CHAPTER I
INTRODUCTION

1.1 Background

Science and technology development in the 21st century has the affects for global challenges and competition which faced by every country, especially Indonesia. Certainly, each country in this world has a role in preparing the generations' 21st Century Skills, which is one way to make it happen through education. The quality of the nation's human resources can be determined based on the quality of education. Education also has an important role in preparing the generation capable for competing in the 21st century accompanied by rapid advances in modern technology. Beside that developed nations are supported by education that is able to develop the potential of learners, so that students can independently solve the problems they face. In addition, future conditions can be established through education that is being implemented, where education must be able to prepare and answer challenges and needs in the future. This is the reasons why education sector has a very important role for the progress of a nation. According to Abidin (2005), the importance of the concept of education learned will be felt if a person enters society especially when one enters the world of work, because the ability to apply concepts that have been studied in school will be used in dealing with the problems of daily life both useful for now and in the future. To be able to successfully live in a 21st century that qualifies with science and technology in a global society, then education must be able to make students not only knowledgeable but also have good character, critical, logical, and innovative (Affandy, et al. 2019). Therefore, education must be managed professionally by individuals who have superior competencies in the field of education.

Answering the challenges of life in the 21st century, Indonesian government has made various efforts in the field of education. One of the efforts made by the Indonesian government in the field of education is to make curriculum changes to empower students to be able to answer challenges in the 21st century. Such as the implementation of curriculum revision 2013 by the

government as an improvement of the previous curriculum, namely the Education Unit Level Curriculum (KTSP) and the 2013 curriculum are to achieve the vision of national education. Learning in the context of curriculum revision 2013 must be able to produce graduates who are relevant to the demands of 21st century learning, namely skilled learning and innovation. These skills relate to critical thinking ability and problem-solving ability, communication and colluding ability, and ability to be creative and innovate (Abidin, 2014).

In the world, the quality of Indonesian education is categorized as low. This statement is evidenced from the results of a survey published by Pearson in 2014 under the title The Learning Curve. From the results of the survey obtained education in Indonesia is at the bottom. Generally, questions that have international standards have characteristics including: (1) measuring high-level thinking ability, (2) based on contextual problems, and (3) using various forms of tests (Directorate of High School Development, 2015). According to the Directorate of High School Development (2015) in general, the ability of Indonesian learners is very low in several ways, namely: (1) understanding complex information, (2) theory, analysis, and problem-solving; (3) use of tools and procedures, and (4) conduct investigations. Based on the results of a survey conducted by Pearson and exposure from the Directorate of High School Development, it can be concluded that the higher order thinking skill in Indonesia's student is relatively low where Indonesia is only able to occupy the bottom 10 rankings.

One of the subjects tested by international survey institutions is science. In general, science can be interpreted as a science that studies the symptoms of nature. Science is divided into several branches of science, one of which is physics.

Physics is a science that studies matter and energy, laws governing particle and wave movement, inter particle interaction, molecular properties, atoms and atomic nuclei, and larger-scale systems such as gases, liquids, and solids (Tipler, 1998). According to Permendikbud No. 21 of 2016, in physics learning, competencies that must be achieved are: (1) can develop curiosity, logical, critical, and analytical attitudes; and (2) can formulate problems, formulate

hypotheses, conclude, and design and conduct experiments related to physics. it can be concluded that physics learning must emphasize the ability to think at a high level or commonly known as Higher Order Thinking Skills (HOTS). This is because critical thinking ability, analyse ability, concluding ability, and experimental designing ability are applications of HOTS.

However, the development of higher order thinking of learners must be done during the learning process teachers must direct students to think critically in solving problems to be solved (Sugeng et al., 2015). However, students tend to have difficulty starting the thought process, the problem that students often experience is to think of physics as a frightening subject. On the other hand, the problem that often comes from teachers concerns monotonous models and teaching methods that end up being the reasons why physics lessons become boring lessons. Most of them don't like physics lessons and think of physics as just a side lesson. The lack of knowledge and low teaching materials used and teachers doesn't have fully used the learning model. The delivery of materials delivered by teachers is still focused on the teacher only while the learners are only listening, this is not appropriate to improve the ability to Higher Order Thinking of students.

HOTS means the capacity to go beyond the information given, to adopt a critical stance, to evaluate, to have metacognitive awareness and problem-solving capacities such as : (1) higher-order thinking is no algorithmic ; that is, the path of action is not fully specified in advance, (2) higher-order thinking tends to be complex, (3) higher-order thinking often yields multiple solutions, each with costs and benefits, rather than unique solutions, (4) higher-order thinking involves nuanced judgment and interpretation, (5) higher-order thinking is effortful. There is considerable mental work involved in the kinds of elaborations and judgments required. Indicator of Higher Order Thinking Skills (HOTS) involve: 1) Critical Thinking as a part of the process of evaluating the evidence collected in problem-solving or the results produced by thinking creatively. 2) Creative Thinking is the very act of generating solutions to problems requires the creative process of going beyond previously learned concepts and rules. Creativity involves divergent and convergent thinking to produce new ideas. Based on some of opinions, it can be

concluded that higher order thinking is a complex thinking, critical thinking ability and problem-solving ability. From some of the above opinions, it can be concluded that higher order thinking is a complex thinking, critical thinking ability and problem-solving ability.

Based on the results of an interview with one of the teachers of SMA N 7 Medan, many students do not pay attention to explaining the subject matter given by the teacher and the lack of participation in doing exercises and sample questions. Physics teachers still tend to teach in conventional ways that are teacher-centred with mathematical approaches, examples of questions and exercises and rarely conduct experiments. The lack of learning media and practicum tools also makes mastery of physics concepts of students low and difficult to apply the concept of physics in everyday life. So it will have an impact on the critical thinking ability and creativity both of which are related to the higher order thinking skills of student. In addition, during the covid 19 pandemic students, which make student, must learn online and not face-to-face. Sometimes teachers only use WhatsApp to deliver materials and gifts. In addition, teachers also rarely use meeting applications such as zoom, google meets and others so that the question and answer process in learning is almost never done. This is due to the limitations of teachers in using technology and the teaching and learning process that occurs is teacher centred. The lack of variety of models and media used causes learners to have a low interest in learning because the interest in learning is an interest or a tendency that remains to pay attention and reminisce about some activities, in this case in the form of learning activities (Slameto, 2010). In learning learners should not only be the recipient of information, but can solve problems given to him through a reflective and sensible thought process. Learning will be more meaningful and resilience to materials can last a long time. The problem that needs to be addressed is the low ability to think creativity and skills of learners need a good follow-up effort from the teacher.

The application of online learning is intended to make the learning process more effective during the social distancing period using applications and internet networks for the delivery of materials in the form of text and video as an evaluation tool. In this case unlimited time and place of learning gives students

the freedom to choose the right moment in learning based on their interests, so that the ability to absorb learning materials becomes higher than learning in the classroom (Kuntarto, 2017).

However, this situation still affects the lack of mastery of the concept of learners who are able to be applied in everyday life that affects the high level of thinking ability of students. Therefore, physics learning should be presented with a more varied learning model and student-centred learning process, thus making students more active even though studying face-to-face (offline) or online. That makes student need teacher demonstration to improve and interest student on Physics.

Based on the descriptions presented above, a solution is needed that can improve the HOTS of students. One solution that can solve the problems that have been presented is by applying a learning model that can develop HOTS learners. The learning model is Problem Based Learning (PBL). According to Rhem (1998) the PBL learning model can be interpreted as a learning model in which learners are given a real, contextual problem and they try to find a solution. In addition, According to (Suprihatiningrum, 2016) in Problem Based Learning, students conduct authentic investigations to find real solutions to real problems. They should analyse and define problems, develop hypotheses and make predictions, collect and analyse information, conduct experiments (if necessary), make inferences and formulate conclusions. This is because the learning model that provides authentic experiences that encourage learners to learn actively, construct knowledge, and naturally as a series of learning activities that emphasize the process of solving problems scientifically is the Problem Based Learning Model (Azis et al, 2017). To Improve Mastery of Concepts on Optical Tools Materials problem-based learning models use problems as a starting point to construct new knowledge of students. Problem Based Learning aims to help students develop thinking skills and problem-solving skills. This is because the learning model that provides authentic experiences that encourage learners to learn actively, construct knowledge, and naturally as a series of learning activities that emphasize the process of solving problems scientifically is the Problem Based Learning Model (Azis et al, 2017). To Improve knowledge of Concepts on Optical Tools Materials

problem-based learning models use problems as a starting point to construct new knowledge of students. Problem Based Learning aims to help students develop thinking skills and problem-solving skills. Learners no longer learn to rely on memory and exemplify only. In learning, learners are faced with a real-world problem at the beginning of learning as a trigger for the learning process. Problem-based learning is used to improve curiosity and critical thinking skills and problem-solving skills, as well as to gain essential knowledge and concepts from learning materials (Hamruni, 2011). Therefore, Problem Based Learning (PBL) learning model is one of the choices of learning models that are suitable to be applied in learning. Based on research conducted by Chusnia Fadhila and Balqis (2012) obtained data that after applying the PBL model there was an increase in high-level thinking skills reached 43.86% and learner learning outcomes reached 30.3%. Based on some of the above opinions it can be concluded that the PBL model can improve high-level thinking skills and learning outcomes or HOTS learners.

The existence of some abstract physics concepts also often an obstacle for teachers in conveying materials to learners, so that learners are not optimal in understanding the concepts described by teachers, then researchers use computer simulation media and need teacher to demonstrate the computer simulation, which aims to provide a more concrete learning experience through the creation of imitations of shapes that approach the actual condition. Such as optical tools material, close to daily life but many students do not understand the concept because of the lack of supporting learning media, The development of information and communication technology becomes a huge potential to improve the quality of education. Virtual media is an interactive multimedia object consisting of various formats including text, hypertext, sound, images, animation, video, and graphics (Gunawan, Setiawan & Widyantoro, 2013). Simulations are designed interactively, so that their use can be directly learned.

Based on the background above, the author is interested in doing research entitled: **"The Effect of Problem Based Learning Model Assisted by simulation demonstration on Students' Higher Order Thinking Skill of Optical Tools Topics"**.

1.2 Problem Identification

Based on the background of the problem, the problems that can be identified are as follows:

1) Learning in schools centred on teachers
2) Rarely uses media and conducts experiments.
3) Students' higher order thinking skills are still low.

1.3 Problem Limitation

Based on the identification of the problems described above and due to time constraints, funds, energy and need to be done more in-depth research, this research is limited to:

1) The learning model used in this study is problem based learning (PBL).
2) This study observes Higher Order Thinking Skills of student.
3) The topic will be learned is Optical Tools
4) The subject in this research are the sudents class XI MIA in SMA Negeri 7 Medan even semester A.Y. 2020/2021

1.4 Problem Formulation

Based on the background explanation of the problem, the formulation of the problem in this study is:

1) How is the students' Higher Order Thinking Skills on optical tools using Problem Based Learning assisted by simulation demonstration?
2) How is the student' Higher Order Thinking Skills on optical tools using conventional model?
3) To analyze the improvement students' Higher Order Thinking Skills using Problem Based Learning (PBL) Model assisted by simulation demonstration and Conventional Learning Model.

1.5 Research Objectives

Based on the formulation of the problem, the next in this study has the following objectives:

1) Knowing the effect of Problem Based Learning model assisted by simulation demonstration on students' Higher Order Thinking Skills of optical tools topics.
2) Knowing the effect of conventional model on students' Higher Order Thinking Skills of optical tools topics.
3) To analyse the improvement of Problem Based Learning model assisted by simulation demonstration on student's Higher Order Thinking Skills of optical tools topics.

1.6 Research Benefits

Based on the above research objectives, the expected benefits in this study are:

1) For school
   Make good contributions for school quality as students learning outcomes and teacher professionalism.
2) For teacher
   Becomes an alternative learning model for teachers in solve some of the problems faced in an effort to improve students' Higher Order Thinking Skills.
3) For Student
   Becomes an interesting learning for students so as to improve their Higher Order Thinking Skills
4) For Research
   As input material for researchers in apply the right learning model in teaching activities in schools in the future and as a means of learning in the future (online). As a comparison material for researchers who delve into and research the same problems

1.7 Operational Definition

The operational definitions of a word or term in a research activity are:

1) HOTS means the capacity to go beyond the information provided, to adopt critical attitudes, to evaluate, to have metacognitive awareness and problem

solving capacity such as: (1) higher order thinking there is no algorithmic; that is, the path of action is not fully predetermined, (2) higher order thinking tends to be complex, (3) higher order thinking often produces multiple solutions, each with costs and benefits, rather than unique solutions, (4) higher order thinking involves nuanced assessment and interpretation, (5) higher order thinking skills is easy.

2) Demonstration Computer simulation is a learning method that makes student easiest to know the phenomena of physics using computer simulation for show the best operations or processes that occur in a system with the help of a computer device based on certain assumptions so that the system can be studied scientifically