CHAPTER I
INTRODUCTION

1.1. Background

Education is an aspect that continues to keep up with the times. Education is also the basis for people to be ready to live and develop in various fields in improving the quality of life. The quality of education is needed in a country to produce a society that is ready to compete both at the national and international levels. (Merliana, 2019)

Improving the quality of education is carried out so that the quality of human resources also improves which can be done in schools. Education is not something static but something dynamic that demands continuous improvement. The world of education has goals that must be achieved in the learning process. (Nana, 2020)

However, in achieving the planned learning objectives, there are various obstacles. As happened in 2020, education in the world has undergone a major change due to the health crisis that has hit the world, namely the Covid-19 pandemic. The Covid-19 pandemic has made many countries in the world decide to close schools and universities, including Indonesia. The United Nations (UN) even revealed that one of the sectors that has been so affected by this pandemic is education. (Purwanto et al, 2020)

United Nations Educational, Scientific and Cultural Organization (UNESCO) on March 4, 2020 suggested opening an education platform for the implementation of distance education that can be used by teachers and schools to limit educational disruptions and reach learners remotely (Setiawan, 2020). This suggestion from UNESCO was welcomed by the Ministry of Education and Culture Republic Indonesia and followed up by issuing Circular Letter Number 4 of 2020 concerning the Implementation of Education Policies in the Emergency Period of the Spread of Covid-19 on March 24, 2020. The circular letter explains that the entire learning process that originally took place face-to-face in schools will be transferred to learning carried out from home through online learning. (Dewi, 2020)

In 2022 the Ministry of Education and Culture Republic Indonesia again issued Circular No. 2 of 2022 regarding the implementation of learning, namely

limited face-to-face learning, in Indonesia called as Pembelajaran Tatap Muka Terbatas (PTMT) at 50%. The application of PTMT raises various problems. One of them resulted in the ineffectiveness of the implementation of learning during the Covid-19 pandemic. PTMT is limited learning by regulating amounts of students that the amount of students is less than the normal as they have to adjust the distance of chairs and tables in the classroom according to health protocol. The ineffectiveness of learning in the form of material provided in PTMT is only in the form of core or most essential material. The submission of material that is not optimal is related to the limited duration of learning. This makes the burden on teachers heavier, as teachers have to carry out teaching twice on PTMT schedule in groups of students who are divided in half every class (Mubarok, 2022)

The same obstacle was also found in SMA Negeri 2 Medan. Based on the results of observation at SMA Negeri 2 Medan and interviews with physics teachers, it was found that learning information was carried out in a blended method, namely 50% face-to-face and 50% online. Physics learning is carried out once in 2 weeks. The method used is lectures and assignments both individually and in groups. This method was carried out because of the limited learning time which resulted in learning to be teacher centered which should be student centered according to the curriculum used. Physics practicum can not be carried out as usual. The implementation of Limited Face-to-face Learning (PTMT) is less effective, resulting in a lack of understanding of students' concepts of the material being studied.

Based on the concept understanding questionnaire given to students of class XI MIPA 5 who have studied the material on Equilibrium Rigid Body, the results show that 11% have high conceptual understanding, 38% have moderate conceptual understanding and 50% have low conceptual understanding. According to the physics teacher at SMA Negeri 2 Medan, the results of students' understanding of concepts decreased during the implementation of PTMT compared to the implementation of previous learning.

Concept understanding is the most important factor that students must have in every learning process. Lessons that have been learned with understanding

concept will be the basic of students in the formation of new knowledge that can be used in solving other problems related to the lesson. (Novitasari et al, 2021)

Things that can be done to overcome the lack of effectiveness of PTMT implementation is the application of the Prediction, Observation, Explanation, Elaboration, Write, and Explanation (POE2WE) learning model. The Prediction, Observation, Explanation, Elaboration, Write and Evaluation (POE2WE) learning model was developed from the POEW (Prediction, Observation, Explanation, Write) learning model and the Physics learning model with a Constructivistic Approach. According to Nana (2018) the POE2WE model is a learning model developed to find out students' understanding of a concept with a constructivist approach. This model builds knowledge in a sequence of processes, first predicting the solution to the problem, conducting experiments to prove predictions, then explaining the experimental results obtained in writing.

Concept understanding can also be improved through the application of technology, one of which is a virtual laboratory, which is an application to provide theoretical material equipped with images, animations, and videos. It aims to enable students to study independently. The virtual laboratory is designed to be an interactive laboratory simulation so that students can be directly involved in observing, measuring, and collecting virtual laboratory data. (Billah & Arif, 2018)

The virtual laboratory was originally developed using a Personal Computer (PC) and has now developed in the form of an android-based smartphone application. This application was developed to do a virtual practicum. The use of smartphones for physics learning activities provides students with comfort in learning (Erfan,M. et al. 2020). Convenience includes flexibility in accessing higher-level learning. Students can build understanding through continuous and independent simulation and evaluation activities. (Arista & Kuswanto, 2018)

Based on the description of the problem above, the researcher is interested in conducting research "**The Effect of POE2WE Model Assisted by Android Lab Virtual PhET to Improve Student's Conceptual on the Equilibrium Rigid Body"**

1.2. Problem Identification

Based on the background of the research problem, the identification of problems in the POE2WE model assisted by android lab virtual PhET are:

1. Ineffective Implementation of Limited Face-to-Face Learning (PTMT)
2. Limited time to learn physics directly at SMA Negeri 2 Medan
3. Teachers become subjects of learning because they use old learning methods due to lack of learning time
4. Submission of learning materials that are not optimal
5. Decreased understanding of students' physics concepts at SMA Negeri 2 Medan
6. Practicum cannot be carried out directly at school

1.3. Problem Limitations

Based on background and identification of the problems above, the limitations of the problem in this study are :

1. This study uses the POE2WE model assisted by android lab virtual PhET for the experimental class and the conventional learning model for the control class.
2. The learning material in this study is limited to the material for equilibrium of rigid body.
3. The subject of this research is class XI-MIPA semester I SMA Negeri 2 Medan in the academic year 2022/2023

1.4.Problem Formulation

Based on the background and problem identification, the research problem formulation of the the POE2WE model assisted by android lab virtual PhET is obtained, as follows:

1. How is the effect of the POE2WE model assisted by the Android Lab Virtual Phet on students concepts on Equilibrium of Rigid Body material?
2. How is the increased students concepts in the Equilibrium of Rigid Body material using the POE2WE model assisted by the Android Lab Virtual Phet?

1.5. Research Objective

The research objectives of the POE2WE model assisted by android lab virtual PhET are:

1. Knowing the effect of the POE2WE model assisted by android lab virtual PhET on students concept in the equilibrium of rigid body material.
2. Knowing the level of understanding of students concepts on the equilibrium of rigid body material using the POE2WE model assisted by android lab virtual PhET.

1.6. Reserarch Purpose

The benefits of this research are:

1. As information to know students conceptual using the POE2WE model assisted by android lab virtual PhET on the equilibrium of rigid body material in class XI-MIPA semester I for the 2022/2023 academic year.
2. As a contribution of thought and information material in the context of adding variations to the learning model in the place of research implementation.
3. As information material for researchers.

1.7. Operational Defenition

1. The POE2WE model is a model developed to determine students understanding of a concept with a constructivist approach. This model builds knowledge in a process sequence beforehand, predicts or predicts solutions to problems, conducts experiments to prove predictions, explains experimental results obtained orally or in writing, makes examples of application in everyday life, writes discussion results and evaluates student understanding. (Nana, 2018)
2. Concept understanding is one of the ability factors that affect student learning outcomes. Concept understanding is the ability to define or state concepts using one's own mind. (Heris et al, 2018)
3. The PhET application was developed using interactive multimedia-based computer technology and can be used as a virtual laboratory. Interactive

multimedia is included in it, namely in the form of video formats, animations, graphics, images, audio, text, and hypertext (Gunawan et al, 2013). This application can be accessed through the website and downloaded for free via the android play store. This application is easy to reach because most teachers and students are already using android-based phones. (Adam et al, 2021)

4. The conventional learning model is a teacher-centered learning model with lecture, question and answer and assignment methods (Helmiati, 2012). The direct instruction model is a learning model that is teacher centered. This model is a learning model which can assist students in learning basic skills and obtain teachable information step by step. (Mastika, 2013)