

# CHAPTER I

## INTRODUCTION

### 1.1 Research Background

The key of learning development as preparing for 21<sup>st</sup> century education is very important to be improved, the learning development relies on integrated problems. The Problems are seen from aspects ranging from the level of *input*, *process*, to *output* (Megawanti, 2015). Input as a learning aspect, based on analysis of Firman (2016) the learning system is more towards the teacher center method than involving students actively (student-centered).

The process as the main aspect to improve, students effort to get the variation learning source can be categorize good, however they prefer selected in conventional method and refer to theoretical aspects only (Supriadi, 2015). As the main aspect to improve. According to Widana (2017) the lack of learning resource have not shown literacy in mathematic and technology that can be achieved by students, the results show low levels of, (1) understanding complex information; (2) data analysis and interpretation (3) use of tools and procedures in problem solving, and (4) investigating the problem. The decline in practice culture is a factor that worsens the learning quality of students (Rofiah *et al.*, 2013).

Another factor that influenced is the lack of student interest in obtaining learning resources from other countries which is also a weakness of students in language literacy skills. The most feasible learning resources had published are still sourced from abroad and still in use of the original language. Students assumed they took the time to translate the meaning of each sentence to get the gist of the reading. In addition, the activities contained in these learning resources are not related or even too high to be carried out with the basic competencies of the RPS (Semester program plans) available on campus (Lukitasari & Herawati, 2014).

If this problem persists, it will adversely affect the output aspects of thinking and behavior, Forehand (2011) states that Critical thinking skills are closely related to Bloom's Taxonomy (C1-C6) to understand abstract concepts that are obtained by training. This ability involves complex metacognition and several skills (such as

analyzing, following, and inferring). In fact students can't realize the part of analyze (C4), evaluate (C5) and make (C6) (Basuki & Hariyanto, 2015) . In the current condition, students will only get a record of knowledge without knowing the understanding process (Nurhayatia, 2017) and learning becomes a rote theory perspective and is oriented towards answering the questions of learning objectives. This mean student classified as low order thinking (LOT), who are only able to, remember (C1), understand (C2), and apply (C3) (Haryanto *et al.*, 2019). According to Rudiansyah *et al.* (2016) LOT dominant had temporarily knowledge and finally an anxious situation arises in students during exams.

The low scientific attitude of students can be seen in difficulties to an understanding of lesson material, this is an indication that someone is incapable, active in learning. The impact is that students tend to be passive and ashamed to ask questions and express opinions. The scientific attitude is indicated by the way students obtain answers. Most students answers exactly from the source of their study, and some even cheat by looking at notes on a test. As a result, the scientific attitude in its honest, and responsible aspects is eroding. (Rudiansyah *et al.*, 2011).

Kurniasih (2014) assumes the change can be started by development the learning resource that good point for adult learning (*andragogy*) with or without teachers. The learning resources mustnotice to the communicative aspects and the world of students (*customized and work environment-oriented*), this conducts the flexibility time, expertise, funds and resources of each student. Module as one of adult learning resource that have been is arranged systematically and interestingly which includes material content, methods, and evaluation that can be used independently (Riyani, 2020). Module that directs students to find answers to something in question so that it can arouse critically and develop intellectual abilities as part of the mental process (Isnaini *et al.*, 2020).

STEM has an opportunity as alternative student learning resource method. STEM is an acronym for an interdisciplinary learning between science, technology, engineering, and mathematics (Hanover Research, 2012). Hourigan & Leavy (2020) states that these four aspects are "a perfect match between higher-level learning and problem-based learning".STEM learning is able to create a cohesive and active learning system because all four aspects are needed simultaneously to

solve problems (Triyanta, 2018). Solutions that show that students give chance build their own knowledge in their minds (*learning by doing*) (Juniaty *et al.*, 2016).

According to Lukitasari & Herawati (2014), cell biology related to structure and all cell activities are some materials that are difficult to understand for students. Students often consider the material abstract, so it is difficult for them to understand the concept of phenomena, relationships, and cell mechanisms in tissues. Saptono *et al.*, (2013) also argued learning process is more oriented towards mastery of subject matter (*transfer of knowledge*) and assignments. thus reducing students to look for learning resources that are only theoretical and memorize all cell biology material.

The researchers analyzed student needs that had been carried out through distributing questionnaires to students in the department of biology 2020 Universitas Negeri Medan, on May 2021. It was found that 90% of students stated that they desperately needed alternative learning sources in multidisciplinary literacy based on cell biology. As many 70% of students stated difficulties in studying cell biology material. Based on the results of the analysis of student needs above, a multidisciplinary-based cell biology module was developed STEM.

Based on the literature and the problems above, the researchers raised the topic of Cell Biology which is difficult to understand and will be developed into one chapter namely Cell Studies, into a module as an independent learning resource integrated with STEM and expected to be a solution to accommodate these problems, support the learning process, and improve learning outcomes. From the description that has been described above, the researcher will raised the title "**The Development of STEM-Based Cell Biology Module to Foster Students Critical Thinking Skills and Scientific Attitudes Through Blended Learning**".

## **1.2 Problem Identification**

1. The lack of learning method and students effort in finding learning resources to foster critical thinking skills and scientific attitudes.
2. The lack of learning resources and method that doesn't shown multidisciplinary learning to foster critical thinking skills and scientific attitudes.

3. STEM-Based learning opportunities to foster students' critical thinking skills critical thinking skill and scientific attitude.
4. The research analysis 70% stated difficulties in studying cell biology and 90% of students strongly needed alternative learning sources in STEM-Based multidisciplinary learning in cell biology.

### **1.3 Scope of Problem**

Based on problem identification, the problem in this study is limited to:

1. The material developed is limited to the topic of Cell Studies.
2. The STEM-based cell biology module that has been developed is validated by material expert, learning design expert, layout design expert and assessed by lectures in cell biology course and students.
3. The development of STEM-based cell biology module using the 4D (*Define, Design, Develop and Disseminate*) model which is limited to the standardization stage of module.
4. Module trials are conducted on limited groups and aimed to foster critical thinking skill and scientific attitude students department of biology 2020

### **1.4 Formulation of Problem**

Based on the scope of the problem, the problem formulations in this study research are :

1. How does the feasibility of the expert validation and student responses' of the STEM-based cell biology module that has been developed?
2. What are the results of the student department of biology 2020 responses on STEM-based cell biology module that has been developed?
3. How does the feasibility of STEM-based cell biology module as an alternative learning resource improve students' critical thinking and scientific attitudes?

### **1.5 Research Objectives**

Based on problem formulation which is described above, the purpose of this research are:

1. To know the validation expert result of the STEM-based cell biology module that has been developed.
2. To know the student responses of students department of biology 2020 on STEM-based cell biology module that has been developed.
3. To know feasibility of STEM-based cell biology module as an alternative learning resource improve students' critical thinking and scientific attitudes.

### **1.6 Research Benefits**

By achieving the research objectives, the results of this study are expected to have benefits in the world of education both theoretically and practically.

#### **1. Theoretical Benefits**

Adding and enriching knowledge in order to improve the quality of learning related to cell biology learning materials and as a contribution to the thought of reference materials for lecturers to develop students' critical thinking skills and scientific attitudes.

#### **2. Practical Benefits**

As a material for consideration and alternatives for students in finding learning resources and reflecting on multidisciplinary literacy skills so as to facilitate the teaching and learning process.

### **1.7 Operational Definitions**

1. The Module developed was prepared for the learning process by selecting learning topics namely Cell studies.
2. STEM-based cell biology module that has been arranged systematically according to basic and main competencies (KD/KI) associate with the STEM aspect (Science, Technology, Engineering and Mathematic), so that learners able to solve problems based on existing multidisciplinary literacy.