Development of a Field Guide Book on the Pteridophyta Topic in Padang Lawas Regency

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Abstract. This study aimed to determine the feasibility of a field manual guidance for ferns (Pteridophyta) in oil palm and rubber plantations in Padang Lawas District. The subjects in this study were (1) material experts, (2) instructional design experts, (3) layout design experts and (4) 4th semester undergraduate students of Biology Department at Universitas Negeri Medan. This field manual guidance was developed according to Thiagarajan (4D), namely the stages: define, design, development and dissemination, but in this study it was only up to the development stage. The results showed that (1) the assessment of material experts based on material suitability, accuracy and strength of the material, learning systematics, efficiency of field manual guidance in learning and language had an average score of 79.5% with good criteria, (2) the assessment of instructional design experts based on the feasibility and presentation of the content had an average score of 90.86% with very good criteria, (3) the assessment of the layout design experts based on the size aspect, the cover design and the content design of the field manual guidance had an average score namely 82.87% with very good criteria, (4) assessment by 4th semester undergraduate students based on individual trials, small groups and limited groups sequentially had scores 84.04%, 93.63%, 86.86% which showed very good criteria. Therefore it can be concluded that the field guide book for ferns (Pteridophyta) in oil palm and rubber plantations in Padang Lawas Regency which was developed was feasible according to material experts, instructional design experts, layout design experts and students, so that the field manual guidance for ferns (Pteridophyta) in oil palm and rubber plantations in Padang Lawas District could be used as a supplementary book for lecturers, students, readers in general and researchers interested in the field of ferns (Pteridophyta).

Keywords: development, field manual guidance, ferns / pteridophyta, oil palm and rubber plantation, padanglawas district.

1. Introduction
Based on the classification carried out by the Book keeping Center of the Ministry of National Education (Pusat Perbukuan Departemen Pendidikan Nasional) regarding educational books, it is revealed that there are four types, namely textbooks, enrichment books, reference books, and educator manuals (2004: 4). This classification is further strengthened by the Regulation of the Minister of National Education Number 2 of 2008 article 6 (2) which states that "apart from textbooks, educators can use educators' manuals, enrichment books, and reference books in the learning process". Based on the above provisions, there are four types of books used in the field of education, namely (1) Textbooks; (2) Enrichment Book; (3) Reference Book; and (4) Educator Handbook.

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A field guide is a book designed to help readers identify wildlife (plants or animals) or other objects from nature. The first field guide to herbs in the United States was *How to Know the Wildflowers* in 1893 by "Mrs. William Starr Dana" (Frances Theodora Parsons). In 1890, Florence Merriam published *Birds through an Opera-Glass*, which described 70 common species. Focusing on live birds observed in the field, the book is considered to be the first field guide in the modern tradition to contain an illustrated bird guide [3].

Low Plant Taxonomy is a compulsory elective subject, however, this subject takes very little time to study so that learning outcomes are considered insufficient to learn it and a guidebook is needed when doing practicum. The Low Plant Taxonomy course is taken by second semester students majoring in Biology, FMIPA at Universitas Negeri Medan.

From the results of the analysis of the books that have been used by second semester students majoring in Biology at the Universitas Negeri Medan, so far this guidebook has not been used for learning activities, especially in the Low Plant Taxonomy course, Pteridophyta material so that when doing assignments in the field students use the Low Plant Taxonomy textbook as learning guide book. From the analysis of the needs of students who have taken the Low Plant Taxonomy course, pteridophyta material was produced as many as 40% of students agreed to be developed and 60% stated that they strongly agreed to develop a field guide book as an additional book on Pteridophyta material.

Based on the results of preliminary observations on the needs of students in the Low Plant Taxonomy course to 40 student respondents of Biology Education at the Universitas Negeri Medan, it was found that 83% stated that they needed a field manual in this course so that the concepts learned were more meaningful. Students consider that the importance of ferns has a role in the conditions of the surrounding environment.

Based on the description above, it is necessary to conduct research on the development of a field guide book for Pteridophyta in Oil Palm and Rubber Plantations in Padang Lawas Regency in the Low Plant Taxonomy course.

2. Material and Methods
This study used the Thiagarajan Model consisting of four stages known as the 4-D model. The four stages were the define stage, the planning stage (design), the development stage and the dissemination stage.

Define Stage (Define)
The purpose of the defining stage was to define the learning needs by analyzing the objectives and limitations of the material. The definition stage consisted of five main steps, namely preliminary analysis, student analysis, concept analysis, task analysis and specification of learning objectives.

Planning Stage (Design)
The design stage was the stage used to design a prototype of teaching materials. This phase could be started after the learning objectives are formulated. The choice of media and the format of teaching materials and their manufacture was a key aspect of this design stage.

Development Stage (Develop)
The develop stage was the stage for modifying the prototype of learning materials. Although the manufacturing process had been carried out since the define stage, the results must be described in the form of initial learning materials which need to be modified before they become the final, effective version.

Dissemination Stage (Disseminate)
The learning material reached the final production phase when the development of field test results and expert appraisal (expert validation) results in positive results or responses. According to Thiagarajan, et al., (1974) the dissemination stage was divided into three activities, namely: (a) Validation testing, textbooks that had been revised at the development stage and then implemented on real targets; (b) Packaging, could be done by printing textbooks that had been developed; (c) Diffusion
and adoption, books that had been printed were then disseminated so that they can be used by students or lecturers. However, this research was limited to the development stage only.

The validation sheet was in the form of a Likert scale. Data obtained from a scale that has been given a score with the answer criteria as listed in the table below.

| No | Answer                        | Score |
|----|-------------------------------|-------|
| 1  | Very good / Very suitable     | 4     |
| 2  | Good / Suitable               | 3     |
| 3  | Less good / less suitable     | 2     |
| 4  | Poor / bad                    | 1     |

Table 1. Item Answer Criteria in the Validation Instrument

Table 2. Percentage of Product Component Indicator Conformity Criteria

| No | Percentage Interval | Criteria |
|----|----------------------|----------|
| 1  | 81% ≤ X ≤ 100%       | Very good|
| 2  | 61% ≤ X ≤ 80%        | Good     |
| 3  | 41% ≤ X ≤ 60%        | Moderate |
| 4  | 21% ≤ X ≤ 400%       | Less good|
| 5  | 0% ≤ X ≤ 20%         | Poor     |

Then the calculation results were accumulated into the percentage eligibility formula for each aspect of the assessment below.

\[
\text{Percentage of suitability} = \frac{\text{Score obtained}}{\text{Total ideal score}} \times 100\%
\]

The collected data were analyzed by using quantitative descriptive analysis techniques which were expressed in the distribution of scores and percentages against predetermined rating scale categories. After presenting in percentage form, the next step was to describe and draw conclusions about each indicator.

The development of the field guidebook was carried out using the Thiagarajan (4-D) model which was carried out in stages following the 4-D research and development steps.

1. Define Stage (Define)

This stage aimed to determine basic problems, analyze student characteristics, and analyze essential concepts of material and student skills to be improved. Establishing basic problems was done by observing the field and collecting supporting articles and journals. Then analyze the characteristics of students as product targets. The development product will be aimed at 2nd semester students who take the Low Plant Taxonomy course. Then at this stage, an analysis of the essential concepts of the subject matter of learning carried out based on the basic competencies in the syllabus and achievement indicators as well as information that is considered important in providing an understanding of Pteridophyta.

2. Planning Stage (Design)

Prior to the preparation of the field guidebook, Pteridophyta research was carried out in 2 locations (Oil Palm and Rubber Plantations). The purpose of this study was to determine the composition, diversity, and abundance of Pteridophyta. Each location consists of five plots. Each plot measures 8 m x 8 m. The distance between the plots was 3 m. Pteridophyta sampling was carried out on five different plots.

Environmental parameters measured during the observation consist of air temperature and humidity and wind speed. Wind speed data was taken from Meteorology and Geophysics Agency (BMKG). The determination of the number of locations to be studied was carried out by purposive sampling, namely
the sampling technique of data sources with certain considerations. Pteridophyta identification was researched, photographed and sampled. And the sample that has been taken was put into newspaper that has been doused with alcohol. The taken pteridophyta was then stored on specimen paper and brought into the laboratory for identification. Pteridophyta identification was carried out in the biosystematics laboratory, Department of Biology, Faculty of Mathematics and Natural Sciences, Unimed. The identification was carried out based on the Pteridophyta identification book, the observed data obtained were then used for analysis. In the next stage, an outline of the field guide book on Pteridophyta will be made which will be used starting from realizing the plan at the definition stage into the design stage, selecting the writing format, then making the initial design. In the use of the field manual presented in printed form. Format selection in manual development for designing or designing book content. Format selection was carried out by reviewing the existing forms of tools that had been developed by several studies on the development of field manuals. The initial design was carried out to design the field guide book. The elements contained in the book are: (1) book cover; (2) book title; (3) preface; (4) glossary; (5) introduction; (6) materials and methods; (7) Pteridophyta image of field study results; (8) data analysis; (9) method of identification; (10) bibliography.

3. Development Stage (Develop)
At the development stage, the product was assessed and revised by material experts, layout and design expert learning. Then the product will be fixed by the researcher and re-validated to show a good appraisal. The results of the assessment will be used as a reference for revising the product again.

3. Results and Discussion

3.1. Results
1. Define Stage (Define)
Data analysis of student needs was carried out at the Universitas Negeri Medan for students majoring in biology education in 4th semester, by distributing a questionnaire on the analysis of the field manual for Pteridophyta on oil palm and rubber plantations in Padang Lawas district in the Low Plant Organism Taxonomy subject. From the analysis of student needs conducted on students, 82% stated that they needed a field guide book in this course so that the concepts and material being studied were more meaningful and efficient.

2. Planning Stage (Design)
The design of the initial draft was carried out based on the standardization of the book which included the feasibility of content (material), language, presentation, and graphics. Preparation of the initial draft started with making the outline of the topics to be discussed and the overall research process as outlined in each title. After compiling the topic framework, a literature study was carried out to support the material. Then, this book was added with facts related to the pteridophyta orders discussed in the book. The writing of this book also paid attention to the layout of the writing, images and the type and size of the writing font so that this book was attractive and easy to read. Then the book cover was designed to best represent the contents of the writing and is expected to attract readers from a good cover design.

3. Development Stage (Develop)
After the writing of the book was complete, the next stage was a study by an expert practitioner, namely validation by material experts, validation of learning experts and validation of layout design experts as well as responses about products by students to field manuals on ferns in oil palm and rubber plantations in Padang Lawas Regency.

a. Feasibility According to Material Expert Validation
Assessment by material experts, namely Mrs. Dina Handayani, S.Pd, M.Si, the field guide book for ferns in oil palm and rubber plantations in Padang Lawas Regency was assessed in terms of content feasibility (material suitability, accuracy and strength of material, learning systematics, book efficiency field guide, and language). The results were in the table below.
Table 3. Material Expert Validation

| No | Assessment Components                 | Average percentage (%) | Criteria |
|----|----------------------------------------|------------------------|----------|
| 1  | Material suitability                   | 90.9                   | Very good|
| 2  | Accuracy and strength of material      | 75                     | Good     |
| 3  | Learning systematics                   | 70.8                   | Good     |
| 4  | Book efficiency field guide in Learning | 80                     | Good     |
| 5  | Language                               | 80.8                   | Good     |
|    | **Average**                            | **79.5**               | **Good** |

Validation carried out by material experts includes content feasibility (material suitability, accuracy and strength of material, learning systematics, efficiency of field manuals, and language). Each component consists of several aspects so that the percentage level of field manual validation was 79.5% and included in the good criteria.

b. Feasibility According to Learning Expert Validation

The learning expert validation was carried out by the biology lecturer Wasis Wuyung W. Brata, M.Pd. at Universitas Negeri Medan. At the initial stage of validation, there were several revisions to the improvements to the field manual that was developed. Validation that was assessed by learning experts was from the feasibility of the content and the feasibility of presentation. It obtained an average rating 90.86% with very good criteria. The results can be seen in the table below:

Table 4. Instructional Design Expert Validation

| No | Assessment Component       | Average Percentage (%) | Criteria |
|----|----------------------------|------------------------|----------|
| 1  | Content feasibility        | 92.85                  | Very good|
| 2  | Display feasibility        | 88.88                  | Very good|
|    | **Average**                | **90.86**              | **Very good** |

c. Feasibility According to Layout Design Expert Validation

The expert validation of the fern field manual design was carried out by Dr. R Mursyid, M.Pd was a lecturer in Educational Technology at Universitas Negeri Medan. The validation assessed by the layout design expert consisted of graphic feasibility (book size, book cover design and book content design). Based on the results of validation by layout design experts, namely from the feasibility of graphics (book size, book cover design and book content design) an average rating of 82.87% was obtained with very good criteria, it can be seen in the table below:

Table 5. Layout Design Expert Validation

| No | Assessment Component      | Average Percentage (%) | Criteria |
|----|----------------------------|------------------------|----------|
| 1  | Book size                 | 83.3                   | Very good|
| 2  | Cover design layout       | 82.5                   | Very good|
| 3  | Content design layout     | 82.81                  | Very good|
|    | **Average**               | **82.87**              | **Very good** |

3.2. Discussion

The Pteridophyta field guide book in Padang Lawas Regency was a learning support for the Low Plant Taxonomy course. From the needs analysis, it was found that students needed a research-based book to provide motivation and information to conduct research. This guide book on the field of ferns in Padang Lawas Regency was designed to be as attractive as possible for students to do research and one of the supporting materials for students to do research, this book can also be a reference material for a material that was relevant to finding something new to be applied to students. The research presented in this book provides motivation to students to develop ideas, insights and their creativity.
This book was written and developed according to learning needs. The material was arranged systematically following the research flow. This book has the title "Pteridophyta Plant Field Guide Book". This book presented the whole process and results obtained during the research process of Pteridophyta in the area of oil palm and rubber plantations in Padang Lawas Regency so that this book was applicable.

The chapters contained in the product being developed will be briefly described as follows: (1) Introduction. This section contained an introduction to the area of Padang Lawas Regency, parts of Pteridophyta, life cycle of pteridophyta, identification of Pteridophyta, habitat, definition of pteridophyta. (2) Implementation and observation techniques. This section described the research location, time of observation, procedures for field activities, the tools and materials used (presented in tabular form and told in narrative form) and data analysis techniques. (3) Data on Observation Results. In this section, the results of data analysis analyzed using the Systat application (in the form of charts and narration) are presented. (4) Order of Pteridophyta types. This section described the results of the Pteridophyta sampling, which were the branch of family and species. In this section, the results of field research obtained from 9 families, which were the branch of family and species, were presented, namely: (1) Thelypteridaceae, (2) Athyriaceae, (3) Davalliaceae, (4) Gleicheniaceae, (5) Nephrolepidaceae, (6) Selaginellaceae, (7) Pteridaceae, (8) Polypodiaceae, (9) Dennstaedtiaceae, contained features, structure, time of observation, habitat, and a description of species descriptions of this family obtained from research results.

The fern field guide book in Padang Lawas Regency was developed by following the steps of the Thiagarajan model consisting of four stages (4-D Models), namely the Define stage, the Design stage, the Development stage and the Dissemination stage. However, this development was only limited to the development stage. Based on the results of validation by material experts, validation of learning experts and validation by layout design experts accompanied by field trials with individual group trials with 3 students, small group testing with 10 students and limited group testing with 28 students, the results shown that this book was very suitable for used as a material for the continuity of the teaching and learning process in the Low Plant Taxonomy course. The results of this eligibility are assessed from the assessment and revision by the validator. Books could be declared valid and suitable for use after going through the validation and testing stages [11].

Products that had been declared good by the validator still have to be corrected according to the suggestions of experts. Reviewed by experts and student responses to books developed were carried out in accordance with the perspective of their respective expertise [8], and referring to the regulation of the Minister of National Education of the Republic of Indonesia Number 2 of 2008 which explains that books that were suitable for teaching materials must include quality (standard) including, (1) feasibility of content / material, (2) feasibility of presentation, (3) feasibility of language, (4) feasibility of graphics. These criteria had been listed in the validation sheet component assessed by the validators. According to [14], a good teaching material if it meets validity aspects, namely validity and practicality. The validity of the book developed could be determined by validity testing, valid criteria could be determined if the score obtained from the experts was at the percentage interval 81% ≤ X ≤ 100% and 61% ≤ X ≤ 80% with very good and good criteria [15].

The results of the validation by the fern field guide book material expert in Padang Lawas Regency obtained a percentage of 79.5% in the good or feasible category. Feasibility content consists of 46 assessment items that focus on material and concepts that were in line with field research achievements. The feasibility of the contents of a book shown that the contents of the book were developed in accordance with the learning objectives. Field manual books must be compiled based on research flow and could be justified its accuracy. According to [13] research-based books were indispensable for students not only to interact with lecturers, students also interact using teaching materials. Teaching materials in the form of research-based books require students to solve problems that occur in everyday life that were solved using research.

Validation by ferns field guide book learning experts in Padang Lawas Regency obtained a percentage of 90.86% in the very good or very feasible category. The feasibility of the book was also carried out to assess the accuracy of the material, the feasibility of presenting such as the title of the
cover book, the table of contents and the presentation of the learning validation image as well as assessing language, of course, in the language field manual book used must be in accordance with good and correct Indonesian principles. According to [16] textbooks must be useful for students and teachers. The grammar used was designed according to the level of student development.

Validation by ferns plant design experts in Padang Lawas District obtained a percentage of 82.87% in the very good or very feasible category. This book was validated by design experts with the aim of knowing the proper and correct book format, book layout, book typography including book cover image assessment, book size, book colour, font, font size, appropriate illustrations and consistent layout. In addition, the pictures in field manuals can affect a person's reading interest because most of them see the pictures before reading [7]. However, this book will continue to be developed and improved based on suggestions and validation from various experts.

4. Conclusion
Based on the data analysis and explanation, it was concluded that the assessment of fern field guide book by material experts was 79.5%, learning experts 90.86%, and design experts 82.87%. Overall it shown that the fern field guidebook was suitable for use by lecturers and students.

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