

## CHAPTER I

### INTRODUCTION

#### 1.1 Background

In issue 64 of 2014 Permendikbut on specialization in secondary education, it is stated that the physics part of the natural sciences, one of the compulsory subjects for MIA specialization in high school students. The main goal of learning physics is to enable students to develop experiences and to formulate problems. Students with problems solving skills are able to draw reliable conclusions, to have a global vision, to make informed decisions, to produce good products and to find creative inventions. The skills in problem-solving and creative thinking are important to help students explore the understanding of concepts (U. Kulsum & S. E Nugroho. 2014).

Physics as a discipline is a lesson reasoning and application aspects are very important for the control of science and technology. The physics course closely related to the scientific approach also serve to broaden the knowledge and understanding of matter and energy, to improve scientific skills, stimulate scientific attitudes and educate students to technological products through the application of theories or principles of physics already mastered. Therefore, physics knowledge must be included to allow students to improve their knowledge and skills and should be used to solve the various problems they face. In this case, the thinking skills are very necessary, in addition to computing skills, observation skills, communication skills, and cooperation skills, as well as skills to respond critically to a problem. Given the importance of physics courses for education, teachers should be able to plan their learning so that students become more interested in physics (Agustina. 2017).

According to No. 20 of 2003 concerning the national education system indicates that the program is a set of plans and arrangements for the purpose, content, learning materials and methods used as guidelines for the implementation learning activities to achieve certain educational goals.

Curriculum 2013 requires the implementation of learning physics in schools or science to develop the ability to think, to work, to be scientific and to communicate as one of the most important aspects of skills life (Leonda, *et al.* 2015). Curriculum 2013 is designed to prepare Indonesian citizens who have the ability to live as individuals and loyal citizens, productive, creative, innovative, emotional and capable of contributing to the life of the world, nations, states, and civilization of the world (Permendikbud. 2013).

Based on observation at SMA Negeri 1 Labuhan Deli, showing that physics learning activities often using conventional methods. Teachers more often communicate the material in front of the class and write it on the board. Almost all information comes from teachers and students only as recipients of the information. Then, based interview with physics teachers is absence of laboratory activity because a laboratory hasn't complete tools and material to experiment, just have one laboratory in this school to all level class, and then the rare of the using worksheets of students in learning, which should be used extensively in the learning curriculum 2013.

Based on the result of the interview, to complete student learning based curriculum 2013 in class X at SMA Negeri 1 Labuhan Deli researcher trying to giving alternative solutions from laboratory activities, that is virtual laboratory activities with using utilization technology, namely PhET Simulation. The advantages of PhET Simulation that is: (1) has an attractive animated display; (2) very easy to use; (3) free download; (4) can adjust laptop/PC specification because provide download simulation packet, Java, and flash; (5) can using in online or offline; and (6) have physical concept models easy to understand for students. The disadvantages of *PhET Simulation* that is: (1) executed application and games are very limited, especially for format files ".jar"; and (2) Need Flash Player updates for Flash that does not update automatically.

The use of PhET Simulation should be supported by the student worksheets. The student worksheets are worksheets containing tasks performed by students, with instructions, the steps to perform a task in a

theoretical or practical form. Student worksheet can be used to increase problem-solving skills, creative thinking, and mastery of students' concepts that involve investigative activities and reflective activities such as analyzing the results of investigative data.

The using of student worksheets with PhET Simulation will not be optimal without the use of learning models in the learning process. Learning in curriculum 2013 gives priority to the scientific approach. The investigation is a learning model that applies the scientific approach. Based on Carlin and Sund cit. Mulyasa (2015), the inquiry is the process of investigating a problem. These learning models applied accordingly to physics learning. In the learning process, students are always used to helping and giving explanations from the teacher to solve problems. Therefore, to more actively improve students in the learning process, it is necessary to use the student worksheet with PhET Simulation based on a guided inquiry.

Bell and Smetana in Maguire and Lindsay (2010) States that guided inquiry is learning models that can practice students skills in process investigation to collect facts data and treat these facts so that students are able to draw conclusions independently to answer questions or issues raised by the teacher.

Based on the background, one strategy to be used to facilitate and help the student in teaching physics, the researcher was conducted research entitled "**THE DEVELOPMENT OF STUDENT WORKSHEET BASED GUIDED INQUIRY USING 4-D METHOD WITH PHET SIMULATION ON WORK AND ENERGY TOPIC**".

## **1.2 Identification of Problem**

Based on the background that has been stated previously, then the identification of the problem in this study are:

1. The learning process of physics still often uses the conventional method.
2. Teachers more often communicate the material in front of the class and write it on the board.

3. Students are less active in learning because of all information from teachers and students only as recipients of the information.
4. The absence of laboratory activity to experiment, and just have one laboratory to all level class.
5. The rare of the using worksheets of students in learning.
6. The absence of student worksheet based guided inquiry with PhET Simulation develops to physics learning on work and energy topics.

### **1.3 Limitation of Problem**

Based on the identification of a problem that has been stated previously, with researcher limitations in times, power and fund, then the problems in this study are limited. Therefore, for this research to be more focused, the problem scope in this study are:

1. Development of LKPD is developed by using a 4D instructional development model which includes defining, design, develop and disseminate stages. This research is limited to the developing stage, namely the testing phase to determine the teachers and students assessment on the developed LKPD. The fourth stage (disseminate) is expected to be carried out by the next researcher.
2. This LKPD assessment is an assessment of the results of validation by a team of experts and student responses.
3. This LKPD developed based guided inquiry with phET Simulation on work and energy topic in class X at SMA N 1 Labuhan Deli.

### **1.4 Formulation of Problem**

Based on the limitation of the problem that has been stated previously, then the formulation of this problem is:

1. How is the level of LKPD feasibility that contains Work and Energy material based on the results of validation by the experts?
2. How is the student's response to the LKPD containing Work and Energy material?

3. What is the LKPD based guided inquiry with PhET-Simulation developed that is suitable for student learning on work and energy in class X at SMA N 1 Labuhan Deli?

### 1.5 Purpose of Research

Based on the limitation of the problem, the purpose of this research are as follow:

1. Knowing the level of LKPD feasibility that contains the Work and Energy material based on the assessment of experts.
2. Knowing student responses to LKPD that contains Work and Energy material based on student responses from the results of product trials.
3. Knowing the LKPD based guided inquiry with PhET Simulation developed that is suitable for student learning on work and energy in class X at SMA N 1 Labuhan Deli.

### 1.6 Benefit of Research

1. To teachers and prospective teacher
  - a. It can be used as a support facility in learning activities.
  - b. Encourage teachers to develop student worksheet as a learning tool for students.
2. To the next researcher

Can be used as study material in the development of worksheet to produce better worksheet.

### 1.7 Operational Definition

1. The student worksheets are worksheets containing tasks performed by students, with instructions, the steps to perform a task in the theoretical or practical form (Depdiknas,2004).
2. Guided inquiry is learning models that can practice students skills in process investigation to collect facts data and treat these facts so that

students are able to draw conclusions independently to answer questions or issues raised by the teacher (Bell and Smetana in Maguire and Lindsay .2010).

3. Physics Education Technology or PhET is a systematic overview of the development of learning technology according to the time. PhET was developed by the University of Colorado at Boulder to provide physics-based teaching and learning virtual laboratory simulations which makes it easy for teachers and students to use for classroom learning (<http://www.phet.colorado.edu>)



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