

CHAPTER I

INTRODUCTION

1.1. Background of the study

Education is an indicator of a country's development and progress. The size or progress of a country is seen from the quality of its education. A country will be said to be left behind if the quality of its education is low (Kadi & Awwaliyah, 2017). Therefore, the government always strives to improve the quality of education, one of which is by improving the quality of learning as stated in Law Number 20 of 2003 concerning the National Education System. Related to this, the learning process starts from elementary school to college. Colleges have various scientific fields, one of which is biology. Biology is one part of science that has a very strategic role in improving knowledge, attitudes and values in students. Therefore, learning biology not only requires observation but also pays attention to process skills to solve problems. (Mursali & Safnowandi, 2016).

Sudarisman (2015) stated that biology learning essentially contains 4 elements, namely scientific processes, scientific products, scientific attitudes, and technology. Scientific attitudes are scientific attitudes that must be possessed in science learning such as responsibility, discipline, honesty, thoroughness and accepting other people's opinions. Scientific products are scientific products in the form of facts, principles, laws, and theories. In scientific processes it is stated that a science-oriented learning approach involving intellectual, manual, and social skills is a science process skill. Thus, biology is closely related to science process skills.

Science process skills mean students' abilities by applying scientific methods through understanding, developing, and discovering science, so that it can be used as a provision to construct previously owned knowledge and new knowledge received into a complete concept. Science process skills provide students with the opportunity to further strengthen the thinking process by actively involving themselves in carrying out scientific-based learning activities (Ilma et al.,

2020). Therefore, biology students are expected to have science process skills in various scientific-based learning, one of which is tissue culture.

In accordance with the Semester Learning Plan (RPS) for the Plant Tissue Culture course in the Biology Department, FMIPA, State University of Medan, one of the basic competencies that students must have is being able to understand the concept and application of plant tissue culture in everyday life (Harahap, 2019). Tissue culture is also a course that applies scientific concepts. Scientific concepts are knowledge produced from a series of scientific methods, which require scientific process skills to discover them (Hayati, 2017).

To see the level of students' science process skills in the tissue culture course, the researcher distributed an initial test of science process skills (KPS) consisting of 10 questions with 10 indicators on each question. This test contains material on the introduction of tissue culture, stages of tissue culture, and various techniques in tissue culture. Based on the initial test, the average KPS value was only 34.25 which is included in the less category (Mursali & Safnowandi, 2016).

Based on the results of observations through interviews conducted with lecturers in charge of the Tissue Culture course at Medan State University, the tissue culture course consists of 2 credits and there is no tissue culture laboratory. This is one of the causes of the low science process skills of students due to the minimal implementation of practicums in this course. In fact, with the existence of practicum activities, students can be more active in improving science process skills (KPS) indicators such as planning research, conducting observations, formulating hypotheses, using tools and materials, interpreting data, communicating results, and conveying statements (Siswono, 2017). Based on the questionnaire distributed to 29 students, data was obtained that 51.7% of students also found it difficult to learn the material on the introduction of tissue culture, tissue culture stages and various techniques in plant tissue culture. In addition, the teaching materials used by lecturers are in the form of tissue culture books that only contain general theories.

Based on the problems above, it can be identified that there is a need for the development of teaching materials using learning models that can improve science process skills. Of the many teaching materials available, it turns out that textbooks are one of the learning resources that are utilized by other than the teaching staff

themselves. The use of teaching materials both in schools and universities usually focuses on books and is indeed one that can help in the learning process (Adabia, 2022). With the existence of textbooks, the results that will be achieved in the learning process in the form of knowledge, understanding, and abilities or skills can be realized properly. Textbooks have very unique and specific characteristics. Unique, meaning that textbooks can only be used for certain students in a particular learning process. While specific means that the contents of the textbook are designed in such a way that they only achieve certain goals for certain students (Astuti et al., 2023).

The developed textbook must be in accordance with the curriculum requirements set by the State University of Medan, namely OBE (Outcome Based Education) which requires the application of case methods and case projects. Therefore, in the development of this textbook, the Project Based Learning (PjBL) basis is used. The Project Based-Learning (PjBL) learning model is an approach that allows students to work independently to build their knowledge in learning and realize it in the form of real products, the results of which are then presented (Ladyana, 2014). The project-based learning model is considered one of the superior learning models in developing various basic skills that students must have, such as decision-making skills, creativity, and problem-solving skills (Abidin, 2014).

The application of PjBL in textbooks is considered capable of improving students' science process skills, this is in line with what was conveyed by Larashati et al (2023) that the application of PjBL can improve science process skills. This is in line with what was conveyed by Guo (2012), namely that PjBL refers to a constructivist framework so that the teaching and learning process becomes more active, meaningful, and can build the learning process.

Similar research on the development of PjBL-based books has also been conducted by Ate et al. (2022) entitled "Development of PjBL-Based Textbooks with a STEM Approach to Improve Students' Conceptual Understanding of Static Fluid Material for Grade XI High School", the results of this study concluded that PjBL-STEM-based textbooks can improve students' conceptual understanding by up to 87.95%. Then based on research entitled "Project-Based on the Internet of

Things to Improve Students' Science Process Skills" by Larashati et al. (2023) stated that the PjBL Model is able to improve SPS and the t-test shows the application of PjBL PjBL with IoT on unidirectional electrophysics material. And based on a journal entitled "Development of Temperature and Heat Modules Based on Project Based Learning to Improve Science Process Skills and Critical Thinking Skills of High School Students" by Hasanah et al. (2018) shows that the physics module based on project based learning on temperature and heat material is appropriate to use, and the physics module can improve students' science process skills and critical thinking skills effectively.

The syntax of Project-Based Learning consists of (Starting with Essential Questions, 2) Developing a Project Plan, 3) Making a Schedule, 4) Monitoring Students and Project Progress, 5) Assessing Results, 6) Evaluating Experience (Kemendikbud, 2014). By implementing all of these syntaxes in textbooks, it is expected that students' science process skills can be improved through project assignments in textbooks. The process skill indicators that need to be practiced are observing, grouping, interpreting, predicting, asking questions, formulating hypotheses, planning experiments, using tools and materials, applying concepts, communicating. Thus, this PjBL-based textbook is designed in such a way as to improve the KPS of Biology Department Students at Unimed.

From the results of the analysis of student needs shared by the author via Google Form, as many as 96% of students agreed that PjBL-based textbooks were developed to improve KPS. Thus, the purpose of the study was to develop PjBL-based textbooks in tissue culture courses on the material Introduction to Tissue Culture, Stages of Tissue Culture, and Various Techniques in Tissue Culture and to test the feasibility of PjBL-based tissue culture textbooks developed based on the assessment of several experts.

1.2. Problem Identification

Based on the above background, the following problems can be identified:

1. Based on the initial test given, it is known that the level of science process skills of several biology students of Universitas Negeri Medan from the

2020 and 2021 batches is still relatively low, namely an average score of 34.25.

2. The textbooks used in teaching tissue culture courses are still based on general theory.
3. Students from the Biology Department at Universitas Negeri Medan find it difficult to study the material on Stages of Tissue Culture and Various Techniques in Tissue Culture.
4. There is no Project-Based Network Culture book that can support student learning both theoretically and practically.
5. The textbooks used by students have not been able to improve science process skills.

1.3.Scope of Study

The scope of the research carried out includes the development of PjBL-based tissue culture textbooks to improve the science process skills of students majoring in biology, State University of Medan which focuses on introducing tissue culture, stages of tissue culture, and various techniques in tissue culture and the subject of this study is students of the Department of Biology, State University of Medan who are studying tissue culture courses.

1.4.Scope of Problems

In facilitating understanding and narrowing the scope of research, researchers limit this problem, viz:

1. The textbooks developed in this study are based on *Project Based Learning (PjBL)*
2. Textbooks were developed in this study to improve science process skills.
3. Textbooks are developed only in tissue culture courses and in introduction tissue culture topics, tissue culture stages, and various techniques in tissue culture.
4. Book development using the Thiagarajan (4-D) model to the *disseminate* stage

1.5. Research Questions

The formulation of the problem in this development research is as follows:

1. How the feasibility of tissue culture textbook based on Project Based Learning (PjBL) which were developed according to topic experts?
2. How is the feasibility of tissue culture textbook based on Project Based Learning (PjBL) which were developed according to design instructional experts?
3. How did the tissue culture lecturer respond to tissue culture textbook based on Project Based Learning (PjBL)?
4. How did the student respond to tissue culture textbook based on Project Based Learning (PjBL)?
5. How is the effectiveness of issue culture textbook based on Project Based Learning (PjBL) on student process science skills especially in the topic of introduction of tissue culture, the stages of tissue culture, and the various technique of tissue culture?

1.6. Study Objectives

The objectives of PjBL-based textbook development research to improve science process skills in tissue culture courses are:

1. Knowing the feasibility of tissue culture textbook based on Project Based Learning (PjBL) which were developed according to topic experts.
2. Knowing the feasibility of tissue culture textbook based on Project Based Learning (PjBL) which were developed according to design instructional experts.
3. Knowing the feasibility of tissue culture textbook based on Project Based Learning (PjBL) based on the responses of tissue culture lecturer.
4. Knowing the feasibility of tissue culture textbook based on Project Based Learning (PjBL) based on student responses
5. Knowing the effectiveness of tissue culture textbook based on Project Based Learning (PjBL) on student science process skills especially in the topic of introduction of tissue culture, the stages of tissue culture, and the various technique of tissue culture.

1.7. Research Purposes

a. For Researchers

- 1) This research can further train in the development of Project Based Learning-based textbooks .
- 1) The developed textbooks can increase knowledge and insight into introduction of tissue culture, the stages of Tissue Culture and Various Technique of Tissue Culture.

b. For Lecturers

- 1) The developed textbooks can help in tissue culture lecture activities
- 2) The developed textbooks can increase students' interest in learning in conducting tissue culture practicum,
- 3) Textbooks developed can facilitate the delivery of teaching topics

c. For Students

- 1) Textbooks developed can increase student enthusiasm for learning in tissue culture lectures both in theory and practicum
- 2) The textbooks developed can help students in conducting tissue culture practicum, especially on technique of tissue culture.
- 3) The developed textbooks can be used as references and learning resources for students in tissue culture lectures.

d. For Higher Education

- 2) Textbooks developed can be a library reference regarding introduction of tissue culture, the stages of Tissue Culture and Various Technique of Tissue Culture

e. For Other Researchers

- 1) This research can be used as a reference or consideration for future research.