

# CHAPTER I

## INTRODUCTION

### 1.1. Background

Education is a conscious and planned effort and has a goal to materialise the learning process that makes learners be active in developing themselves so as to be a useful person for the interests of many people (Nurkhalisa, 2017).

The swift current of globalization show a lot of competition especially in industry and education, so we need human resources who have the ability to compete in the globalization. The 21<sup>st</sup> century requires every individual to have skills such as good hard skills and soft skills so that they can enter the world of work and are ready to compete with other countries (Sutiyatmini, 2018).

The purpose of National Education of Indonesia is stipulated in Undang-Undang Nomor 20 Year 2003 which describes the national education which aims to develop human beings as a person of faith and cautious to God, having noble character, healthy, knowledgeable, capable, creative, independent, and become citizen which is democratic and responsible through planned and systematic educational activities. The educational system needs to be made directed, guided, and there is continuity in each system so that education can develop the potential of learners both in the affective, cognitive, and psychomotor areas (Nurkhalisa, 2017).

Education is a conscious and planned effort and has a goal to materialise the learning process that makes learners be active in developing themselves so as to be a useful person for the interests of many people. The purpose of National Education of Indonesia is stipulated in Undang-Undang Nomor 20 Year 2003 which describes the national education which aims to develop human beings as a person of faith and cautious to God, having noble character, healthy, knowledgeable, capable, creative, independent, and become citizen which is democratic and responsible through planned and systematic educational activities. Mastery of Science and Technology is now an important key in confront challenges in the future. Various challenges that appeared such as related to improving quality of life, equity development, and the ability to develop human resources. Therefore, Natural Sciences education as part of education. A role important for to prepare students who have scientific literacy, that

is, those who are able to think critically, creative, logical, and take the initiative in responding to issues in the community caused by the impact of the development of science and technology (Permanasari, 2016).

In today's information age, the main goal of the educational system should be provide students with information acquisition skills instead of directly providing them with the information they needed, to prepare individuals for real life and enable individuals to use knowledge and the needed skills to be an informed citizen. STEM (Science, Technology, Engineering, Mathematics) education is an interdisciplinary and applied approach that is coupled with real world, it integrates the four disciplines and these subjects cannot and should not be taught in isolation, just as they do not exist in isolation in the real world or the workforce (Gustiani, 2016).

Learning is directed to encourage students to actively find out, develop the ability to reason, and form critical students. With the STEM (Science, Technology, Engineering, Mathematics) approach, students not only memorize concepts, but more than how students understand and comprehend the concepts of science and their relationships in everyday life. This means that through the STEM (Science, Technology, Engineering, Mathematics) approach students don't just memorize concepts, but rather how students understand and comprehend the concepts of science and their links in everyday life (Pertiwi, 2017)

One of the learning practices in Indonesia that can be developed is learning by integrating STEM (Science, Technology, Engineering, and Mathematics) which STEM is suggested to be able to help the success of 21st century skills. Learning with the STEM Education approach (Science, Technology, Engineering, Mathematics) can be the key to creating students who are able to compete internationally, because the application of the STEM Education learning approach by integrating the four components able to produce critical thinking activities that are characterized by providing basic clarification related to the problem, gathering basic information, give opinions and make initial conclusions, make further clarification, draw the best conclusions (Ennis, 2017).

Education Center of STEM (Science, Technology, Engineering, Mathematics) (2014) in Firman (2015) stated that STEM learning does not only mean strengthening of practical education of STEM fields separately, but it is rather to

develop an educational approach that integrates science, technology, engineering and math, by focusing on the educational process in daily life real solving. STEM education (Science, Technology, Engineering, Mathematics) provides the opportunity for teachers to show students how concepts, principles and techniques from science, technology, engineering, and mathematics are used in an integrated way in the development of products, processes and the systems used in their daily life (Asmuniv, 2015).

One form of educational reform can be carried out using a learning approach that can help teachers in creating experts namely the STEM (Science, Technology, Engineering, Mathematics) approach. The STEM approach is an approach that refers to the four components of science that is knowledge, technology, engineering, and mathematics. In line with this based on researchers who show that the application of STEM can help answer questions based on inquiry, and can help students to create new knowledge (Permanasari, 2016).

Student Worksheets are arranged into learning tools packed in an integrated manner that allows students to learn the material independently. However, most Student Worksheets used today do not facilitate students to develop their abilities. The Student Worksheet contains material briefly and questions that must be done by students. Student Worksheets should be designed by the teacher himself pay attention to the structure of the Student Worksheets that have been determined by the Ministry of National Education (2008) consists of 6 components, namely: (a) title; (b) learning instructions; (c) competencies to be achieved; (d) supporting information; (E) the tasks and work steps; and (f) Assessment (Nursanty, 2017).

Student Worksheets can be used to improve students' creative thinking skills which involves activities by the hands such as investigations and thinking activities such as analyzing the results of investigative data (Aldila, 2017). Especially in learning Biology on Environmental Change material because it requires creative thinking to solve environmental problems and their impacts. Especially the Environment changes in class X because the teacher has not actively involved students in learning directing questions that explore students' ideas (Syabani, 2018).

Based on observations in class X Natural Science SMA Negeri 2 Percut Sei TUAN, teaching materials used in learning activities are not varied because it uses

textbooks only. While the facilities and infrastructure to support learning activities such as libraries already exist, but the laboratory owned by the school is incomplete so it is rarely used. Data from interviews with biology subject teachers revealed that the students' level of thinking ability was still low. This is aimed at the low ability of students to solve problems related to application in daily life. Therefore, the development of Student Worksheets that are adjusted to the conditions and needs of students is considered necessary.

Based on the background, the research entitled : “Development of 3R (Reduce, Reuse, Recycle) Student Worksheet Based on STEM (Science, Technology, Engineering, Mathematics) on Environmental Change Topic Class X Natural Science SMA Negeri 2 Percut Sei Tuan” has been done.

## **1.2. Problem Identifications**

Based on background of the problem that has been described, can be identified problems as follows:

1. Student Worksheet that are used only a collection of questions and material summary.
2. Student untrained to following the learning process with the STEM approach, students only memorize concepts and haven't apply it in everyday life.
3. Teachers' knowledge about learning with the STEM approach is not sufficient so they haven't applied the Student Worksheet based on the STEM approach in learning biology, especially on the subject of environmental change.

## **1.3. Problem Scope**

Considering the scope of the problem in this study is very broad, the authors limit the problem in this research to:

1. The material contained in the Student Worksheet is Environmental Change Topic Class X semester II.
2. Student Worksheets that will be developed using the STEM approach.
3. This development research uses a 4-D model that includes the *Define, Design, Develop, Disseminate* stages. But this research is only limited to the develop stage.

4. Validity of product seen from the validation expert team, teacher assessment, and student responses.

#### **1.4. Research Questions**

1. How good feasibility the Student Worksheet based on Material Expert?
2. How good feasibility the Student Worksheet based on learning Strategy Expert?
3. How good feasibility the Student Worksheet based on Biology Teacher?
4. What are the student responses on the Student Worksheet based on STEM in Environmental Change topic?
5. How effective the Student worksheet to improving student achievement on Environmental change topic?

#### **1.5. Research Objectives**

The objectives of this research are:

1. To Know the Material Expert assessment of the feasibility the Student Worksheets based on STEM in environmental change topic.
2. To Know the Learning Strategy Expert assessment of the feasibility the Student Worksheets based on STEM in environmental change topic.
3. To Know the Teachers Assessment of the feasibility the Student Worksheets based on STEM on environmental change topic.
4. To Know the Student Respons of the feasibility the Student Worksheets based on STEM on environmental change topic.
5. Knowing the effectiveness of Student worksheet that be developed based on STEM on Environmental change topic?

#### **1.6. Research Benefits**

1. For the authors, hope this research as an added insight into science education, and experience in making good and correct Student Worksheets.
2. For teachers, For teachers, is expected to improve the quality of making the creative and innovative Student Worksheets for the process of teaching and learning activities as well as a reference in making teaching materials.

3. For student, add experience and creativity in the learning process with the STEM approach.

### **1.7. Operational Definitions**

Some terms are used in this research Operationally defined as follows:

1. Development of Student Worksheets with the STEM approach using 4-D development model.
2. STEM (Science, Technology, Engineering, Mathematics) is an interdisciplinary learning approach with a focus on education. Student Worksheet is a printed material in the form sheets of paper which contains material, summaries, and instructions for implementing learning tasks that must be done by students, which refer to the basic competence that must be achieved.
3. Environmental change is the disruption of environmental balance due to natural factors and human factors. Natural factors can be caused by volcanoes, floods, while factors caused by humans can be due to pollution.