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*by* Siti Alimah

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# Encyclopedia of plants on Mount Tidar Magelang as a plantae learning source: expert and user review

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**Abstract.** Local potential can be used as a source of learning in contextual learning strategy. A learning source in the surrounding area can provide direct experience so that it will expectedly improve the students' learning outcome. The purpose of this research is to test the validity of the "Encyclopedia of Plants on Mount Tidar Magelang" as a plantae learning source. The research and development method used was the Borg and Gall R&D model. The scores of questionnaire results, as research data evaluated by material expert, media expert, teacher, and the students as users; were analyzed by quantitative descriptive analysis. The validation results from the media expert are very valid in the graphics and language aspects. The validation results from the material expert are valid in the content feasibility and presentation techniques, while it was very valid at the language aspect. Based on small scale test, the Encyclopedia of Plants on Mount Tidar Magelang is also very valid when it is used as a plantae leaning source.

## 1. Introduction

The learning process should be able to introduce students to the nearest environment so that it becomes contextual learning process. It will be easier for the students to understand the concept of material in the learning process using direct objects rather than just imagining it [1]. It is in line with Morgan *et.al.*, who concluded that providing direct experience could improve the students' understanding of science concepts, skills, and environmental awareness [2]. Good understanding of the material concept will expectedly improve learning outcomes. The school environment as the students learning source of the living things classification learning material could improve the students learning outcomes [3]. Hence, it is suggested that teachers apply it to other relevant materials.

Teachers can optimize the school environment as a source of Biology learning, such as plantae learning. However, there are several learning process limitations in observing direct objects or visiting the location of learning sources that make it difficult to be applied. Those include transportation problems, unsupportive weather and limited learning hours. Therefore, teachers have to be creative to present the surrounding environment as a learning source to become learning media, such as an encyclopedia, as printed learning media. Encyclopedia is a very popular reference book because it collects the descriptions of various kinds of knowledge or certain fields of knowledge in separate articles and is usually arranged alphabetically [4].

In the plantae learning material, the developed learning sources generally focus more on certain sub-topics, such as the Encyclopedia of Medicinal Plants Based on Local Potential in the Sinjai Area as a Learning Source of Spermatophyta [5], and the Encyclopedia of Medicinal Plants Based on Local Potential in Tarakan City [6]. However, the basic competencies stated in Permendikbud No. 38 Year



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2018 are **students can** categorize plants into divisio based on general characteristics, and link their roles in life [7]. Therefore, to make it easier for the students to achieve their basic competencies, teachers need learning media that include all divisions in the plantae kingdom, namely Bryophyta, Pteridophyte, and Spermatophyta.

In general, the benefit of media in the learning process is to facilitate interaction between teacher and student so that learning activities will be more effective and efficient [8]. Meanwhile, it is specifically stated by National Education Department (2003) that the media can also be practically used to overcome the time and space limitations. The students' effectiveness in categorizing plants into direct plant objects can be replaced by presenting plant objects in clear photograph so that the students can observe them easily. Therefore, the writers need to develop an encyclopedia as a plantae learning source which includes groups of moss, ferns, and seed plants by observing the plant diversity on Mt Tidar Magelang, Central Java. Physically, Mt Tidar area is a core area, an area that has plant vegetation with relatively dense stand and is an uninhabited area [9]. Hence, this area is suitable for a plantae learning source.

The purpose of this research is to test the validity of the "Encyclopedia of Plants on Mount Tidar Magelang". Furthermore, it can be evaluated as a source of Biology learning, especially plantae learning material, at high schools around Magelang.

## 2. Methods

The encyclopedia development in this research is based on the research and development model developed by Sugiyono which refers to Borg & Gall [10]. The development procedure of the Encyclopedia of Plants on Mount Tidar Magelang is as follows:

### 2.1. Encyclopedia Design

This stage aims to design the specification of plant encyclopedia that will be developed. The plant encyclopedia will present the personal documents of identified plant photographs on Mt. Tidar Magelang. The selected plants can represent the member of Spermatophyta, Pteridophyta, and Bryophyta divisio. If there is an important part of plant that is not available when collecting data, such as flowers and fruits, a picture of that part can be taken from another source by mentioning the source.

### 2.2. Encyclopedia Validation

Design validation is carried out to assess the product feasibility according to each relevant expert. The validation process includes validation of material expert and media expert. They were asked to provide suggestions and evaluation of the developed products by filling out a questionnaire. Validation was determined by having a scale of one to four. The scores of the questionnaire results obtained from expert evaluation were then analyzed descriptively using the following formula [11] :

$$P = \frac{f}{n} \times 100\%$$

Notes:

P = Percent Value

f = Obtained score

7 = Maximum Score

To determine the quality of the developed encyclopedia, the data, which were at first in the form of scores, were then changed into qualitative data (interval data) with the scale of five, it was referred to the following Table 1.

**Table 1.** Score interval and criteria

Level of achievement	Score Interval (%)	Criteria
A	$81 \leq P \leq 100$	Very Valid
B	$61 \leq P < 81$	Valid
C	$41 \leq P < 61$	Moderately Valid
D	$21 \leq P < 41$	Less Valid
E	$P \leq 20$	Least valid

### 2.3. Encyclopedia Design Revision

The revision is used to improve the Encyclopedia of Plants on Mount Tidar Magelang before conducting a small-scale test. This revision is based on the expert validation results. The weaknesses of the encyclopedia are identified by the questionnaire results and expert advices at the validation process.

### 2.4. Small scale Test

Small scale test is conducted to identify the developed encyclopedia feasibility based on presentation and material aspects in the Encyclopedia of Plants on Mount Tidar Magelang. The small-scale test was conducted in SMA Negeri 1 Mertoyudan Magelang at 9 students with various academic ability. Three students were high achievers. Three students were mid achievers. Three students were low achievers. There was also one Biology teacher. At this small scale test, the students and the teacher evaluated the design of "Encyclopedia of Plant on Mt Tidar Magelang" by filling out the questionnaire.

## 3. Results and Discussion

### 3.1. The design of "Encyclopedia of Plants on Mount Tidar Magelang"

The research product and product development resulted in the draft of Encyclopedia of Plants on Mount Tidar Magelang. The data were collected by exploring and identifying kinds of plants on Mt Tidar Magelang that was held in January 2020.

The writers used Corel Draw X7 graphic design application to design the "Encyclopedia of Plants on Mount Tidar Magelang". The encyclopedia developed at this research is a printed media with the size of 21 x 29.7 cm (A4) on 102 pages. The pictures in the encyclopedia were direct documentation of plants taken from predetermined track of Mt Tidar Magelang.

At the exploration stage on Mt Tidar magelang, the writers successfully identified 48 kinds of plants that represented groups of mosses, ferns and seed plants. The scientific names of each species were certainly taken by matching the pictures of the species to the book of references. Kinds of plants presented in the encyclopedia show the pictures of plant crown, the plant characteristics, such as the shape of the leave, stem, flower, fruit; and present the description of plant species, the distribution and benefits.

### 3.2. The evaluation of "Encyclopedia of Plants on Mount Tidar Magelang" by material and media expert

The draft of plant encyclopedia was validated by material expert and media expert. It was validated based on the suggestions given by the experts. The validation results from material expert are shown in Table 2.

**Table 2.** Encyclopedia evaluation from material expert

Aspect	Evaluation (%)	Remarks
Content Feasibility	75.00	valid
Presentation Technique	65.00	valid
Language	82.50	very valid



The content feasibility aspect **6**s valid, with some notes that had to be clarified such as there were no classification and information to the students about the learning activity, and the benefits of plants are still general without mentioning **10** source. The encyclopedia was then revised based on the recommendation from material expert shown in Figure 1.

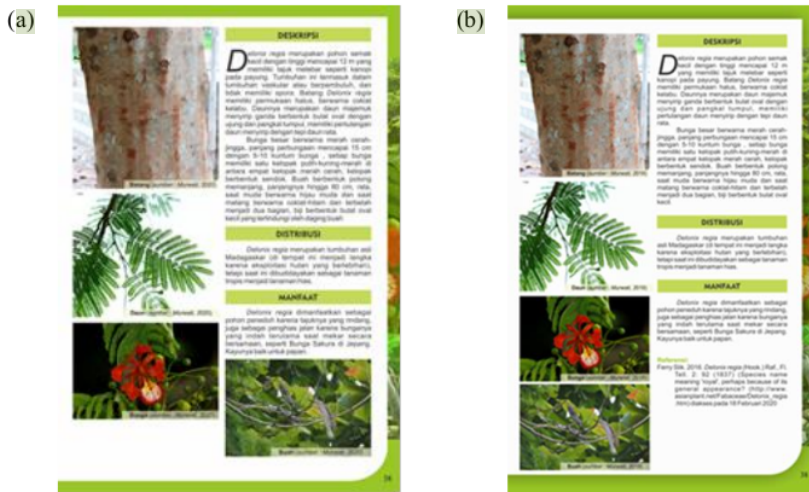


Figure 1. Mentioned source: (a) before revision and (b) after revision

Meanwhile, the classification of each plant species is not presented because the basic competence of plantae learning according to Permendikbud No. 38 Year 2018 states that the students can categorize some plants into the divisio based on the general characteristics, and relate their roles in life. To achieve this basic competence, the students are expected to categorize the plants into the divisio by using the pictures of plants in the encyclopedia. If there is an unclear picture, the students can read the description of the plants presented in the encyclopedia. This students' activity is guided by the students' worksheet which is arranged separately from the encyclopedia. Therefore, there is no information about the students' activity stated in the encyclopedia. The plant pictures in the encyclopedia can replace the plant object so that the activity can make the students experience it directly. The combination of the encyclopedia and the students' worksheet can make the students get the experience which open their mind and give meaningful learning outcome [12].

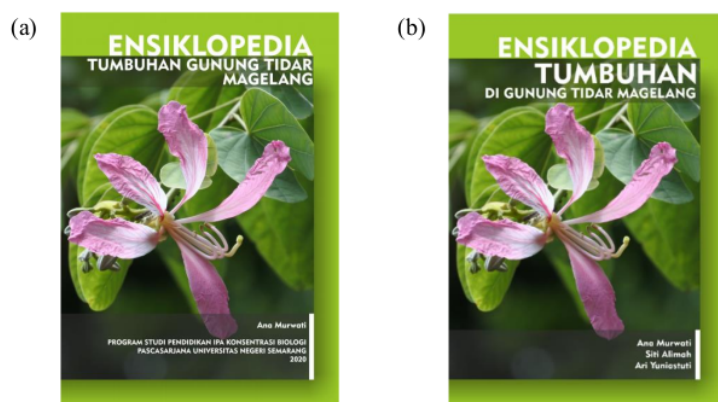
The presentation technique aspect was valid, with some notes that had to be clarified such as the encyclopedia had more than one same organ pictures of plants, and here were no page number, label, introductory, index and glossarium. The writer then revised the encyclopedia based on the recommendation from material expert. The highest evaluation percentage given by the material expert was the language aspect because the language used was easily understood, straightforward, and based on language rules. The language used also related to the thinking development and social-emotional development of the students. The appropriate diction, based on the students' development, was expected to make the students understand the material from the encyclopedia easily. The use of an encyclopedia as the media to convey the science concept would be indirectly and effectively develop the students' thinking ability [13]. It also proved that there was a strong relationship between the concept understanding and the students' critical thinking [14].

The validation results from media expert are shown in Table 3. The graphics aspect **5**s was evaluated by media expert. The result of this aspect evaluation was very good at the component of cover design and content design of the encyclopedia. The media expert suggested that the writers change the title "Encyclopedia of Plants, Mount Tidar Magelang" into "Encyclopedia of Plants on Mount Tidar

Magelang” which showed that kinds of plants in the encyclopedia were found in the area of Mt Tidar Magelang. It was also suggested that the writers write the names of the three writers on the cover page. The cover of the encyclopedia before revision and after revision can be seen from Figure 2.

**Table 3.** Encyclopedia evaluation by the media expert

Aspect	Evaluation (%)	Remarks
Graphics	97.22	very valid
Language	100.00	very valid



**Figure 2.** Cover: (a) before revision and (b) after revision

Each layer of the encyclopedia is designed in the most interesting way by showing the details of each organ such as the shape of leaf, flower and fruit; so that the observation could be done easily. The picture in a printed learning source was very important because it could help the students realize the concept taught by the teacher [15]. The encyclopedia is presented in full colour to attract the reader to read it. The use of full colour could improve the reading interest and comprehension [6]. It is also supported by the research conducted by Monica and Laura, which stated that the use of color could improve the reading interest at 40%, the learning activity at 55%-78%, and reading comprehension at 73% [16].

Meanwhile, the evaluation of balance composition items and size of layout elements arranged was good. The expert suggested that the writers focus the picture's clarity and add the real size of moss plant to make the students imagine the real size of moss in its natural habitat.

The media expert also stated that the language aspect of the encyclopedia was very good at its readability, straightforwardness, language rules, and the use of technical terms and symbol. The suggestions from media expert were also used to improve the encyclopedia in the first revision stage before being tested on a small scale.

### 3.3. Small-scale Test

The small scale test aims to determine the validity of the Encyclopedia of Plants on Mount Tidar Magelang as a plantae learning source based on the users' review. They are student and teacher. The encyclopedia evaluation reviewed by the students and the Biology teacher in SMA Negeri 1 Mertoyudan is shown in Table 4.

The encyclopedia evaluation reviewed by the student was very valid at the material aspect, contextual aspect, language aspect, media presentation aspect, and up-to-date aspect; while it was valid at the implementation aspect. According to the student, the Encyclopedia of Plants on Mount Tidar Magelang

is an interesting book and good to read. It attracts the students to read because of the interesting pictures presented clearly. The content is also complete. Although this encyclopedia is a printed material, as the research conducted by Nizar which included the graphic elements such as picture, letter order, and colour composition layout [12]; it shows that Encyclopedia of Plants on Mount Tidar Magelang has a good visual communication design so that it attracts the students. The students also suggested that the school distribute the book so that they can learn the material everytime and everywhere.

**Table 4.** The encyclopedia evaluation reviewed by the student

Aspect	Teacher		Student	
	Evaluation (%)	Remarks	Evaluation (%)	Remarks
Material/Content	90.00	Very valid	88.19	Very valid
Language	100.00	Very valid	90.74	Very valid
Media Presentation	91.67	Very valid	90.97	Very valid
Up-to-date	83.33	Very valid	90.74	Very valid
Implementation	75.00	Valid	95.83	Very valid

The results of the encyclopedia evaluation reviewed by the teacher was also categorized as very valid with some notes that had to be clarified. The teacher provided the same suggestion as what the material expert had already suggested. The teacher suggested that the writer add the taxonomy of each plant and glossarium because most of the students have not understood yet the language terms of plant morphology. The students' understanding towards the text in the book will make them understand the material concept easily. Therefore, it can improve their learning achievement. The teacher also suggested that the writer should attach the directions in doing the plant observation on Mt Tidar Magelang so that the students can observe the plants by using the encyclopedia. Positive response from the students and the teacher means the Encyclopedia of Plants on Mt Tidar Magelang, which is based on local potential, can be used as a plantae learning source in teaching learning activity [5].

#### 4. Conclusion

It is stated by media expert that Encyclopedia of Plants on Mount Tidar Magelang is very valid at graphics and language aspect. The validation results from the material expert are valid in the content feasibility and presentation techniques, while it was very valid at the language aspect. Based on the small-scale test, the encyclopedia evaluation was reviewed by the students and biology teacher was very valid at the material aspect, contextual aspect, language aspect, media presentation aspect, and contemporary aspect; while it was valid at the implementation aspect.

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