CHAPTER I
INTRODUCTION

1.1. Background of the Study

The development of information technology is currently developing rapidly, which encourages everyone to follow all these events to keep up with the times. With the understanding of advances in information technology today, human resources are needed. Understanding advances in information technology require critical, systematic, logical, creative thinking and a willingness to collaborate effectively (Durodolu, 2016).

In the industrial revolution 4.0 era, various innovations were born, such as the internet of things, artificial intelligence, big data (mass data), and robots to improve human quality of life (Puspita et al., 2020). This phenomenon will impact many different areas of life, including education. Therefore, the educational institution as a place of education and the creation of human resources must improve the quality of education. This increase must keep up with the development of information and communication technology. As a result, schools can compete to improve learning quality in the coming time (Sudarmansyah, 2019).

Currently, the form of information technology application in learning that is in high demand by the public is smartphones, especially Android. An *Android smartphone* is a mobile device equipped with an operating system like a computer (Abildinovaa et al., 2016). Android smartphones can perform various forms of multimedia just like computers, but the advantage is that smartphones are highly portable and can be used more efficiently (Ismanto et al., 2017)**.** One example of the development of information technology using Android in education is an Android-based learning media.

Plant tissue culture is the cultivation of plant tissues or cells into whole small plants with similar characteristics to their parents (Harahap, 2011). The material provided in this course includes an introduction to plant tissue culture, an introduction to the plant tissue culture laboratory, sterilizing tools and equipment,

and fabricating Murashige and Skoog tissue culture media (MS), plants grown in vitro, callus induction and sterilization and explant planting (Batubara, 2017).

Based on the results of literature review, most of the material in this plant tissue culture course is relatively new and may seem monotonous and abstract to students taking the course (Batubara, 2017). As a result, many students pass this course with a low final grade (Harahap et al., 2019).

Also, it is often difficult for lecturers to communicate that this process does not involve hands-on practice. Limited learning resources, inadequate laboratory facilities, large numbers of students, and not enough time mean that the materials provided are based solely on the textbooks used for learning (Sundari & Harahap, 2018). In addition to textbooks, Microsoft PowerPoint is also used too often in the learning process. The lecturer also provides materials and exercises from SIPDA UNIMED, which sometimes crashes the website if too many students access it. For this reason, plant tissue culture learning media is needed that can be accessed quickly, whether using the internet or not. One of the media that can support the learning of plant tissue culture, especially sterilization and planting of explant, is an Android-based learning media.

Based on the results of an analysis of student problems by Insani et al. (2018) in the Biology Education Study Program, FMIPA, Medan State University, it was found that 72% of students stated that the tissue culture material presented was not research-based, and there was no tissue culture practicum textbook. If only use textbooks, of course, there is a SWOT analysis that must be considered.

The strenght of print-based textbooks are as a source of information when students get assignments or face exams. Students also need printed books as a source of literature to support their research. The weakness of print-based textbooks is that they do not display motion because not all materials can be modulated, so students can only read about methods of sterilization practice and plant planting. Therefore, there is an opportunity to improve print-based teaching materials into Android-based teaching materials. In Android-based learning media, a visualization of sterilization practicum and explant planting can be attached so that what cannot be modulated can be transferred to digital media. In addition, students also have the opportunity to study anywhere and anytime using Android-based learning media.

Android-based learning media can reach a broader range of students, so Android-based learning media has the opportunity to be more desirable. The challenge or threats of switching from print-based learning media to android-based learning media is the need for research or research directly in the laboratory to be carried out so that the visualization of sterilization practicum and explant planting does not experience misconceptions. In addition, special skills are needed in creating and editing digital media to suit the needs of students.

Based on the results of the analysis of student needs that was carried out through distributing questionnaires to students majoring in biology in the non-educational biology 2019 study program at Universitas Negeri Medan in December 2021, it was found that as many as 44% of students experienced difficulties in studying plant tissue culture courses, especially in sterilization and explant planting. The unavailability of textbooks regarding tissue culture practicum, especially on sterilization and explant planting materials, is part of the difficulty for students in understanding tissue culture material.

According to interview result of tissue culture lecturer, explant planting is challenging to handle at home because it requires planting medium and sophisticated equipment. Alternatively, the lecturer suggested watching a video on YouTube. Students have never used an Android-based learning tool such as an app in the Faculty of Mathematics and Natural Science Universitas Negeri Medan environment. For this reason, there is a need to develop innovative and practical teaching materials that can help lecturers overcome the various challenges they face, like dealing with students with audio and visual learning types.

This researchs aims to develop android-based learning media for plant tissue culture courses through the problems described above because of the importance of updating learning media to achieve learning goals. This learning media will be made on the PowerPoint, iSpring Suite 10, and Web 2 APK Buider. This Android-based learning media has the advantage that it can be downloaded by anyone and anywhere, making it easier for students and educators to study plant tissue culture material. This learning media is supported by people who often carry smartphones. In addition, Android-based learning media also has a feature where the maker can include various kinds of learning materials and videos at will and is not limited.

Android-based learning are beneficial for learning, as learning activities can run more smoothly and save more time. The researchers still hope that the learning materials developed will help learn about plant tissue culture at the Faculty of Mathematics and Natural Sciences, Department of Biology, Universitas Negeri Medan.

Android-based learning materials will be fully supported for plant tissue culture learning, especially on material for sterilization and explant planting to make it easier for educators to provide material and practicum videos and make it easier for students to understand it.

1.2. Problem Identification

The identification problems in this study are:

1. Most of the material in this plant tissue culture course is relatively new and may seem monotonous and abstract to students taking the course.
2. Experience in sterilization and explant planting practicum is still lacking, so there is still limited knowledge about sterilization and explant planting.
3. Based on the result of student needs analysis, as many as 44% of students experienced difficulties in studying plant tissue culture courses, especially sterilization and explant planting material.
4. Based on the interview results with the lecturer of the plant tissue culture course, students have never used an Android-based learning tool such as an app in the Faculty of Mathematics and Natural Science Universitas Negeri Medan environment.

1.3. Scope of Study

Based on the identification of the problem above, the scope in this research is Development of Learning Media Based on Android on Sterilization and Explant Planting Material.

1.4. Research Questions

Based on the scope of problem above, it can be formulated the problem under study, that is:

1. According to the media expert, how well is the feasibility level has the android-based sterilization and explant planting learning media been developed?
2. According to the material expert, how well is the feasibility level has the android-based sterilization and explant planting learning media been developed?
3. What is the response of tissue culture lecturer to Android-based learning media on sterilization and explant planting that have been developed?
4. What is the response of biology students' class of 2019 to Android-based learning media on sterilization and explant planting that have been developed?

1.5. Limitation of Problems

Based on the identification of the problem, the researcher provides a limitation of the research to be carried out. Researchers limit problems so that they can be addressed in a more targeted way and minimize the occurrence of problems, including:

1. Learning resources are developed as applications that can be control using an *Android smartphone*. Content include in the application includes learning competencies, learning material, practicum videos conduct by researcher, and developer profiles.
2. In this research, the materials used were introducing plant tissue culture until sterilization and explant planting.
3. Learning media based on Android that has been developed are validated by material expert and media expert, tissue culture lecturer's response, and student's response in the department of biology, Faculty of Mathematics and Naturan Science, Universitas Negeri Medan.
4. The subjects used are biology students' class of 2019 who have taken tissue culture courses.

1.6. Study Objectives

The objectives of this development research are:

1. To determine the feasibility level of the learning media that has been developed based on the media expert's assessment results.
2. To determine the feasibility level of the learning media that has been developed based on the material expert's assessment results.
3. To find out the response of tissue culture lecturer to the media that has been developed.
4. To find out the response of biology students class 2019 to the media that has been developed.

1.7. Research Benefits

The results obtained from this study are expected to be useful theoretically and practically. The theoretical benefits of research are as follows:

A. Theoretical Benefits

Theoretically, the results of this study are expected to be useful, specifically:

1. Contribute ideas for the renewal of learning media at the University which continues to grow in accordance with the demands of the academic community.
2. Providing scientific contributions in the department of biology, which is making innovations in the use of learning media.
3. As a foothold and reference for further research.

B. Practical Benefits

Practically, this research can be useful as follows:

1. For researchers

   This study improves the ability of researchers in making learning media that serves to facilitate learning biology.
2. For lecturers

   This research can be a reference for lecturer so that they can conduct practical activities more easily.
3. For students

Students find it easier to learn about sterilization and explant planting materials as well as practical guidelines.

4. For the other

   This research contributes ideas as an alternative solution in improving learning and practicum activities on other learning institutions.

1.8. Operational Definitions

1. Learning media based on Android is basically a device-based application with the Android operating system and can be downloaded on an Android smartphone.
2. The learning media developed were prepared for the learning process by choosing the topic of learning, which is sterilization and explant planting.
3. iSpring Suite is a software that creates learning media by loading several aspects of media such as audio, visual, and audiovisual. The device is integrated with PowerPoint and can be collaborated with several supporting software to make the resulting media more exciting and interactive.
4. Website 2 APK builder, software for converting learning media files from PowerPoint combined with iSpring Suite 10 into an Android application.
5. Explant sterilization is a process to kill spores and microorganisms until they are no longer possible to reproduce or become a source of contaminants during the development process.
6. Explant Planting is a tissue culture process starting with cutting the plant parts to be cultured in the culture medium.