CHAPTER I
INTRODUCTION

1.1 Background

The National Education System in Law No. 20 of 2003 article 1 paragraph 20 states that learning is the process of interaction between students and learning resources in a learning environment. Learning is also defined as a system consisting of various components that are interconnected with each other including learning objectives, materials, methods, and evaluation (Rusman, 2017). The four components need to be considered and designed as well as possible by the teacher so that learning objectives can be achieved optimally. One of the lessons applied at school is learning in the field of physics.

Physics learning is one of the branches of natural science that discusses natural phenomena in everyday life that can be studied using the sensory organs (Rahayu et al., 2018). The physics learning process requires understanding and application of concepts so that meaningful learning is realized. According to Sari in (Latifah & Kurniawan, 2020), meaningful learning will be realized when students experience what they learn themselves, not just knowing it so that in physics learning, students are required to be able to build knowledge in themselves with their active role during the learning process. Physics learning is also a process to help students learn well and master the knowledge and concepts of physics and the laws of physics with scientific methods including observing, formulating problems, formulating hypotheses, measuring, analyzing data, and concluding problems and applying them in everyday life (Damayanti et al., 2013).

Achievement in the learning process can be known through the evaluation process. Evaluation is carried out to measure and determine the extent to which students process in learning (Nana, 2019). Evaluation results will show basic competencies, materials, or indicators that have not yet reached student mastery (Febriana, 2019). Educators have an obligation to evaluate test results and set success standards in order to make appropriate improvement programs.

One of the evaluations of physics learning can be seen from the assessment based on the statistical results of the 2019 National Examination scores in the science

specialization group subjects in private and public schools found that the achievement of competencies in physics subjects with an average value of 45.79 was still in the insufficient category and the second lowest after mathematics (38.60). The national percentage of students who answered correctly based on the material tested in physics is mechanics (45.93), waves and optics (44.42), thermodynamics (42.50), and electricity, magnetism, and modern physics (48.06). The absorption value is less than equal to 55.00 in mechanics material there are 11 out of 15 indicators, wave and optical material there are 5 out of 7 indicators, thermodynamic material there are 5 out of 6 indicators, and in electricity, magnetism, and modern physics material there are 8 out of 12 indicators (Kemdikbud, 2018). This means that the percentage of indicator achievement is still very low.

In the list of regional and education unit scores, the 2019 National Exam scores (Kemdikbud, 2018) for physics subjects at the North Sumatra Province level are (41.62), Batu Bara Regency (35, 68), SMA Negeri 1 Sei Suka (36.17). Based on these data, the achievement of the regional level is getting smaller than the average value of the national level which is actually already a category lacking in value achievement.

Observations were made of students in one of the XII MIA and XI MIA classes of SMA Negeri 1 Sei Suka who were randomly selected using a questionnaire, with the result that 60% of students disagreed with the statement that they liked the material in physics but knew that the subject was important to learn. If paying attention to the percentage of statements in the form of actions, then there are 63.07% of students agreeing with the statements given such as studying the material in advance, attending on time, studying again, studying at home, and so on.

Based on the results of direct interviews conducted with students, students still have difficulties in learning physics related to the concept of counting and analyzing problems. This is because students tend to memorize formulas rather than understand concepts. Thus, when students do not remember formulas, they will have difficulty in solving problems. The same response was also given by the teacher that the weakness that is often found in students is poor math skills, especially on the topic of balance of rigid bodies. The teacher stated that students have the most difficulty on the topic of equilibrium of rigid bodies where students do not master the

concept of geometry in mathematics such as flat buildings, space buildings, determining the X and Y coordinates of a plane, and so on.

The results of interviews with physics teachers related to the physics learning process at school, stated that teachers often experience time constraints so that they emphasize important material topics in exams and tests that will be faced by students. Teachers also diligently provide practice questions and only bring teaching aids into the classroom rather than carrying out learning in the laboratory or practice so that laboratory utilization is not optimal. This shows that most of the learning activities carried out by teachers still dominantly use the lecture method.

Based on these problems, it can be overcome by using the development of diagnostic test instruments. With the utilization of this diagnostic test instrument, it is expected to be one of the teacher's alternatives in conducting learning evaluations. Thus, the results of analyzing the weaknesses experienced by students are obtained correctly. Then, the right solution will be found in overcoming student problems in learning activities.

1.2 Problem Identification

Based on the background of the problems described above, problems that are relevant to the research can be identified, among others :

1. The low percentage of students interest in learning physics
2. Students' weak mathematical skills
3. Student errors in connecting preconceptions with the concepts to be learned
4. Students have not mastered the prerequisite skills so that it becomes an obstacle for students in solving problems related to the concept of equilibrium of rigid body
5. The four-tier diagnostic tests that have been conducted have not revealed the learning difficulties that students have
6. Inputting a large amount of misconception diagnostic test result data takes a long time if done manually

1.3 Research Scope

Based on the research background, the scope of this research includes :

1. Development of a Google-Form-assisted four-tier test instrument

2. Identification of students' physics learning difficulties in equilibrium of rigid body topic
3. The design of the following research methods is ADDIE

1.4 Problem Limit

In this study, researchers provide problem limitations so that this research is more focused. So, the limitations of the problem are :

1. The subjects studied were students of class XI semester I of SMA Negeri 1 Sei Suka
2. The test instrument developed is a four-tier diagnostic test instrument
3. The concept of equilibrium of rigid body that will be identified as the source of student learning difficulties refers to the curriculum 2013

1.5 Problem Formulation

Based on the identification of these problems, the problem formulations that will be studied in this study are :

1. How to develop a valid and reliable four-tier diagnostic test instrument?
2. What students' understanding of the concept of equilibrium of rigid bodies is based on the level of confidence in their answers and the level of confidence in their reasoning?
3. What is the student learning difficulties identified with the concept of equilibrium of rigid body?

1.6 Research Objectives

The following research objectives are to answer the problem formulations raised in this study. The research objectives are :

1. Obtain a valid and reliable four-tier diagnostic test instrument
2. Knowing about the students' understanding on the concept of equilibrium of rigid bodies
3. Knowing the learning difficulties on the concept of equilibrium of rigid body identified in class XI IPA students at SMA Negeri 1 Sei Suka

1.7 Research Benefits

This research is expected to provide benefits, among others:

1.7.1 For School

Making a good contribution to school quality as student learning outcomes and teacher professionalism.

1.7.2 For Teacher

This research provides information about the results of identifying student learning difficulties in the concept of equilibrium of rigid body so that it can be a reference for teachers in considering further learning.

1.7.3 For Students

This research can be used to determine the learning difficulties experienced by students, especially in equilibrium of rigid bodies in physics lessons. It is also expected that students will get solutions that are in accordance with the learning difficulties experienced so that it can cause motivation to increase students' enthusiasm for learning.

1.7.4 For Other Researchers

This research can be used as a reference to reveal specific student learning difficulties and can be used as a reference for implementing learning models and developing tests that can reduce learning difficulties experienced by students on the concept of equilibrium of rigid body.

1.7.5 For Scientific Development

In scientific development especially in the four-tier diagnostic test instrument, the results of this study are expected to be a reference to reveal student learning difficulties and can be used as a reference for applying learning models that can reduce learning difficulties experienced by students on equilibrium of rigid body topic.