enhance students' critical thinking skills in learning Solar System?"

1.3 Research Question

According to the research problem above, the research attempts to address this following research questions:

1) How is students' learning process in learning Solar System by using NASA Science Multimedia?
2) How is the enhancement of students' critical thinking after learning Solar System by using NASA Science Multimedia?

1.4 Limitation of Problem

To make the research become focused, the following are the limitation of problems:

1) NASA Science as an Interactive Multimedia

   NASA Science is an educational website about Space and Earth Science maintained by the Planetary Science Communications team at NASA's Jet Propulsion Laboratory (National Aeronautics and Space Administration [NASA], 2019). The features to be applied in this research are limited to NASA Solar System Exploration and NASA Space Place.

2) Critical Thinking Skills

   According to Paul & Elder (2019), thinking critically is the process of evaluating and analyzing thinking to improve it and to reach a conclusion based on the goals and knowledge. The indicators of critical thinking to be developed into assessment is according to Facione (2015) which covers five indicators such as interpretation, analysis, inference, evaluation, and explanation.

3) Solar System

In this research, the Solar System topic is limited by core competence number 3 and basic competence number 3.11 that are attached in the 2013 National Curriculum of Indonesia for Junior High School. The limitation of the topic in this study focuses on the Characteristic of Solar System Component, Rotation and Revolution of Earth and Moon, Solar and Lunar Eclipse, and Moon Phase.

1.5 Research Objective

Based on the proposed research questions, the objectives of this research are:

1) To investigate students' learning process in learning Solar System by using NASA Science as interactive multimedia.

2) To analyze the enhancement of students' critical thinking skills after learning Solar System by using NASA Science as interactive multimedia.

1.6 Research Benefit

The result of this research is expected to give the following benefits:

1) Students

By the existence of this research, NASA Science creates a new experience for students to learn Solar System Topic through interactive multimedia. It supports students to be more motivated in learning Solar System as their curiosity can be explored by operating NASA Science.

2) Teachers

Through this research, NASA Science helps teachers improve the learning process to be more creative and innovative. This interactive multimedia can support teachers in creating a new way of teaching the Solar System Topic.

3) Other Researchers

This research can assist and be used as a reference for other researchers who have the same focus study but in a different dependent variable or for other

researchers who want to study future research about another interactive multimedia in learning science.

1.7 The Organization of Research Paper

This section describes the structure of this research paper for each chapter. This research is composed of five chapters. The first chapter is Introduction which contains the background, research problem, research question, limitation of problem, research objective, research benefit, and systematic of this research paper. This chapter is the basis of research. All the discussion was based on the research problem and question which stated in this chapter. Every argument of this research is cited in the background.

The second chapter in this research is Literature Review which consists of literature, theory, and information of research variables. All of the literature and theories were adapted from books and journals. The explanations include NASA Science as interactive multimedia, students' critical thinking skills, analysis of core competence and basic competence, Solar System as the topic in this study, and the research which has relevance with this study.

Then for the third chapter, it contains the Research Methodology which explains the methodology used for this research. It includes the research method, research design, research subject, operational definition, research instrument, instrument analysis, data analysis, and research procedure.

After the Research Methodology, the chapter of this research is continued to the fourth chapter which is Result and Discussion. This chapter is concerned with the result of the data analysis and the discussion of the findings. Based on the research question that has already been stated in Chapter I, the researcher then interprets and analyzes the data. The data is displayed in the figures and tables format.

For the last structure of this research, it is composed with Conclusion and Recommendation. This chapter includes the conclusion from all the research findings as to the response to research questions and followed by the research suggestions and recommendations.