

# The Development of Textbook Based on Research About the Insect Pollinator on Chili Paper (*Capsicum annum L.*)

Fitriatu

College student of Magister Biology Education,  
Universitas Negeri Medan  
Medan, Indonesia  
fitriatu13443@gmail.com

Syarifuddin

Lecture of Magister Biology Education,  
Universitas Negeri Medan  
Medan, Indonesia  
syarif\_syarifuddin@yahoo.com

Idramsa

Lecture of Magister Biology Education,  
Universitas Negeri Medan  
Medan, Indonesia  
idramsa@gmail.com

**Abstract**—The aim of research is to develop the textbook based on reseach about Insect pollinators on chili paper (*Capsicum annum L.*) is suitable use in Entomology subject. This study used a 4D development model suggested by Thiagarajan and was conducted until development stage only. The subjects of the trial were matter expert, intruactional media expert, layout expert, and responses of subject lecturers. The result of validation by matter expert was 83,52% with excellent categories, intruactional media expert was 78,55% with good categories, layout expert was 83,94% excellent categories and responses of subject lecturers was 86,96% with excellent categories. It can be concluded that the product can be used as an additional textbook in learning activities in the Entomology course and there is no revision.

**Keywords**— *textbook, 4D development model, insect pollinator, and chili paper (Capsicum annum L.)*

## I. INTRODUCTION

Entomology is one of the subjects in the biology department which deals with insects. Insect is one of the sub-classes of the most abundant arthropods found in nature, so extensive and difficult to learn. According to [1] one of the challenges faced in biology learning is the lack of adequate teaching materials, especially teaching materials that help improve the realm of student skills by presenting research results in the student environment.

Teaching materials are a set of materials / substances (both information, tools, and texts) that are systematically arranged which students must learn in order to achieve predetermined competency standards such as textbooks [2]. According to the Ministry of National Education, (2008) textbooks are handbooks for a course and one of the learning resources that makes it easier for students to obtain a number of information on knowledge, experience and skills in the learning process [3].

Entomology textbook [4] which is one of the main sources of 5th semester Biology students in Medan State University in studying insects, not yet containing content about pollinator insect. Broadly speaking the book introduces about insect biology in general and has not explained the ecological functions of insects. One of the most important ecological functions of insects including human benefit is the function of insects as influential pollinators which effect on agricultural products such as fruits and vegetables. The formation of fruit and seeds in plants generally depends on the success rate of pollination of flowers[5]. Based on the observation results of Unimed Biology / Biology Education students understanding is under of the standart about the ecological function of insects as insect pollinator, 67% knew the importance of insect pollinator but did not understand and study them specifically, while 33% said they did not understand and did not study the importance of pollinating insects.

The Entomology book that used by Unimed students now needs to be accompanied by textbooks on insect pollinator on Chili papper plants (*C. annum L.*) which are developed based on research given their influence on human needs and increasing the college student's knowledge and experience. From the results of observations made, as many as 22.6% of college students stated that they really needed and agreed and 46.8% of students said they needed and agreed to develop a research-based textbook on insect pollinator on chili papper(*C. annum L.*). Therefore, to improve students' knowledge, experience and understanding, learning, teaching materials, and the right media to recognize insects as an organisms that are beneficial to life are one of them as insect pollinator.

Based on the description above, it is necessary to conduct research development of textbooks based on reserct about insect pollinator on chili papper plants (*C. annum L.*). The purpose of this study is to produce a product in the form of a textbook based on reserct about insect pollinator on chili

papper(*Capsicum annum L.*) plants that are suitable to use in Entomology courses.

## II. METHODS

The type of the research used development research (R & D). The product was developed in the form of a textbook based on reserct about insect pollinator on chili papper plants (*Capsicum annum L.*) intended for biology students at Medan State University. This textbook was developed based on the 4-D development model by Thiagarajan (1974). The stages of 4-D development include define (design), design (design), development (development) and dissemination (spread) but in this study only to the stage of development.

### 2.1 Phase of Define (Pendefenisian)

At this stage the basic problems are determined, analyzing the characteristics of students, and analyzing the essential concepts of the material and skills of students that will be improved.

### 2.2 Phase of Design (Design)

In this stage, the selection of the teaching book format is in accordance with the format of the textbook writing that is good and correct and in accordance with the needs of the students. Then making an outline by realizing the plan at the define stage into the design stage, selecting the writing format and initial design, namely determining the elements that will be contained in the textbook. In accordance with the development of research-based textbooks, at the design stage, pollinator insects were conducted on chili papper plants (*Capsicum annum.L*) at the districts of Deli Serdang and Karo with research procedures that have been designed.

### 2.3 Stage of Development (Development)

At this stage the product is assessed and revised by material experts, instructional design experts, layout experts and the response of the proficient lecturer in Entomology courses. The feasibility of teaching books was assessed through questionnaires with 4 criteria, namely not good, good enough, good and very good. Furthermore, the data obtained will be analyzed descriptively by calculating the percentage score for each criterion in the developed textbook, so that the percentage of feasibility obtained from the aspect assessed by the formula:

$$P = \frac{\sum x}{\sum xi} \times 100\%$$

Information:

P = Percentage score

$\sum x$  = Number of respondents' answers in 1 item

$\sum xi$  = Amount of ideal value in item

## III. RESULTS AND DISCUSSION

### 3.1 RESULTS

In accordance with the previous presentation, the development of the textbooks based on reserct about insect

pollinator on chili papper plants (*C. annum L.*) at Medan State University was carried out using a 4-D model that was carried out in stages.

#### 3.1.1 The results of the Define phase

Problems faced by students are the many objects of study in Entomology courses, especially insects because of their diverse and abundant numbers. The lack of student reading material about insect pollinator has resulted in a lack of student understanding of the ecological functions of insect pollinator. Learning objectives that will be achieved by students through developed textbooks are the characteristics and description of morphological insect pillonator, the factors that influence pollination by insect, methods of observing insect pollinator, insect pollinator species on chili papper plants and their characteristics.

#### 3.1.2 Results of the Design Phase

Before the preparation of research-based textbooks in the format that had been prepared, research was conducted to the insect pollinator on chili papper plants (*Capsicum annum.L*) in Karo and Deli Seradang districts. Various types of insects obtained in research and observation processes are described in developed textbooks. The results of the research to insect pollinator on Chili papper(*Capsicum annum L.*) plants have been carried out in two locations, Kab. Deli Serdang and Karo with walking transect observation methods combined with insect nets, found 22 insect species including 19 species found in locations near oil palm plantations namely Kab. Deli Serdang with 1634 individuals from 7 families and 7 species found in locations near the forest, namely Kab. Karo with individuals numbered 3110 from 5 families. The results of gathering information from various sources as well as the results of research as outlined in the textbook produce the contents of the book totaling 6 chapters.



### 3.1.3 Results of the Development phase

At the development stage the developed textbook was validated by a team of material experts, instructional design experts, layout experts and course lecturers.

#### 3.1.3.1 Material Expert

Assessment by material experts was carried out to improve the quality of materials and books. The quality of the material is the subject of the study about insect pollinator, the suitability of the material discussed with the Competency Standards, Basic Competencies and the objectives set out in the Entomology course. The results of the average percentage of the material expert team on each component can be seen in Table 2.

Table 2. Percentage of assessment from the material expert team on material / content feasibility

No.	Component of Assessment	Average (%)	Criteria
1.	Feasibility Contents	85,55	Very Good
2.	Feasibility to Present	81,25	Very Good
3.	Language Feasibility	83,73	Very Good
<b>Average</b>		<b>83,51</b>	<b>Very Good</b>

The average rating is 83.51% and is classified as very good. The results of this assessment indicate that in terms of material, the expert team assessed that the book was good and could be used in the actual field as additional teaching material in learning activities and there was no revision.

#### 3.1.3.2 Instructional Design Expert

Assessment is done to improve the suitability of the book on Entomology learning including the suitability of the material discussed with the Competency Standards and Basic Competencies in the Entomology course, as well as the feasibility of the language according to the good and correct writing order. The results of the average validation percentage of the learning design experts on the textbook Table 3.

Table 3. Percentage of assessment of learning design experts on the suitability of learning

No.	Component	Average (%)	Criteria
1.	Feasibility of Content	87	Very Good
2.	Suitability of Learning	71	Good
3.	Language Feasibility	77,67	Good
<b>Average</b>		<b>78,55</b>	<b>Good</b>

The average assessment of book conformity to Entomology learning is based on the assessment component of 78.55% and is classified as good. The results of this assessment show that in terms of learning design experts assess teaching books can be used in the actual field as

additional textbooks in learning activities and there is no revision.

#### 3.1.3.3 Expert Layout

Assessment is carried out to improve the suitability of book size and design. The quality of the size is in accordance with the correct book format and the design of the book is in the form of book cover and contents. Results of the average validation percentage from layout design experts in the following table, Table 4.

Table 4. Percentage of expert layout evaluations of the suitability of the size and design of textbooks.

No.	Component	Average (%)	Criteria
1.	Book size	91,67	Very Good
2.	Good cover design	80	Good
3.	Book design	80,16	Good
<b>Average</b>		<b>83,94</b>	<b>Very good</b>

The average rating based on the assessment component is 83.94% and is classified as very good. The results of this assessment indicate that in terms of layout, the expert assessed that books could be used in the actual field as additional textbooks in learning activities and there were no revisions.

#### 3.1.3.4 Response of Entomology Subject Lecturer

The assessment was conducted to improve the suitability of the size and design of the book on student development. The quality of the book display and presentation of textbooks are appropriate in supporting the learning process in the Entomology course. The results of the average percentage of responses from lecturer lecturers to textbooks Table 5.

Table 5. Percentage of assessment of Entomology lecturers on the suitability of the material in learning and design of textbooks.

No	Component	Average (%)	Criteria
1.	Display of Book	87,6	Very Good
2.	Material presentation	86,32	Very Good
<b>Average</b>		<b>86,96</b>	<b>Very Good</b>

The average response is based on the rating component of 86.96% and is classified as very good. The results of this assessment indicate that in terms of the appearance and presentation of the material in the book, the lecturer considers that the book can be used in the actual field as an additional textbook in learning activities and there is no revision.

An excellent style manual for science writers is 7.

### 3.2 Discussion

The product that has been developed in this study is a textbook based on the research about insect pollinator on chili pepper plants (*C. annuum* L.). This textbook is a supporting teaching material in studying Entomology. Learning using textbooks facilitates the learning process [6]. The process of developing textbooks is adjusted to the instructional objectives of the course, then collects various information from various library sources, such as textbooks, scientific articles, journals, and mass media, and then packaged according to student needs and written as teaching materials using a systematic framework [7].

The feasibility of teaching materials seen from the ability of teaching materials to meet the standards of feasibility assessment of the National Education Standards Agency (2006) which consists of content feasibility, language feasibility, presentation feasibility, and feasibility of graphics (layout). On the feasibility of content, the strength and accuracy of the material and the suitability of the supporting material are in the category of "Very Good" with a percentage of 83.51%. According to Prasetyo, 2017 the material developed should be related to the achievement of competencies that must be mastered by students because the material in the book helps students master the various competencies that have been determined.

To make easy the students comprehend the competencies that must be mastered, the author lists the goals or achievements of learning in each chapter in the developed textbook that aims to facilitate students to know what abilities students must possess after studying the textbook. Books must present material that is adapted to the development of science and technology [8]. This textbook is expected to help students understand the concept of insects as insect pollinator and link them in human life [9]. Textbooks contain examples that are close to everyday life in order to stimulate students to try or apply the knowledge gained in their real life and form the transfer of learning from everything learned from textbooks [10].

In the feasibility of presentation in the form of exposure techniques, study subjects or book supporters are in the category of "Very Good" with a percentage of 81.25% and the feasibility of language in accordance with a good and correct writing order in the category "Very Good" with 83.73% percentage. The material has been presented in a coherent, systemic, straightforward, and easy to understand manner [11]. The sentence is presented simply, with a maximum of 30 words per sentence to make it easier for readers to understand sentences. According to [12] language standards include; use good and correct Indonesian, terminology adheres to enhanced spelling, clear readability [13] and is appropriate, easy to read. Not using the same grammatical structure with many meanings [14].

The results of the validation data analysis of the design learning experts stated that the overall research-based textbooks were in the "Good" category with a percentage of 78.55%. The book is considered to have contained elements of

textbooks and can be used in learning such as having clear learning outcomes, motivate students to discuss, increase the curiosity and motivate students to ask questions, have clear evaluations and feedback for the students.

Integrity is assessed by layout design experts, the purpose of this validation is to assess the quality of the size of the book, the appearance of the book, illustration of the image and layout of the writing that makes the reader interested so that students can use it as a supporting book for Entomology courses. The average validation result from layout experts is 83.94%, this value indicates that this book is feasible to use with a very good category.

The assessment or results of data analysis responses of Entomology lecturers at Medan State University is worth 86.96%, which means the book can be used as an additional book or supporting book in studying insects such as pollinating insects. This can be seen from the quality of the display of the book and the presentation of teaching book material accordingly in supporting the learning process in the Entomology course. Picture textbooks work well in teaching, when text and images are combined, performance and reading retention increase compared to books that only contain text.

### IV. CONCLUSION

Based on the results of data validation and analysis, conclusions can be obtained that the textbooks based on research about insects pollinator are appropriate for use by lecturers and students in Entomology learning.

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