

CHAPTER I

INTRODUCTION

1.1. Background

Education is an endeavor to create a learning environment and learning process in which pupils may actively use their religion spiritual strength, self-control, personality, intelligence, noble character, and skill potential based on Undang-Undang Republik Indonesia Nomor 20 Tahun 2003 about Sistem Pendidikan Nasional Pasal 1 Ayat 1. Education always experiences development according to the existing era. Technology is one of the terms that is often connected in the scope of teaching and learning processes and systems (Ibrahim, 2014).

In the 21st century, the rapid development of information technology has had a significant impact on society. Society is increasingly aware of the importance of preparing the younger generation to meet the demands of this century. In everyday life in the context of learning, faced with a problem and manage to make solutions, make decisions quickly and precisely. Along with the rapid development of information technology, students' competencies are not limited to process ability, but need to have the ability to think and act to receive, choose and need to manage information.

Critical thinking is a fundamental ability in learning in the 21st century that can be trained through education, according to (Hidayah, 2017). Critical thinking as reasonable reflective thinking that is focused on deciding about what is done or believed (Ennis, 1996). A person who has critical thinking tends to identify relevant information more quickly, separate irrelevant information and use this information to find solutions to problems or make decisions, and if necessary. Filsaime (2008) reveals that someone who thinks critically has a great curiosity, actual, reasoning is trustworthy, flexible, honest in respond to personal prejudice, be careful in making decisions, be transparent on issues, and be balanced in evaluating.

Physics is a part of science, in essence science as a collection of knowledge can be in the form of facts, concepts, principles, laws, theories and models which are commonly called products. Physics can be used as a tool to train critical and analytical thinking ability in problem solving both qualitatively and quantitatively and can develop knowledge, ability, and self-confidence (Oemar, 2012). Physics has a very important role because the phenomena that exist in nature are closely related to physics and in everyday life.

Based on the results of observations in the third internship of researcher at SMAN 7 Medan, physics lesson is often seen as difficult and boring. This happens because the concepts understanding of physics is still lacking. Students tend to memorize without understanding the topic and also learn a lot about mathematical equations, so that physics is identified with numbers and formulas. The teacher rarely understands the students about the topic, they're just emphasizes the formula. The learning that is being carried out is still teacher centered (conventional). Teachers tend not to apply contextual problem-based learning and provide a problem at the beginning of learning which is useful for stimulating students to think critically. The teacher only trains students through sample questions. When researcher provide information, many students are less critical in analyzing the information, do not try to investigate, are less able to provide further explanations and are too quick to conclude without thinking first. In addition, students rarely do practicum due to the lack of practicum tools in the laboratory, the absence of assistants to assist teachers in managing practicum activities, and the inaccuracy of practicum results. The results of an interview with a physics teacher at SMAN 7 Medan said that another reason practicum in the laboratory rarely done is because the physics laboratory room is used as a learning class, besides that, there is not enough time to carry out practicum and students are less able to apply the concept of physics in everyday life so the ability to solve problems related to the concept of physics are also low. This is also due to the lack of using media that supports the physics learning process, especially in technology such as computers. One effort is needed to overcome the problems, namely by implementing a more effective and varied learning model and media that support the learning process so that it can make it easier for students to

understand physics concepts deeply and involve students actively in the learning process so that students can develop their thinking processes critical and able to solve problems found in everyday life related to the concept of physics.

Based on the description of the observation results above, the problem that occur is the lacking of students' critical thinking ability. One of the learning that can help students improving their critical thinking so that students can solve problems logically and are thought to be effective is problem based learning (PBL). PBL is problem-based learning, in this case the teacher presents a variety of authentic and meaningful situations to students, which serves as a basis for investigation and inquiry (Arends, 2008). PBL challenges students to solve authentic problems in many information (Birgli, 2015). According to Arends (2008) the purpose of PBL is to help students develop critical thinking ability, problem-solving abilities and intellectual ability, learn the role of adults and become independent and autonomous learning. This relates to a student's future career or workplace context that requires critical thinking ability (Megan and Huijser, 2011).

Seen from the context of improving the quality of education, PBL is a learning model that can be used to improve the learning system. The PBL model places the problem as the keyword of the learning process. This is in line with Sanjaya (2008) which states that PBL can develop students' ability to think critically and develop their ability to adapt to new knowledge. This is also supported by the results of research (Yosiwita, 2013; Al-Fikry, 2018; Handayani 2017) which state that by using the PBL model, students' critical thinking ability had increased. Learning models that facilitate students' thinking abilities need to be developed for all subjects, including physics. The use of the PBL model will be more optimal and interesting in training critical thinking if it is collaborated with the use of learning media, both simple and technology-based media. According to Omodara (2014), learning media is a simulation and all communication tools such as prints, graphics, animation, audio and audiovisual that can be used to convey learning. The use of learning media in the teaching and learning process will be more effective (Cifuentes, 2001). Critical thinking requires an interaction in the teaching system and in this process the media is needed.

Media such as learning media can be used to stimulate the thoughts and feelings of students in a way that they can participate in the learning process. One of these is computer simulation (Sadiman, 2009). One technology-based media that could be used for PBL model learning are learning media such as computer simulations. According to De Jong (1998), using computer simulations in classrooms can improve the learning outcome of students. Computer simulation is a technique used to replicate the operations and processes of a system. It enables the study of systems through the use of assumptions and simulations. This method can provide students with an opportunity to develop their critical thinking (Law, 1991). Computer simulation is a technique utilized to imitate the operations or processes of a system. This procedure enables the study of systems through the use of certain assumptions. In addition, computer simulation is also able to improve students' critical thinking ability. According to Lu (2017), learning using computer simulations can help students understand phenomena that are difficult to observe in the real world. As a result, students can learn about a relevant problem through an educational process that involves exploration and an experimental experiment, then gaining deeper understanding and information.

The use of computer simulations in the PBL model can improve students' critical thinking ability because computer simulations can stimulate students' curiosity to find solutions to the problems presented (Munandar, 2018). This is also supported by Santoso (2016) who state that the use of the computer simulation-assisted PBL model has a positive effect on students' critical thinking ability. Pawlikowski (2002) suggests that computer technology in the form of computer simulations used in learning is a very powerful medium for improving students' critical thinking ability by providing opportunities for students to develop ability in identifying problems, searching, organizing, analyzing, evaluating, and communicate information. According to Zahara, et al (2015), learning using computer simulations can improve critical thinking ability because computer simulations can involve students in learning activities that require high cognitive ability. In line with this, Stoney (1999) say that the use of computer simulations can improve students' critical thinking ability through students' interest and concentration in paying attention to the material on the computer

simulation. Researchers looked at the results of previous research conducted by Munandar (2018). The results showed that there is an effect of PBL model assisted by animation media on students' critical thinking ability and student learning outcomes in the form of increased grades. The use of computer simulation-assisted PBL models can have a positive effect on students' critical thinking ability. During the problem solving process, students must be able to collect data that is relevant to the given problem, students are required to provide initial guesses in solving problems, conduct research to prove initial guesses and find logical solutions based on the research carried out. Computer simulations play a role in helping students understand phenomena that are difficult to observe in the real world. This certainly can help students to focus on the problems to be solved. Researchers looked at the results of previous research conducted by Purba (2019). The results showed that there is an effect of PBL model assisted by animation media on students' critical thinking ability and student learning outcomes in the form of increased grades.

Researchers will do the study on optical tools topic. Optical tools topic is one of the topics in physics learning regarding a number of equipment that utilizes the principle of light refraction and reflection. The number of tools and practicum steps for the use of optic tools that have developed along with the recent technological developments greatly encourage the learning needs of students by utilizing computer technology. Simulations are applied with the aim of making students better understand the concept of using optical instruments. This is supported by previous study conducted by Suhandi (2009) on the effectiveness of using computer simulations in improving concept understanding. Through PBL learning, students can be involved in learning because students can define problems and diagnose problems with a physics phenomenon. This learning is suitable for implementing simulations because students can observe a physical phenomenon. In optic tools topic, virtual simulation is really needed to visualize the process of loupe and microscope image. This supports that learning media is needed to provide a clearer picture of these symptoms in an interesting way, one of which is learning in the form of a simulation because it can combine text, ,

images, animation so that all physics concepts can be visualized and can be visualized presented more attractive to increase student motivation.

In the beginning of 2020 the world was stunned by the discovery of a new type of coronavirus, which has affected over 215 countries. To fight covid-19, the government has prohibited physical distancing and social distancing. Through the Education and Culture Ministry, it has also banned the carrying out of face-to-face lectures and online learning (Surat Edaran Kemendikbud Dikti No. 1 tahun 2020). Online learning is a type of learning that uses the internet to provide various types of learning experiences. The ability to connect and communicate with other individuals online has been identified as a major advantage of using this technology. At the implementation level, mobile devices are required to support online learning. This is because learning is done digitally (Grant, 2013). The rapid emergence and acceptance of mobile technology has greatly contributed to the success of distance learning. Numerous educational institutions have also adopted various media to support the development of online learning (Korucu, 2011). Online learning is an alternative method of education that enables students to receive educational resources from a distance, without having to travel to a physical school or institution. Online learning is a type of distance learning that uses technology. It is mainly used for education (Molinda, 2005). The era of industrial revolution 4.0 requires online learning (Pangondian, 2019). Based on the above explanation, the researcher proposed a study entitled "**The Implementation of Problem Based Learning Model Assisted by Simulations to Improve Students' Critical Thinking Ability using Online Learning.**"

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1.2. Problem Identification

Based on the background that have been mentioned, can be identified some problems that arise, as follows:

- 1) Physics learning process is still teacher centered;
- 2) Student rarely do experiments;
- 3) Physics learning less use of learning media;
- 4) Lacking of students' critical thinking ability.

1.3. Problem Limitation

Problem limitation in this research as follows:

- 1) The learning model used in this study is PBL assisted by simulations;
- 2) The ability will be measured is critical thinking ability.

1.4. Problem Formulation

The problem formulation in this study are:

1. How is the student' critical thinking ability using PBL model assisted by simulations?
2. How is the student' critical thinking ability using conventional learning model?
3. Which one model is better for improving student' critical thinking ability between PBL model assisted by simulations and conventional learning model?

1.5. Research Objectives

The research objectives are:

1. To know the students' critical thinking ability using PBL model assisted by simulations.
2. To know the students' critical thinking ability using conventional learning model.
3. To analyze the improvement critical thinking ability of student by using PBL model assisted by simulations and conventional learning model.

1.6. Research Benefits

The benefits expected from this research are:

- 1) For students, it is expected to be interesting learning so that they can improve critical thinking ability during a pandemic (online learning).
- 2) For teachers, as an alternative model of learning in solving some of the problems faced in an effort to improve students' critical thinking ability during a pandemic (online learning).
- 3) For researchers, as input to be able to apply appropriate learning models in teaching and learning activities in schools in the future and as a means of learning during a pandemic (online learning). As a comparison material for researchers who study and research the same problem.

1.7. Operational Definition

- 1) PBL model is problem-based learning, in this case the teacher presents a variety of authentic and meaningful situations to students, which serves as a basis for investigation and investigation (Arends, 2008).
- 2) Critical thinking is a process, the goal is to make reasonable decisions about what to believe and what to do (Ennis, 1996)
- 3) Computer simulation is a technique used to study the various processes and operations of a system (Law, 1991).