

Development of Research Based Field Guide Book about Dragonfly Diversity (*Odonata*)

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Abstract— This research aimed to develop a field guide book material diversity of dragonfly (*Odonata*) research based on the subjects of entomology. This field guidebook was developed by using Four-D model of Thiagarajan (4D), namely stages: define, design, development and dissemination but in research only until the stage of development. The field guidebook developed was validated based on three criteria, namely content material quality, learning design quality and layout design quality. Data about the quality of product development was collected by questionnaire and analyzed by descriptive qualitative. The content material validation results were assessed by two material experts based on material suitability, accuracy and strength of the material, systematics of learning, efficiency of the field guide in learning and language has an average value of 81.35 % with very good criteria. The results of the learning design validation were assessed by one learning expert based on the feasibility aspects of the contents and presentation of contents having an average value of 96.12% with very good criteria. Layout design validation results rated by two experts design layout with several aspects of the size of the field guide books, field guides book cover design and book design field guide pick average value is 80.50% with the very good criteria. The results of the validation were obtained after making several revisions to the research-based field guide for dragonfly diversity (*Odonata*) in the entomology course this is worth using.

Keywords— *Book development, Research-based, Entomology*

I. INTRODUCTION

Entomology is the elective course taken by students at Universitas Negeri Medan. Achievement Learning achieved by students in the Entomology course requires S1 Biology students from FMIPA Universitas Negeri Medan to analyze the role of insects in ecosystems, analyze the role of insects for humans, recognize insects through introduction to morphological structures, insect integumentary systems, insect interactions, insect classification and insect roles for human life and how to make an insectarium. From the above explanation, the competencies of undergraduate students at level 6 of the IQF are able to apply their fields of expertise and

utilize science and technology in their fields in solving problems and being able to adapt to the situation at hand [1].

Based on observations, the results of the analysis of books that have been used by 4th semester students or 6th semester Biology Department at Universitas Negeri Medan, the field guidebook has not been used for learning activities especially in Entomology courses so that when doing assignments in the field students Entomology textbook as a learning guidebook. The results of information through interviews related to the learning process, students have difficulties related to understanding work procedures in the field, how to store fauna after capture, difficult to recognize fauna catches and constraints to analyze data. The respondent's students felt that students who took Entomology courses needed additional guidebooks or references that could help them on some of these topics.

Several studies have shown some studies of dragonflies (*Odonata*) in the State of Malaysia, especially in Bachoc, found the presence of *Odonata* species that immigrated from urban areas and some of them were typical coastal *Odonata* species [2]. Other studies were also carried out in Malaysia, Brunei, and Indonesia which found relatively new *odonata* species from new species, almost all from Brunei and Peninsular Malaysia, while in Indonesia, Java and Sumatra islands in particular many endemic species are known only from series or even from a single specimen. Although it can be concluded that most of these species are either local or rare, this allows a large number of vulnerable or endangered *Odonata* species [3].

[4], in his study said that the group of general guiding organisms used in estimating water quality are Plankton, Benthos, *Odonata* and Nekton (fish) larvae, these groups are used in estimating water quality because they can reflect the changes in physical and chemical conditions that occur in waters within certain intervals, one of which is *Odonata* larvae.

Dragonflies (*Odonata*) for example, are insects that can be used as indicators of clean water. Research related to decreasing dragonfly diversity (*Odonata*) shows that ponds around urban parks have dropped dramatically due to large-

scale urbanization of several dragonfly species in urban areas [5].

The number or extent of ponds that vary, and extreme temperatures also affect the diversity of species around the pond [6]. Furthermore, the research conducted by [7], the abundance of individuals and the wealth of dragonfly species obtained at each station was different. This is thought to be a factor of natural habitat (ponds, calm waters, lading with many plants) and heterogeneous plant vegetation that is often found in several places which affects the diversity of dragonflies.

In this regard, to improve students' understanding of the importance of Dragonfly (Odonata) as a learning resource, it is necessary to develop a field guidebook for Entomology courses specifically on the Diversity of Dragonfly (Odonata) based on research. Some research-based textbook development [8-10], and research-based teaching materials [11,12] have been considered feasible and can help students in the learning process. With the results of the research, it will be very helpful for students who will study and research pollinating insects in city parks in the future. Therefore, it is necessary to develop a field guidebook to complement and refine existing teaching materials, one of which is a research-based field guide. The research-based field guide contains a mix of theory and research activities, so students can understand concretely the application of the concepts learned. The use of research-based field manuals also helps to achieve the competency of Entomology courses, especially in applications in everyday life.

II. METHODS

A. Research Design

The development of this textbook was designed to follow the research and development stages, which was adapted from the development of a 4-D model learning material (define, design, develop and disseminate) by [13] modified to the Development/ development stage [14]

a. Defining Phase (Define)

This stage aimed to establish basic problems, analyze student characteristics, and analyze essential concepts of material and student skills that will be improved

b. Planning Stage (Design)

The design of guidebook is done by choosing a format that is in accordance with the format of a good and correct textbook. At this stage an outline was made to be used starting from realizing the plan at the defining stage into the design stage, selecting the writing format then making the initial design.

c. Development Stage (Develop)

The guidebook that will be used by lecturers and students was first validated, including material validation, learning design and layout design. The feasibility of field manuals was assessed with a range of assessments on questionnaires score 1-5 which represented 5 criteria namely very good, good moderate, not good and bad. The results of the analysis data are categorized as follows:

TABLE 1. ANSWER CRITERIA INSTRUMENT VALIDATION ITEMS

No	Indicator	Score
1.	Very Good	5
2.	Good	4
3.	Moderate	3
4.	Not good	2
5.	Bad	1

TABLE 2. SUITABILITY PRESENTATION CRITERIA OF PRODUCT COMPONENT INDICATORS

No.	Score Range	Criteria
1	85 % score 100	Very Good
2	69 % score 84	Good
3	53 % score 68	Moderate
4	37 % score 52	Not good
5	20 % score 36	Bad

Then the calculation results are accumulated in the formula for the feasibility percentage of each aspect of the assessment below

$$\text{Percentage of score suitability} = \frac{\text{Number of scores obtained}}{\text{Ideal total score}} \times 100\%$$

The collected data were analyzed by quantitative descriptive analysis techniques expressed in the distribution of scores and percentages of the predetermined rating scale categories. After presentation in percentage form, the next step is to describe and draw conclusions about each indicator. The research steps with the 4-D model are presented as follows:

a. Defining Phase (Define)

This stage aims to define and define lesson needs by analyzing the goals and boundaries of the material, then set the basic problem, analyze the characteristics of students, and analyze the essential concepts of material and student skills that will be improved. Establishing basic problems is done by observing the field and collecting supporting articles and journals. Then analyze the characteristics of students as product target. Product development aimed for students in semester 4 or semester 6 who had Entomology courses.

b. Planning Stage (Design)

At this stage an outline of a research-based field guide on dragonflies (Odonata) was made which will be used starting from realizing the plan at the defining stage into the design stage, selecting the writing format, then making the initial design. Media that are relevant to the characteristics of dragonfly diversity material (Odonata), namely media images, schemes, tables and graphs. The use of research-based field manuals is presented in print. Media used such as the format

selection and the initial design of the field guidebook design. The elements contained in the field guidebook are: book cover; book title; acknowledgments, preface; preliminary; materials and methods; data analysis and results; insect images from field studies; bibliography; glossary and index.

c. Development Stage (Develop)

At the development stage, the product will be assessed and revised by material experts, layout design experts and learning design experts. Then the product will be repaired by the researcher and validated again until it shows a good feasibility rate. The results of the assessment will be used as a reference to revise the product again.

III. RESULTS AND DISCUSSION

A. Results

a. Validation by Material Expert

Material validation was carried out by 2 expert lecturers. This was done to improve the quality of the material from the book. Aspects assessed by material experts are the content / structure of the book, characteristics of books, presentation of material. These results can be seen in Table 3.

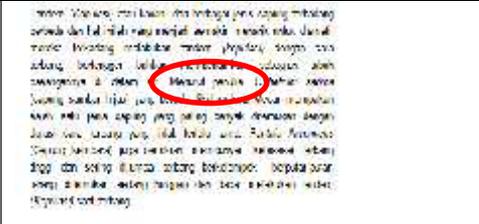
TABLE 3. RESULTS OF MATERIAL EVALUATION OF

No.	Assessment Indicator	Score range (%)	Criteria
1.	Content / Structure of the Book	79,68	Good
2.	Characteristics of Books	83,33	Good
3.	Material presentation	80,35	Good
Score (%)		81,35	Good

The average rating was 81.35% and was considered good. The results of the assessment indicate that in terms of material, content / structure, characteristics and presentation of dragonfly diversity (*Odonata*) field guidebook by the material expert team, the book was good and worth to be used. The field manual has been revised based on material expert advice on this aspect, presented in the table.

TABLE 4. COMPARISON OF BEFORE AND AFTER REVISIONS BY MATERIAL EXPERTS

No.	Before Revision	After Revision
1.	In the title "Chapter 1 Introduction" in the Preliminary Chapter is changed to be "Know the Dragonfly"	

2.		
	In the table the tools using "some" are changed to "units".	
3.		
	Avoid subjectivity from the author. Preferably "the word "according to the author" is avoided	
4.	The use of language that is less appropriate in the Introduction (such as the word profit is changed into benefits, etc.) and many writings that have typographical errors.	
5.	Add points at a glance about dragonflies, because they are considered important	
6.	Add the role of dragonflies in addition to ecological values and inspirational values	
		
7.	The list of tools and materials originally only included in table form, must be described in narrative form as well as in the Insect Sampling Technique Chapter.	

3.1.2. Validation by Layout Design Experts

Validation of design experts by the two experts to improve the quality of the design of the books developed. The aspect assessed by layout design experts is the attractiveness of books, book presentation and image clarity. These results can be seen in Table 5.

TABLE 5. RESULTS OF DESIGN LAYOUT EXPERT ASSESSMENT OF THE DRAGONFLY DIVERSITY FIELD GUIDE (ODONATA)

No.	Assessment Indicator	Percentage (%)	Criteria
1.	Book Format	79,16	Good
2.	Cover Layout	83,33	Good
3.	Cover typography	82,50	Good
4.	Cover typography	87,50	Very Good
5.	Sample illustration	69,63	Good
6.	Layout	82,50	Good
7.	Image content	75	Good

illustration

Average	80,50	Good
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The average rating of design experts was 80.50% and was considered good. The results of the study show that in terms of layout design experts, the book is good and feasible to use. Revised books from design experts can be seen in table 6.

TABLE 6. COMPARISON OF BEFORE AND AFTER REVISIONS BY LAYOUT DESIGN EXPERTS

No.	Before Revision	After Revision
1.		
	Cover is not attractive and imaginative.	
2.	The layout of the image is not good.	
3.	Color and other elements are less harmonious	
4.	The image source must be included.	
5.	Images less contrast.	

b. Validation by Learning Material Design Experts

Validation by learning material design experts was carried out to improve the quality of the design of the books developed. The aspects assessed by learning experts are conceptual fit, depth of learning concepts, and learning presentation techniques. These results can be seen in Table 7.

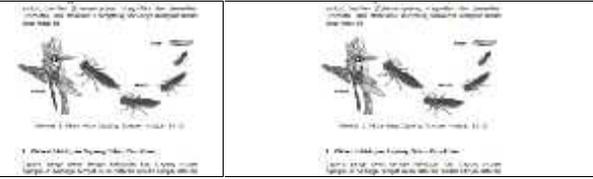
TABLE 7. RESULTS OF LEARNING MATERIAL DESIGN EXPERT ASSESSMENT OF THE DRAGONFLY DIVERSITY FIELD GUIDE (ODONATA)

No.	Assessment Indicator	Percentage (%)	Criteria
1.	Content Feasibility	96,42	Very Good
2.	Feasibility of Presentation	95,83	Very Good
Average		96,12	Very Good

The average rating of design experts was 96.12% and was considered good. The results of the study show that in terms of learning design experts assessing the book has been very good and feasible to use. Revised books from design experts can be seen in table 8.

TABLE 8. COMPARISON OF BEFORE AND AFTER REVISIONS BY LEARNING MATERIAL DESIGN EXPERTS

No.	Before Revision	After Revision
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1.	
	The pictures printed on the books developed need to have good numbering and contrast.
	Book based on field research should describe the entire process carried out at the beginning of the research to the end as well as the obstacles faced in a language that is easy to understand.
2.	The names of pollinator insect species contained in the Observation Results Data Chapter and in the Order Chapter should be sorted alphabetically.

B. Discussion

Product that have been developed in this study is a book. This book is a supporting material for Entomology subjects, especially Dragonfly diversity (*Odonata*) material which can be used as additional teaching material in Entomology courses and field activities that can help and support the learning activities of the course. The book that was developed refers to the steps of the Thiagarajan model consisting of four stages (four-D Models), namely the stage of defining, designing, development and dissemination. However, this development is only limited to the development stage. This book presents the entire process and results obtained during the research process of Dragonfly (*Odonata*) in urban areas, namely in several Medan City garden ponds so that this book is applicable. Presentation of scientific methods, species description and data analysis are clues that can be used by students in the process of activities in the field. This topic can also be an optional selection of mini research assignments so that users of this book can study the overall picture of research / research.

Based on the results of the validation according to the team of material experts, layout design experts, learning material design experts, this book was feasible to use. The results of this feasibility can be seen based on the material presented in the field guide for Entomology courses from material experts at 81.35%. This research-based textbook is expected to be able to help students understand the diversity of dragonflies (*Odonata*) in the surrounding environment that can be found in everyday environments. According to research-based books have a very good impact on strengthening students' understanding of abstract concepts in textbooks so that students have a more real understanding.

Validation of the feasibility of this book was also conducted by the layout design experts The purpose of this validation was also to assess the physical condition of the book which includes several indicators, namely the size of the book, the appearance of the book, the layout of the writing which can finally be used by students as Entomology field guide books. The average validation result from layout design experts is 80.50%.

This score indicates that this field guide is worthy of being used in a good category. Validation of the feasibility of field guide books was also conducted on learning design experts with the aim of assessing the language in the field guide used to be in accordance with the Bahasa Indonesia method that is good and correct so that it makes it easier for students to understand the material about insect pollinators generally. From the evaluation by the validation of learning material design experts, book eligibility was obtained 96.12% and was in a very good category. The score obtained shows that this book includes the criteria that must be owned by a guidebook.

The guidebook must be able to motivate learners by utilizing interesting things such as pictures and illustrations that can support learning [15], so that the images presented in this book must be of good quality. In addition, the pictures in the field guidebook can influence someone's reading interest because students mostly see pictures before reading. Meanwhile the types and fonts of writing influence the level of readability of the book. If a book has good readability, then it can affect the interest of the reader, facilitate the reader, and help the memory of the reader, and help the efficiency of the reader [16]. After going through the validation process by the expert team (material, learning, and design) and product responses by students who have graduated and are following the Entomology course, it is considered appropriate to be used as additional teaching material in the form of a field guidebook in the course. Often with time, provides a very good picture of the importance of the strategy of putting strong links between research and teaching at the level of higher education.

IV. CONCLUSION

Based on the results of exposure and data analysis, conclusions can be drawn that the research based field guidebook on Dragonfly Diversity (*Odonata*) is appropriate for use by lecturers and students.

ACKNOWLEDGMENT

The author expresses the great gratitude to the supervisors: Mr. Dr. Syarifuddin, M. Sc and Mr. Dr. Ashar Hasairin, M.Si. who helped the author a lot in completing this article and Park Service in Medan for collecting data for the completion of this article.

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