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The Practicality of Popular Scientific Books based on the Diversity of Tree Species on the Puting Riverbank

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Abstract

Learning resources using popular scientific books based on local potential found in an area is one solution that can be used to overcome problems in learning Plant Ecology courses. This development research aims to describe the practicality of the contents, expectations and actual prototypes of a popular scientific book entitled “Tree Species Diversity in Puting Riverbanks”. The research method uses a Tessmer design that focuses on formative evaluation. The results of the research on the practicality test of the content seen from the readability results of students got an average value of 94.23% with very good criteria, while the results of the practicality test of expectations and actual seen from the results of the implementation of popular scientific books which obtained an average value of 88.89% with very good criteria and the results of student responses to popular scientific books with an average of 95.96% with criteria strongly agree. This shows that a popular scientific book with the title "Diversity of Tree Species on the Puting Riverbank" is very practical to use to explore students' critical thinking skills in learning plant ecology.

Abstrak

Sumber belajar menggunakan buku ilmiah populer berbasis potensi lokal yang terdapat pada suatu daerah merupakan salah satu solusi yang dapat digunakan untuk mengatasi masalah di dalam pembelajaran mata kuliah Ekologi Tumbuhan. Penelitian pengembangan ini bertujuan untuk mendeskripsikan kepraktisan isi, harapan dan aktual prototipe buku ilmiah populer yang berjudul “Keanekaragaman Jenis Pohon di Bantaran Sungai Puting” Metode penelitian menggunakan desain Tessmer yang berfokus pada evaluasi formatif. Hasil penelitian pada uji kepraktisan isi yang dilihat dari hasil keterbacaan mahasiswa mendapatkan nilai rata-rata 94,23% dengan kriteria sangat baik, sedangkan hasil uji kepraktisan harapan dan aktual dilihat dari hasil uji keterlaksanaan buku ilmiah populer yang memperoleh nilai rata-rata 88.89% dengan kriteria sangat baik dan hasil respon mahasiswa terhadap buku ilmiah populer dengan rata-rata 95,96% dengan kriteria sangat setuju. Hal tersebut menunjukan bahwa buku ilmiah populer dengan judul “Keanekaragaman Jenis Pohon di Bantaran Sungai Puting” sangat praktis digunakan untuk menggali keterampilan berpikir kritis mahasiswa dalam pembelajaran Ekologi Tumbuhan.

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A. Introduction

South Kalimantan Province is one of the areas that have a wealth of wetlands that is very wide and diverse so that it has the potential for diverse living things. Fajrin *et al*. (2021) South Kalimantan is an area that has various types of potential biodiversity as well as several habitats for living things in the area. One of them is on the banks of the Puting River. The Puting Riverbank has the potential for a diversity of flora and fauna; this is due to the availability of food resources and a place for various kinds of living things, one of which is a tree.

Trees are one of the local potentials that can be used as learning resources for students. Learning resources can be developed by utilizing the surrounding environment or locally based. Learning with the context of life is contextual learning. Contextual learning is learning related to the everyday environment that will provide a learning experience for the students themselves (Dewi *et al*., 2017). One of the lessons that need to be implemented using a contextual approach is the material on diversity which is discussed in the plant ecology course.

The plant ecology course is a course that teaches the focus of studies on plants, so it is defined as a course that studies the interaction relationship between plants and their environment. The lack of use of environmentally based or local potential sources of materials makes the concept of biodiversity more difficult to understand. So that is what makes it necessary to develop teaching materials that can contain material with examples from the surrounding environment

Teaching materials are materials or materials for a lesson that are systematically arranged which will later be used by both teachers and students in the learning process (Sagita, 2018). Popular scientific books are one example of teaching materials.

Popular scientific books are scientific books written in a way that is easy to understand by the general public at large, such as teachers, lecturers, students, scientific practitioners, and enthusiasts of the field of science (LIPI Press Editor Team, 2016). The above statement is in line with Astuti *et al*. (2021) BIP is made to be simple, so it is easy to use, not boring, and can be learned anytime and anywhere because it is easy to carry.

Popular science books are more than simple scientific knowledge shown to the general public. Popular scientific books synthesize, reorganize and present knowledge to various audiences including the disciplines of society from the authors themselves (Schirrmacher, 2009). Popular scientific writing uses simple, concise, dense language, the text must be appropriate to the level of education, the ideas conveyed must be sequential, the sentences must lead to understanding, and the sentences used must be clear and convincing (Rakedzon & Tsabari, 2017).

A good book is a book that is well written and the language used is easy to understand, presented in an attractive manner and equipped with clear pictures and information. This makes student learning activities more interesting, able to learn independently and easily learn every competency that must be mastered (Putri *et al*., 2020).

The use of popular scientific books based on local potential is very useful for students in learning because in popular science books there are several advantages, one of which is the presence of pictures of plants that have different colors and are accompanied by local names on each plant, so that it can attract students' reading interest and make it easier to understand the learning material (Latifah *et al*., 2018). There is a need for the development of teaching materials in support of the diversity concept material which contains material with examples that are around the environment. This is what underlies researchers to develop teaching materials based on local content made in the form of popular scientific books.

Several studies on research on the development of popular scientific books have been carried out by Fajrin *et al*. (2021) about the practicality of popular scientific books on ethnobotany stated that it is practical to use as an enrichment material for ethnobotany learning. The research above is in line with the research conducted by Irwandi *et al*. (2019) about the practicality of popular scientific books about sea turtles in coastal areas which are stated to be practical for use in learning based on observations of the implementation of lesson plans (RPP). Meanwhile, research on the development of teaching materials with plant materials has been carried out by Putra *et al*. (2020) stated that the results of research on BIP teaching materials for the diversity of species of the Fabaceae family obtained a readability value in the very good category, student responses in the category of strongly agree and the implementation of popular scientific books in the very good category so that the developed book was declared practical to use.

B. Method

This type of research is development research. Development research that is focused on Formative Evaluation by Tessmer (1998) This development research begins with conducting preliminary

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research to design the initial product to be developed, namely a popular scientific book entitled "Diversity of Tree Species on the Puting Riverbank".

Data on the practicality of the contents of popular scientific books are obtained from the results of the One to one test, while the practicality of expectations is obtained from the Small group test and the actual practicality is obtained from the Field test where the following data are obtained:

1) Test the practicality of the content. The instrument used was a student legibility questionnaire. The results of the practicality test of the contents are calculated by the formula below:

$$P = \frac{A}{B} \times 100\%$$

Information:
P : Percentage
A : Total score obtained for each aspect
B : Total score

Table 1 Percentage of Readability Test

Percentage	Criteria
80,01< x ≤ 100	Very good
60,01< x ≤ 80	Good
40,01< x ≤ 60	Currently
20,01< x ≤ 40	Not good
0 < x ≤ 20	Not very good

(Source: Modification of Fatmawati, 2014)

2) The practicality test of expectations and actual can be seen through a questionnaire on the implementation of expectations and actual use of popular scientific books. The results of the implementation test of the use of student popular scientific books are calculated by the formula below:

$$\text{Student Score} = \frac{Total\ score\ obtained}{Maximum\ score} \times 100\%$$

Table 2 Categories of Implementation of the Use of BIP

Percentage	Criteria
80,01< x ≤ 100	Very good
60,01< x ≤ 80	Good
40,01< x ≤ 60	Currently
20,01< x ≤ 40	Not good
0 < x ≤ 20	Not very good

(Source: Modification of Fatmawati, 2014)

3) Student responses to the use of popular scientific books, namely using the instrument used, namely the expected and actual practicality test sheet in the form of student response questionnaires. The results of student responses to the use of popular scientific books are calculated using the formula below:

$$\text{Student responses percentage} = \frac{A}{B} \times 100\%$$

Information :
A = Proportion of students who choose
B = Total ideal score

Table 3 Percentage of Student Responses to the Use of BIP

Percentage	Statement/Practicality Level
80,01 < x ≤ 100%	SS/Strongly agree
60,01< x ≤ 80,00%	S/Agree
40,01< x ≤ 60,00%	KS/Disagree
20,01< x ≤ 40,00%	TS/Disagree

C.Results And Discussion

1. Student Readability

The practicality of the contents of the scientific book on the diversity of tree species on the Puting River Basin was obtained based on the results of the student legibility test (three students) as shown in Table 4.

The results of the readability test of the popular scientific book "Diversity of Tree Species on the Puting River Bank" in table 2 which was developed obtained the highest score of 100%. This value is influenced by several things including, the content of the developed BIP is easy to understand, has clear images and so on. While the lowest value is 83.33%, this is due to the lack of images presented in accordance with the material in the developed BIP. So that the results of the readability test get an average value of 94.23% in the very good category. These results indicate that the popular scientific books developed are suitable for further testing to explore students' critical thinking skills in studying diversity learning, especially tree species diversity. The results of the student legibility test in the practicality test of the contents of the popular scientific book on tree species diversity aims to assess the attractiveness aspect in presenting the popular scientific book "Tree Species Diversity on the Puting Riverbank".

Khairiyah *et al*. (2016) said that readability (rediability) is a measure of the suitability of the material contained in reading materials developed for readers (students). This is in line with Putra *et al*. (2021) explained that individual tests are important so that the teaching materials developed are in accordance with the conditions of students in the field. In addition, teaching materials according to students' needs makes it easier for students to learn independently, thereby increasing interaction as a process in the learning experience.

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The readability level of the BIP is closely related to the aspect or presentation technique and the language used. The language used in the preparation of this BIP is precise, clear, easy to understand, and communicative. The choice or use of such language helps accelerate the delivery and mastery of teaching materials by students. Individual trials, the emphasis is more on process factors than on learning outcomes. All data obtained at this stage (assessment, comments, observations, and student suggestions) were compiled and analyzed to revise the product.

Table 4 Student Readability Test Results

No	Statement	Student			Average
		I	II	III	
1	Easy to understand text	4	4	4	100,00
2	Image is clear or not blurry	4	4	4	100,00
3	There is a description in the picture	4	4	4	100,00
4	Interesting images presented	3	3	4	83,33
5	The images presented are in accordance with the material	3	4	3	83,33
6	Explaining a concept using illustrations of problems related to everyday life	4	3	3	83,33
7	Using everyday life examples	3	4	3	83,33
8	Encourage discussion with other friends	4	3	4	91,67
9	Related to biology	4	4	4	100,00
10	The material is coherent	4	4	4	100,00
11	There are no sentences that have a double meaning	4	4	4	100,00
12	The symbols or symbols in this popular science book are easy to understand	4	4	4	100,00
13	The terms in this popular science book are easy to understand	4	4	4	100,00
Overall Average (%)					**94,23**
Criteria					**Very good**

The results of the one to one student test were viewed from the readability component, the interactive component, the ease of use component, the students stated strongly agree (very good criteria) that popular scientific books were used in learning plant ecology. According to the results of the response, it shows that popular scientific books are very easy to understand because the presentation of the material is accompanied by pictures, associated with knowledge and adapted to student experience. Mulyadi (2015) states the suitability of the book with the level of readability and experience of students is important to note, because it can affect the interest and motivation of students to read and study the materials in the book.

Suggestions from students related to popular scientific books, namely to multiply the pictures of tree species in the book. This proves that students expect that popular scientific books that they will use in learning plant ecology can help make it easier for them to know the diversity of tree species in an area. Mulyati (2002) said that pictures/photos in learning resources serve to clarify information, help memory and understanding, provide variety so as not to be boring, and beautify to attract readers' interest. Therefore, it is necessary to make improvements to popular scientific books according to these suggestions. It is important to do so that popular scientific books developed can meet the demands of students so that they can learn more optimally with quality teaching materials.

2. Implementation of the Use of Popular Scientific Books

The implementation of the use of the Tree Species Diversity BIP on the Puting River uses 3 students (expected) and 10 students (actual) S1 Biology Education ULM. Data on the implementation of the use of BIP can be seen in Table 5.

Based on the results of table 3 on the BIP implementation test, the diversity of tree species on the banks of the Puting River obtained the highest score of 100%. This is because students are interested in reading preliminary information, facts about the concept of diversity in the developed BIP. While the lowest score is 33.33% because students do not read descriptions of general information, because they think it is clear. So, the expected and actual implementation of BIP obtained an average result of 88.89% with very good criteria. This shows that the BIP developed by students is very practical to use to explore students' critical thinking skills in studying Plant Ecology courses.

The advantage of the BIP that was developed is practically used based on its implementation; on certain pages in the BIP that was developed statements were found to explore students' critical thinking skills. This is in line with Dhamono *et al*. (2019), that the teaching materials developed must contain statements to explore students' critical thinking skills. The existence of these statements makes students sequentially or systematically in studying part by part of the material presented in the BIP.

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Table 5 Data on the Implementation of the Use of Popular Scientific Books

No	Statement	Execution	
		Hope	current
1	Students read the front (table of contents, instructions and explanation of contents)	66,67	70,00
2	Students read the introductory information	100,00	90,00
3	Students read descriptions of general information	33,33	70,00
4	Students look at pictures and descriptions in popular scientific books	100,00	100,00
5	Students look at the writing on the colored boxes	100,00	90,00
6	Students read facts about the concept of diversity	100,00	100,00
7	Students reading the glossary	100,00	80,00
8	Students use popular scientific books when making observations	100,00	100,00
9	Students use popular scientific books when doing data analysis	100,00	100,00
Percentage (%)		**88,89**	**88,89**
Overall Average		**88,89**	
Criteria		**Very good**	

3. Student Response to Popular Science Books

Student responses to the BIP on Tree Species Diversity on the Puting River Bank used 3 students (expected) and 10 students (actual) S1 Biology Education ULM. The results of student responses are presented in Table 6 below.

Based on the results of student responses, the highest score was 100% because the BIP developed could make students learn actively and independently. So, the results of student responses in expectations and actual results obtained 95.96% with a very good category. This shows that the BIP developed according to students' expectations and actuality is very practical to use to explore students' critical thinking skills in studying Plant Ecology courses. The BIP developed is very easy for students to understand, because the presentation of the material in the BIP is accompanied by pictures that are associated with knowledge and adapted to the student's experience. This was stated by Dewi *et al.* (2010), that teaching materials can be interesting, when using pictures or illustrations that clarify the content of the material that is easy for students to understand.

Table 6 Student Responses to Popular Science Books

No	Statement	Practicality	
		Hope	Current
1	This BIP motivates me to study.	86,67	92,00
2	I can learn actively and independently with this BIP.	100,00	96,00
3	The material presented can be understood easily.	100,00	100,00
4	Beep is very interesting and not boring when used.	93,33	96,00
5	If the use of BIP is carried out like this, I can remember the concepts from the lesson material easily and for longer	93,33	98,00
6	The use of BIP can help solve problems in everyday life related to learning topics	100,00	96,00
7	The use of this BIP has broadened my horizons	93,33	98,00
8	I can understand the material with the help of good quality pictures	93,33	98,00
9	I can study according to the needs of independent study	93,33	96,00
10	Learning by using BIP can help me develop critical thinking skills.	100,00	96,00
Percentage (%)		**95,33**	**96,60**
Overall Average		**95,96**	
Criteria		**Strongly agree**	

The advantages of the BIP developed are the presentation of the BIP which is written in a simple manner and by using popular language style, simple, concise and dense, so that it attracts reading interest and is easily understood by a wide audience. This makes it easy to learn, not boring, and easy to carry anywhere so that it can be learned anytime and anywhere. Learning about tree species diversity using BIP went well. This is explained by Suswina (2016), who explains that the coherence of the content of teaching materials makes it easier for students to learn and also guides students to get used to thinking coherently. In addition, Fajeriadi *et al.* (2019) states, the coherence in writing can make it easier for readers to understand the flow of material and can improve students' critical thinking skills.

The practicality of BIP development products is very important to do before the product is used to measure its effectiveness; the practicality of teaching material development products is not only for BIP, but also for other types of teaching materials (Dharmono *et al.*, 2019). Product development is said to be practical if the product is

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easy for students or teachers to run and richer than student textbooks (Nieveen, 1999). Tessmer (2014) stated that the practicality test focused on data about students' ability to confirm the success of improving product results before field testing. This is in line with Ibrahim & Subali (2017); the practicality of product development can be obtained by observing whether the users of the book have difficulty using the product.

D. Conclusion

The results of the practical study of popular scientific books on the Diversity of Tree Species on the Puting Riverbank were obtained from three tests, namely the practicality test of the content seen from the readability results of students getting an average value of 94.23% with very good criteria, while the results of the practical and actual expectations were seen from the results of the implementation of popular scientific books with an average score of 88.89% with very good criteria and the results of student responses to popular scientific books with an average of 95.96% with the criteria of strongly agreeing. This shows that the BIP developed is very practical to use to explore students' critical thinking skills in studying Plant Ecology courses

Suggestion:

This research only comes to practicality, to obtain information on the feasibility of this BIP, it is necessary to continue testing the effectiveness obtained from student users.

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