

CHAPTER I

INTRODUCTION

1.1. Background

Tropical Ecology is a compulsory subject that must be taken by Biology Education students at Medan State University. This subject examines aspects of diversity, abundance, distribution of flora (plants) and fauna (animals) found in various ecosystems found in the tropics (especially Indonesia) along with environmental physico-chemical factors that influence it. The ecosystems he studied include rainforests, mangroves, estuaries, wetlands and peatlands, karsts, marines and coral reefs, lakes, rivers and watersheds, rice fields and various gardens. Furthermore, this course also examines the role of humans in changing these ecosystems along with the efforts that need to be made to maintain their sustainability (RPS Tropical Ecology, 2023).

The learning outcomes that students must achieve in the Tropical Ecology course are to broaden their understanding of ecological and evolutionary principles and their application; understand the introduction to tropical ecosystems - variation, distribution, biogeography, history and biodiversity; be able to compare temperate climates with tropical and tropical systems that differ from each other; be able to analyze long-term data to better understand the dynamics of tropical systems and the principles that enable the conservation of tropical diversity; able to design field studies to test hypotheses/questions obtained from field observations; have spent time in as many tropical systems as possible and were able to identify key elements and understand their ecology (Nanyang Technological University, 2020).

The geographical structure of the Indonesian archipelago is a sea area, with the number of islands consisting of 17,508 islands forming a coastline of 81,000 km² that surrounds the entire territory of Indonesia. This can be interpreted that 2/3 of Indonesia's territory is water. The water area will form coastal and coastal areas with high human activity. The potential of coastal areas, both biological and abiotic,

is very large and their development tends to support economic and environmental sectors such as mining, fisheries, forestry, industry, green tourism or ecotourism (Harefa, 2020).

Public Relations Information of the Ministry of Environment and Forestry In 2017, Indonesia's mangrove ecosystem is the largest in the world and has the highest biodiversity. In 2015, the mangrove area reached 3,489,140.68 ha or 23% of the world's mangrove ecosystem with a total area of 16,530,000 hectares. Good condition covering an area of 1,671,140.75 ha, damaged condition 1,817,999.93 ha. In data from the North Sumatra Elephant Foundation shows the shrinkage of mangrove forests in North Sumatra, namely in 1989 around 96,000 Ha, in 2002 to 63,000 Ha, in 2009 it shrank to 26,000 Ha, and experienced a slight growth in 2014 to 36,000 Ha. According to the North Sumatra Environment Agency, a 2013 survey showed that 90% of mangroves in North Sumatra were severely damaged, caused by the conversion of 12,000 hectares of land to oil palm plantations and conversion to 10,000 ha of ponds.

The largest mangrove forest in North Sumatra is in Langkat Regency with an area of 11,709.16 Ha in 2010 and there was a change in the area of mangrove forest in 1980-2010 covering an area of 25,816.01 Ha (Restu, 2012). Analysis of plants in the Lubuk Kertang mangrove forest found 15 types. Four species are included in *Acanthaceae*, namely *Acanthus ilicifolius*, *Avicennia marina*, *A. lanata*, and *A. officinalis*. Five species belong to *Rhizophoraceae*: *Bruguiera gymnorrhiza*, *B. sexangula* (*Rhizophoraceae*), *Ceriops tagal*, *R. apiculata*, and *R. mucronata*. In addition, there are *Excoecaria agallocha* (*Euphorbiaceae*), *Lumnitzera racemosa* (*Combretaceae*), *L. littorea* (*Combretaceae*), *Scyphiphora hydrophyllacea* (*Rubiaceae*), *Sonneratia caseolaris* (*Sonneratiaceae*), and *Xylocarpus granatum* (*Meliaceae*) (Basyuni, 2018).

The importance of mangroves to be studied is because mangroves are one of the local potentials and can be empowered as a source of information in the science learning process both in the classroom and outside the classroom by utilizing the natural environment. Learning resources that utilize the direct natural environment will make students more active and make it easier for them to form their understanding of concepts and foster an attitude of caring for the environment.

The environment has potential that can be utilized as a source of ideas that can be developed to support the learning process. Environment-oriented learning resources make learning more contextual and are expected to increase student knowledge not only theoretically, but also practically to recognize surrounding phenomena (Elmovriani et al., 2016; Sunia et al., 2018). In addition, mangroves are widely used as knowledge tourism studies, so that when students are taught about it they will be able to get to know the conditions of the surrounding environment and become a community that maintains its environment.

Based on the results of observations and interviews conducted with course lecturers and Biology Education students in the BESP 2020 and PSPB B 2020 classes at Medan State University, the results showed that 63.3% of students did not know the origin of the word mangrove, 70% of students did not know the benefits of mangrove ecology, 66.75% of students did not know the characteristics, types and root systems of mangroves, 76.7% of students did not know about Viviparous reproduction in mangroves, 80% of students did not know the differences in mangrove zoning, and 63.3% of students did not know the tools needed to carry out vegetation analysis. Then, students have never conducted lectures/field practice on mangrove ecosystems, learning is limited to theory classes. Then, students do not have field guidebooks regarding mangrove ecosystems, this causes mangrove ecosystem learning to be carried out in class due to limited learning resources for going to the field. BESP 2020 and PSPB B 2020 students also thought that it was necessary to develop a field manual on mangrove ecosystems that could support field lecture activities.

Based on the needs analysis described above, the learning of the Tropical Ecology course in the Biology Education undergraduate program, FMIPA, Medan State University is not in accordance with the applicable curriculum and educational demands, where the learning principles applied must be in-depth and include the ability to think critically, inductively and deductively to solve problems. problem (Afandi et al, 2012). The goals expected to be achieved through the field guidebook that will be developed include students being able to analyze the ecological characteristics of mangroves or mangroves (diversity, abundance, distribution, physico-chemical properties), through literature review, mini-research and

engineering ideas. By conducting field studies, students will be trained in making observations, collecting data, analyzing data, compiling reports, and presenting reports. With these skills, students are expected to be able to better understand and interpret concepts in Tropical Ecology material such as mangrove ecosystems. These skills help students become skilled in conducting research and can improve higher-order thinking skills (Umar, 2011; Slameto, 2016).

Given the importance of the potential of mangrove ecosystems in learning Tropical Ecology, it is necessary to conduct mangrove exploration research in Lubuk Kertang and develop it into a field guide as teaching material so that it can be used in learning. The existence of a Tropical Ecology field guide that includes findings through research is expected to increase student motivation, competence, and achievement. There are teaching materials in the form of field guides that utilize the potential of mangrove ecosystems which is an innovation in the world of education that must continue to be developed.

Research on teaching materials in the form of field guides was conducted by Siregar (2017) with the title "Development of Field Guidebooks for Identification of Orchid Plants as a Learning Resource for Biology for Class X High School/MA Students", field guides for identification of orchid plants are considered to have very good quality with ideal percentages ranging 82.92% - 96.92%. Riefani (2019) with the title "Validity and Practicality of the "Bird Diversity" Field Guide in the Beach Area of Sungai Bakau Village". Based on the results of expert validation, the validity of the field guide is very valid. Riefani (2020) with the title "Validity of Field Guides for Vertebrate Zoology Courses", based on the validator's assessment of the feasibility aspect of the content; presentation feasibility; and language feasibility including very valid criteria. Related research was also carried out by Mawaddah (2022) with the title "*Avicennia* Observation Field Guide in Mangrove Area, Sungai Rasau, Indonesia", based on the results of the assessment of the three validators, the validity of developing teaching materials for *Avicennia* Fieldwork Guide (Api-api) in the River Mangrove Area The rasau which was prepared as enrichment material in the Plant Ecology course was declared very valid.

Based on this background, it is important to conduct research on the development of a mangrove ecosystem field guidebook as an innovative mangrove learning resource for Biology students at Medan State University.

1.2. Problem Identification

Based on the background above, the identification of problems in this study is as follows:

1. Lack of references to mangrove field guidelines as student teaching materials
2. Student understanding of mangroves is still limited
3. Students have never conducted field studies related to mangrove ecosystems
4. Use of the surrounding environment as a source of learning and field studies that are rarely carried out
5. Unavailability of variations in field assignments or mini research for students in the Tropical Ecology course

1.3. Scope of Research

1. The product developed in this study is a field guidebook for mangrove ecosystems
2. The object of research is the PSPB B 2021 and PSPB D 2021 Biology Education class at Medan State University
3. The research period is 3 months

1.4. Scope of Problem

Based on the identification of the problems above, there are several problems faced by Biology Education students at Medan State University. And given the limitations of researchers, it is necessary to limit the problem. This aims to make researchers more focused, focused and not deviate from the main target of discussion. For this reason, researchers focus research on aspects of:

1. Development products are field manuals that use Thiagarajan or 4-D development models

2. The development of field guidebooks is based on field research in mangrove studies in Lubuk Kertang Mangrove Tourism, West Brandan District, Langkat Regency, North Sumatra
3. Analysis of vegetation (to determine diversity and physico-chemical properties) consists of three transects and nine plots
4. Mangrove Field Guide is intended for Biology students of Medan State University

1.5. Problem Formulation

Based on the limitations of the problem above, the formulation of the problem in this study are:

1. How is the process of developing the Mangrove Ecosystem Field Guidebook?
2. What is the feasibility level of the Mangrove Ecosystem Field Guidebook at Medan State University according to material experts, learning experts and layout design experts?
3. How do lecturers who teach Tropical Ecology courses and students respond to the use of Field Guidebooks at Medan State University as a source of mangrove learning?
4. How effective is the use of the Lubuk Kertang mangrove field guidebook as a learning resource for students' cognitive or knowledge levels?

1.6. Research Objectives

The objectives of this development research are as follows:

1. Developing a Lubuk Kertang mangrove field guidebook as a learning resource for students in the Tropical Ecology course
2. Knowing the feasibility level by material expert validators, learning experts and layout design experts on the results of the development of the Mangrove Ecosystem Field Guidebook at Medan State University
3. Knowing the responses of lecturers in the Tropical Ecology course and student responses regarding the use of the Mangrove Ecosystem Field Guidebook at Medan State University as a learning resource

4. Knowing the effectiveness of using the Lubuk Kertang mangrove field guidebook as a learning resource for the cognitive level or knowledge of students

1.7. Research Benefits

From the research to be conducted, it is expected to provide the following benefits:

1. Theoretically, it is expected to be used as a reference or reference for the development of a research-based Mangrove Ecosystem Field Guidebook for Biology students in research and development and enrich the scientific treasures that aim to improve the quality of lectures related to the development of research-based student field guidebooks.
2. Practically, it is expected to provide supporting sources for research-based Tropical Ecology course lecture activities in the surrounding environment to support future Tropical Ecology learning. As a matter of consideration, empirical basis and terms of reference for relevant education researchers in the future.