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**The Development of Textbook  
For A Course of *Pengembangan Bahan Ajar Biologi*  
(Biology Teaching Material Development)  
For Biology Education Department Students Of  
Universitas Ahmad Dahlan**

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**Abstract**

*The aim of this research is to develop a textbook for a course of pengembangan bahan ajar biologi (Biology teaching material development) for the students of biology education department, Faculty of Education and Teachers Training, Universitas Ahmad Dahlan. This research is a Research and Development (R & D). The development was done by referring to a 4-D model which includes define, design, develop, and disseminate. The assessment of the product was conducted by the expert of the material and the expert of the media. The trial was done by 47 students of biology education department, Faculty of Education and Teachers Training, Universitas Ahmad Dahlan. In detail, there are 10 students for the small group trial and 37 students for the field trial. The data was collected using questionnaires. The data which was obtained from the questionnaires were analysed descriptively. The finding of the research is as follows; 1). The textbook is suitable to be used in the learning process, 2). The developed textbook was assessed by (a) the aspect of content advisability belongs to good quality, (b) the aspect of presentation belongs to good quality (c) the aspect of language belongs to very good quality, and (d) the aspect of graphics belongs to good quality, 3). The students' responses toward the developed textbook which is categorized as "good" in terms of both the aspect of the look and the aspect of the material presentation. While the aspect of benefit is categorized as "very well".*

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**1. INTRODUCTION**

A learning process is a two-way interaction that occurs between educator, student, and environment. The learning process can run effectively if it is equipped with the right teaching material. Teaching material is all forms of materials that contain learning material which is used to help teacher/instructor in carrying out teaching and learning activities in the classroom. Practically speaking, teaching material consists of two types. There are printed teaching materials and non-print teaching materials. The examples of printed teaching material are textbook/coursebook, handout, module, poster, and leaflet. While non-print teaching material can be in the form of audio teaching material such as tape, radio, visual teaching

material such as picture, photograph, and even audiovisual teaching material such as video/film.

Nowadays, the learning process in the course of *Pengembangan Bahan Ajar Biologi* (PBAB) conducted in biology education department, Faculty of Education and Teachers Training, Universitas Ahmad Dahlan has not been equipped with the teaching material which is developed by the lecturer. The teaching material that is used is a textbook which the content has not been in accordance with the demands of the curriculum and learning outcomes of the biology education department. As a result, it is necessary to develop a teaching material that can be used as a guide for both lecturer and student. A textbook is a teaching material that can be used as a guide for both lecturer and student in having lecture activity. Designing a

textbook can be adapted to the curriculum, written and designed based on the need of the students. It also can be using communicative language, referring to competency that must be achieved, and arranged for instructional processes.

## 2. RESEARCH METHODS

The type of this research is research and development. According to Sugiyono (2013: 407), research and development is a research method that is used to produce a certain product, and to test the effectiveness of the product. This research and development was carried out by using a 4-D development model. It is a model of developing devices which is developed by Thiagarajan, Semmel and Semmel (1974: 5). 4-D development model consists of 4 main stages. There are: Define, Design, Develop, and Disseminate.

The instrument that was used to obtain the data on the advisability of the textbook was by giving questionnaires. Questionnaires were given to the expert of the material and media. It was also used to record students' responses when the product testing process was carried out. The data was analyzed using descriptive analysis. The data that was analyzed included the advisability and students' responses. The technique of data analysis for advisability and responses of students was carried out as follows:

- Qualitative data derived from filling in the validation sheet from the expert of the material and media. Yet, the students' responses subsequently converted into quantitative data.
- Calculate the average total score of each component using the formula:

$$\bar{X} = \frac{\sum X}{n}$$

Where:

$\bar{X}$  = Average score

$\sum X$  = total score

$n$  = number of assessors

- Change the average score to a value by category. The collected data is subsequently calculated and categorized.

**Table 1. Ideal Rating Score Conversion**

Score range (i)	Category
$Mi + 1,5 SDi \leq x \leq Mi + 3,0 SDi$	Very good
$Mi + 0 SDi \leq x < Mi + 1,5 SDi$	Good
$Mi - 1,5 SDi \leq x < Mi + 0 SDi$	Less
$Mi - 3 SDi \leq x < Mi - 1,5 SDi$	Very less

Which:

Mi: ideal mean

SDi: ideal standard deviation

$Mi = \frac{1}{2}$  (ideal max score + ideal min score)

$SDi = (1/2) (1/3)$  (ideal max score - ideal min score)

Ideal max score =  $\sum$  criteria x highest score

Ideal min score =  $\sum$  criteria x lowest score

In this research, the value of advisability is determined by a minimum value of "B" in the good category. If the result of the assessment by expert provides the final result of "B" in terms of material, language, look and graphics, then the product that is developed in the form of a textbook is considered appropriate to be used in the learning process and can be disseminated.

## 3. RESULTS AND DISCUSSION

### a. Finding and Discussion

#### 1) The result of product evaluation

Data from the evaluation of the textbook was obtained from the expert of the material and media. The data assessment by the expert of the material consists of three aspects. There are the aspect of content advisability, the aspect of the presentation, and the aspect of language. The data of evaluation by the expert of the material can be briefly seen in table 2.

**Table 2. Data Result of the Assessment by the Expert of the Material**

No	Aspect	Total score	Category
1	Content advisability	46	Good
2	Presentation advisability	26	Good
3	Language advisability	43	Very Good

Evaluation by the expert of the media includes the aspect of graphics. Data of evaluation by the expert of the media can be briefly seen in table 3.

**Table 3. Data Result of the Assessment by the Expert of the Media**

No	Aspect	Total score	Category
1	Graphics	75	Good

Small group trial was carried out after evaluation of the product and an improvement was done based on the evaluation. Students' responses during learning process using textbook can be seen from the questionnaires which were distributed by the researcher at the end of the learning activity. Students' responses include the aspect of look, material presentation, and benefit. Data of students' responses can be briefly seen in table 4.

**Table 4. Data result of the Small Group Trial**

Aspect	Total Score	Category
Look	6,1	Good
Material	22,1	Good
Presentation benefit	7	Very Good

Students' responses during learning process using textbook were obtained through questionnaires which were distributed to students at the end of the learning activity. Data result of students' responses in detail can be seen in table 5.

**Table 5. Data result of students' responses**

No	Aspect	Total Score	Category
1	Look	6,49	Good
2	Material Presentation	26,03	Very Good
3	Benefit	7,14	Very Good

The result of the assessment by the expert of the material on the aspect of content advisability got a total score of 54 and if it is converted, it belongs to good category. Some things that must be corrected in the content/material section are in the developed textbook. As an example is the need analysis of new teaching material, Basic Competence 3 is the only one listed, but Basic Competence 4 is not listed yet. According to Permendiknas no. 24 of 2016, it is stated that the objectives of the curriculum include 4 competencies. There are spiritual manner, social manner, knowledge, and skill. Spiritual competence (KI 1) and social manner competence (KI 2) is achieved through indirect learning, while knowledge competence (KI 3) and skill competencies (KI 4) are achieved through the learning process. Therefore, Basic competence 3 and 4 should be included in the need analysis of teaching material.

## 2) Data analysis of product evaluation result

The result of the assessment by the expert of the material on the aspect of presentation got a total score of 26 and if it is converted, it belongs to good category. According to the expert of the material, some things that must be corrected in the textbook which is developed are related to inequality of the numbers used in the chapter title in the table of contents and in the content of the book. In the table of contents, the chapter title uses Arabic numerals, while the content of the book uses Roman numerals. Obviously, those must be consistent. The similarities between the numbers in the table of contents with the numbers on the contents of the book will make students easier to find the title of the material that they want to learn.

According to the expert of the material, the presentation section needs to be consistently dealing with the number of questions and the type of questions in each chapter. The initial draft which was compiled by the researcher in chapter 1 to 5, the exercises are 10 questions of multiple choice, while in chapter 6 to 10 the exercises are 5 questions of an essay. Exercises are a tool that is used to measure the level of students' understanding of the material that has been studied. Therefore, it must be consistent and equal in number and type in each chapter.

The assessment of language aspect got a total score of 43 and if it is converted, it belongs to very good category. According to the expert of the material, language as a means of communication which is used to convey a message in form of learning material in the developed textbook needs to have several improvements. The improvements must be done. Especially, the use of some terms which are adopted or adapted from foreign language must be italicized or given an explanation first. Some symbols which are used by the author also have some typographical error. That is why the correction and improvement are a must.

The assessment by the expert of the media is related to graphics aspect of the textbook which is developed. The expert of the media gave a total score of 75 and if it is converted, it belongs to good category. According to the expert of the media, some things that need to be improved from the textbook are cover, spine, header and footer, table of contents, list of tables, and pictures.

According to the expert of the media, the cover section (front cover) has not reflected the specificity of biology teaching material because the cover is still plain and there is no picture of it. A cover is an important part of a textbook. Attractive book cover will make students being enthusiastic to read the book. This is in accordance with Kurniasih (2014) who states that a good cover must attract the reader's attention and interest. According to the expert of the media, the spine also must be improved. The improvement needs to be done in order to complete the title that lacks the word "Biologi" because there is only written "Pengembangan Bahan Ajar". The spine can make the reader easier in finding the title of the book when the book is placed on a shelf or arranged in a standing position. According to *Badan Standar Nasional Pendidikan*, a good spine must be harmonious with the front cover and back cover. However, it also has unity and consistency.

According to the expert of the media, the header and footer of the textbook are too large. Moreover, it can interfere with the reader of the book. Header and footer are part of a book look that can be affecting the reader of the book. Based on the guideline for compiling textbook by *Badan Standar Nasional Pendidikan* (BSNP), the placement of illustration as background should not interfere with the page number. According to the expert of the media, the table of contents needs to be corrected in order to fit the title of the material in the textbook. In the table of contents, it needs to be added with the chapter title and sub-chapter title. This is in accordance with Kurniasih (2014) who states table of contents must contain the chapter title, sub-chapter title (subheading), and sub-subtitle chapter (sub-subheading).

Small group trial was carried out after the textbook was revised based on the input and also

assessment from the expert of the material and media. Small group trial was conducted on 10 students of class A in the biology education department. It was randomly selected by considering the differences in students' ability (high, medium, and low). The purpose of the small group trial is to collect information that can be used as material to improve the product for the next revision. The information that was obtained during small group trial is about the students' responses toward the developed textbook. The students' responses toward the developed textbook were obtained through questionnaires which were distributed to the students at the end of the learning process.

The data on students' responses toward the developed product (textbook) in the look aspect got a total score of 6.1 and if it is converted, it belongs to good category. There are some inputs given by students which are: the cover that is too crowded, the color that lacks contrast, and the selection of pictures that is less of variation. The input was also given to the example of leaflet and poster which the pictures are broken and the writing is unclear.

In the aspect of the presentation, the material got a total score of 22.1 and if it is converted, it belongs to good category. According to students' opinion, the material is easy to be learned and the language choice is also easy to be understood. There are some inputs from students about the use of the term that is still unfamiliar for students. Moreover, there is no explanation in the textbook. There are also some error and mistyping in writing words. In terms of the benefit of the textbook for students, it got a total score of 7.0 and if it is converted, it belongs to very well category. Students argued that the developed textbook can be used as a reference book and also a handbook in the course of *Pengembangan Bahan Ajar Biologi* (Biology teaching material Development) because so far, the students are still having difficulty in finding references, especially in the form of a textbook.

### **3) Result Analysis of the field trial**

The field trial was carried out after the product was revised based on some weaknesses which were obtained after a small group trial. The purpose of the field trial is to operationalize the textbook in a real class situation. In the field trial, the students provided responses toward the developed textbook from the aspect of the look, presentation, and benefit.

In the aspect of the look, it got a total score of 6.49 from the students and if it is converted, it belongs to good category. There were some inputs given by students on the aspect of the look especially on the cover which is less colorful. Color selection was done by the researcher. There were only two colors which were white and blue because too many colors on the cover would make irrelevant to the content of the textbook. The improvement to

the leaflet and poster that have not been colored yet means that they should be colored to make them more attractive. Moreover, it can enlarge the writing in the leaflet, so that will be easier to be read.

In the aspect of the presentation, it got a total score of 26.03 from the students and if it is converted, it belongs to very good category. It shows that the concept, problem illustration, and examples used in the textbook are close to real life. As a result, it is easy for students to understand the material in the textbook. The material is presented in the textbook coherently starting from the general things toward the specific things.

In the aspect of benefit, it got a total score of 7.14 by the students and if it is converted, it belongs to very good category. The students argued that the developed textbook was very helpful in the learning process. The materials were presented in a simple manner, equipped with the summaries, and also some questions made students easier to study. In addition, the material in the textbook was compiled in accordance with *Satuan Acara Perkuliahan (SAP)*. It was compiled by the lecturer so that the order of the material in the textbook is the same as the sequence of learning material in the class.

### **4) Product revision**

Product revision was done based on the suggestions from the expert of the material and media, small group trial, and field trial. The stage of product revision was done with the following:

#### **a) First revision**

The first revision was done after the textbook was validated by the expert of the material and media. The validation results in the form of assessment, inputs, and also suggestions were used as a guideline for revising the developed textbook. This first revision resulted in a product that was decent to be tested. The product of this first revision was used for small group trial. In this first revision, some improvements were made. There are the improvement to the book cover, table of contents, an addition of book identities on the spine, addition of information on the tables and pictures, improvement of some questions and also improvement of the header and footer.

#### **b) Second revision**

The second revision was done after the product had been tested in a small group (small group trial). The revision that was made after the small group trial are the improvement of the cover which are having too many pictures and illustrations, improvement of some typos and error, replacing sample leaflet and poster which were unclear and broken. The pictures of sample leaflet and poster are replaced with a colored and larger picture.

#### **c) Third revision**

The third revision is a product revision toward the product that was used in the field trial.

This revision is based on the result of learning activity using the developed textbook. In this third revision, improvements were made dealing with some following matters such as: a cover that is less colorful because it only uses two colors (blue and white) and then one more color is added (yellow), Changing the color of the sample leaflet and poster which was still black and white to be full color.

#### **5) Final Product Study**

The teaching material in the form of a textbook have been developed. The three stages of the research are (1) Validation by the expert; (2) Finding of the small group trial; (3) finding of the field trials. The final product of this development is a textbook for a course of *Pengembangan Bahan Ajar Biologi* (Biology teaching material Development) for the students of biology education department at Faculty of Education and Teachers Training, Universitas Ahmad Dahlan.

The discussion of the final product on the development of the textbook is a confirmation result between the theoretical background and the research finding of the previous research. The discussion includes the characteristic of the textbook from the aspect of content advisability, the aspect of language, the aspect of the presentation, the aspect of graphics, and also the finding in the field trial. In the aspect of content advisability, the material in the developed textbook is about the types of printed and non-printed teaching material, the characteristic, and the steps of compiling it. The material is a material which is needed by students especially as a provision to become a teacher in the future who must be able to develop their own teaching material. Based on the assessment by the assessor, it can be seen that the developed textbook got a positive score, according to the expert of the material, it belongs to good category.

In the aspect of language, the product got a positive value. The expert of the material gave a very good score. This shows that the language which is used in the textbook is easy to be understood and it can help students to understand the learning material which is presented in the textbook. Language as a communication tool can convey a message well in the form of learning material.

The assessment on the aspect of the presentation shows a positive result. According to the expert of the material, the developed textbook belongs to good category. This positive value indicates that the developed textbook has an attractive look and it is easy for students to understand it. Therefore, it can increase students' learning interest and motivation as stated by *Depdiknas* (the Ministry of National Education) (2008).

The assessment on the aspect of graphics shows a positive result. The result of the assessment by the expert of the media toward the developed

textbook in term of graphics belongs to good category. This shows that the developed product is designed by combining color, layout, and size. Thus, it makes students being interested to read and learn the developed textbook.

The use of a textbook can make students being active in participating in the learning process. If nowadays students tend to be passive during the learning process, it is because they do not have learning material. By textbook, it can make students ready when they join the learning process because they have studied the material in the textbook first before joining the learning process.

Based on the finding, it can be said that learning using the developed textbook is effective. Achieving the effectiveness in the learning process is based on the students' responses. The students assume that textbook makes the students understand the material better, they have preparation before participating in the learning process, and the textbook can train the understanding of the material by doing some questions in it. Thus, it can be concluded that the developed textbook is a product that is suitable and decent to be used in the learning process.

#### **4. CONCLUSIONS**

Based on the research finding and data analysis that has been done, it can be concluded as follows: 1. The research resulted in a product in the form of a textbook for a course of *Pengembangan Bahan Ajar Biologi* (Biology teaching material Development) which is suitable to be used in the learning process. 2. The quality of the developed textbook is determined by the aspect of content advisability, the aspect of the presentation, and the aspect of graphics. According to the expert, it belongs to good quality, while the aspect of language advisability belongs to very good quality. 3. The students' responses during the learning process by using the textbook is categorized as "good" in terms of both the aspect of the look and the aspect of the material presentation. While the aspect of benefit is categorized as "very well".

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