

## CHAPTER I

### INTRODUCTION

#### 1.1 Background of Study

Education is a method or bridge for human beings to broaden their ability through gaining knowledge of techniques they get. With education, we may deliver a start to the next era of the country with intelligent and sociable individuals, which means that a generation can take benefit of the current development in addition to viable (Fitri, 2021). The Indonesian people still face a problem concerning the education world: the quality of education. In particular, the quality of science education is still low by the 2003 PISA (Program for International Student Assessment) Study results, which reported that Indonesia was ranked 38th out of 41 participating countries. The low quality of science education also occurs in schools as the spearhead of education delivery (Astawan & Sudana, 2014).

The chemistry learning process that has existed so far needs to be improved and designed in such a way as to provide attractive and fun learning conditions so that students are more enthusiastic, passionate, and interested in chemistry (Rosa & Pujiati, 2017). Based on observations done by researchers at MAN 1 Medan, known that teachers in the teaching and learning process have not implemented the demands of the 2013 curriculum. It can see in the learning conducted by the teacher, which is teacher-centered, resulting in low student learning outcomes. Note that the average daily test results for chemistry class X MIPA still need to reach the minimum completeness criterion (KKM), which is 75, partly due to students' understanding of chemistry concepts. The 2013 curriculum demands that the learning process be carried out in an interactive, creative, fun, and challenging way, motivating students to be active in learning and providing vast space to hone their skills (Kemendikbud, 2013).

To deal with the problem of students' learning outcomes by implementing an integrative approach during the learning process and applying it by linking the four fields of discipline to improve students' learning outcomes. Regarding

disciplinary integration, Henriksen (2014) emphasized that STEM is an interdisciplinary field that encourages students to apply their knowledge from several angles to solve complicated problems (product) (Aguilera & Ortiz-Revilla, 2021).

The researcher chose the STEM approach because STEM-based learning maximally involves students' ability to search for and find something systematically, logically, and analytically so that they can formulate their findings and be useful for their daily lives. Suriti, (2021) research found that using the STEM-based learning model successfully improved chemistry learning outcomes in dynamic equilibrium material.

According to Irmita (2018), Learning by integrating STEM can significantly affect academic achievement. Through the STEM approach, students memorize concepts, how they understand scientific concepts and their relation to everyday life. The integration of STEM education into teaching and learning may be carried out at all levels of education, from elementary school to university, because aspects of STEM implementation, such as intelligence, creativity, and design ability, do not depend on age.

Teaching and learning activities require learning resources in the learning process. Learning resources help facilitate students to adequately achieved learning objectives. There are many learning resources, one of which is the Student Worksheet. Student Worksheet is a teaching material and learning resource supporting the learning process. Student Worksheets help minimize educators' role but activate students more in learning (Septian et al., 2019).

General Guidelines for the Development of Teaching Materials revealed by the National Education Office (Prastowo, 2015) student worksheets contain tasks students must do. Worksheets are usually in the form of instructions or steps to complete a task, and the task must be clear about the essential competencies (Kurnianingsih & Yonata, 2019). The existence of innovative and creative student worksheets will create more enjoyable learning (Mayasari et al., 2019).

Based on the results of observations in class X MAN 1 Medan, the teaching materials teachers use during learning are less varied. Improving the

quality of the learning process is by making student worksheets more interesting. At the same time, the facilities and infrastructure that support these schools' existing teaching and learning process are adequate, such as libraries, laboratories, and internet networks, but teachers rarely use them in the learning process. Indonesian youth mainly use the internet facility for a chat. This activity is far from using the internet as a source of information for school assignments or lessons. One of the main reasons or causes for the lack of internet access related to school assignments or lessons by urban students or adolescents in Indonesia is the lack of activity on the part of the school in implementing learning via the internet. Using the internet in schools will bring information sources closer to teachers and their students so that they have easy access to information from various sources, especially those relating to the most up-to-date material in the field of education or learning (Qomariyah, 2009).

Based on the student worksheet problems, the researcher seeks to provide innovation by developing E-Student Worksheets, which play a role in facilitating students and teachers when teaching and learning as the form of progress in the development of technology and information in the education world. Electronic Student Worksheets (E-Student Worksheets) are a series of activities used by students in conducting investigations and solving problems to make it easier for students to understand learning material in electronic form, the application of which uses desktop computers, notebooks, and smartphones. (Puspita et al., 2021).

According to Syafitri & Tressyalina (2020), E-Student Worksheets can simplify and narrow space and time to make learning a more effective learning resource. Based on these Student Worksheets problems, the author seeks to provide innovation by creating E-Student Worksheets, which make teaching and learning easier for students and teachers. This E-Student worksheet was developed on a STEM basis to increase students' learning outcomes in electrolyte and non-electrolyte solution subjects in an attractive, logical, structured way and easy application so that it can help students in learning.

Sari et al. (2022) supported that teachers need E-Student Worksheets as an alternative solution to improve students' learning outcomes. Based on the

background above, the research title is **“Development of STEM–Based E-Student Worksheets to Improve Students’ Learning Outcomes on Electrolyte and Non-Electrolyte Solution Subject.”**

### **1.2 Problem Identification**

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

1. Teachers still carry out conventional learning, so they are less able to explore and improve students' understanding of chemistry
2. Learning still relies on the role of educators as well lack of enthusiasm for learning students in the process of learning.
3. Low student learning outcomes.
4. The use of internet facilities in schools is not optimal yet.
5. STEM-based E-Student Worksheets for Chemistry have not yet been developed on electrolyte and non-electrolyte solutions.

### **1.3 Scope of Research**

Limitations in this study are as follows:

1. The E-Student Worksheets developed in the form of STEM-based E-Student Worksheets on Chemistry learning for class X high school students
2. The learning material developed in the STEM-based E-Student Worksheets is Electrolyte and Non-electrolyte Solutions subject.
3. Learning outcomes focused on increasing learning outcomes and students in solving problems or phenomena in the environment around students.

### **1.4 Problem Formulation**

The problem formulation of this development research is as follows:

1. How is the development of STEM-based E-Student Worksheets to improve students' learning outcomes on electrolyte and non-electrolyte solutions?
2. How is the standardization of STEM-based E-Student Worksheets to improve students' learning outcomes on electrolyte and non-electrolyte solutions by experts?

3. How is the implementation in class of the STEM-based E-Student Worksheets in improving students' learning outcomes on electrolyte and non-electrolyte solutions subject?

### **1.5 Research Objectives**

The objectives of the research to be carried out are:

1. To develop the STEM-based E-Student Worksheets to improve students' learning outcomes on electrolyte and non-electrolyte solutions subject.
2. To standardize the STEM-based E-Student Worksheets to improve students' learning outcomes on electrolyte and non-electrolyte solutions in order to meet the feasibility by experts.
3. To implement the STEM-based E-Student Worksheets in improving students' learning outcomes on electrolyte and non-electrolyte solutions subject in class.

### **1.6 Research Benefits**

The benefits of this research are:

1. For teachers, E-Student Worksheets on STEM-based electrolyte and non-electrolyte solution materials can be used as learning tools in class.
2. For students, E-Student Worksheets on STEM-based electrolyte and non-electrolyte solution material can be used to improve students' learning outcomes.
3. For future researchers, these E-Student Worksheets as reference material to research the development of Chemistry E-Student Worksheets on STEM-based electrolyte and non-electrolyte solutions.