

The practicality of popular scientific books about familia poaceae in mangrove swamps on Sungai Bakau to students' critical thinking ability

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Article Information	Abstract
Keyword: Practicality; Poaceae; Popular science books; Critical thinking Kata Kunci: Kepraktisan; Poaceae; Buku ilmiah populer; Berpikir kritis History: Received : 19/12/2021 Accepted : 31/01/2022	This development research aims to describe the popular scientific book Poaceae in the mangrove swamp of the Sungai Bakau Village on students' critical thinking skills. The stages of development include self-evaluation, expert test, individual test, small group test, and field test. The research subjects were five students for the response test and 3 observers for the implementation test of the popular scientific book Poaceae in the mangrove swamp of the Sungai Bakau Village on students' critical thinking skills. The type of data is descriptive data, using BIP implementation instruments and student responses are used for practicality of content and practicality of expectations. Technical data analysis was carried out in accordance with the objectives of the research which included the practicality of BIP. The calculation of the data is done by calculating the total score for each aspect tested and then dividing the total score so that the percentage that shows the practicality of BIP is obtained. The results showed that popular scientific books that had been developed were stated to be very practical based on the BIP individual test with an average of 89.74%. Popular scientific books are declared practical because the results of student responses with an average value of 90.74% with very good criteria, results of BIP implementation on average 92.80% with criteria strongly agree. Based on this, the developed BIP is very practical to use and makes it easier for students to learn. Abstrak Penelitian pengembangan ini bertujuan mendeskripsikan buku ilmiah populer Poaceae di rawa mangrove desa Sungai Bakau terhadap kemampuan berpikir kritis mahasiswa. Tahap-tahap pengembangan meliputi evaluasi diri, uji pakar, uji perorangan, uji kelompok kecil, dan uji lapangan. Subjek penelitian adalah lima mahasiswa untuk uji respon dan 3 observer untuk uji keterlaksanaan buku ilmiah populer Poaceae di rawa mangrove desa Sungai Bakau terhadap kemampuan berpikir kritis mahasiswa. Jenis data yaitu data deskriptif, menggunakan instrument instrument keterlaksanaan BIP dan respon mahasiswa digunakan untuk kepraktisan isi dan kepraktisan harapan. Teknis analisis data dilakukan sesuai dengan tujuan dari penelitian yang meliputi kepraktisan BIP. Perhitungan data dilakukan dengan cara menghitung jumlah skor tiap aspek yang diuji kemudian dibagi jumlah skor total sehingga didapatkanlah persentase yang menunjukkan kepraktisan BIP. Hasil penelitian menunjukkan buku ilmiah populer yang telah dikembangkan dinyatakan sangat praktis berdasarkan uji perorangan BIP dengan rata-rata 89,74%. Buku ilmiah populer dinyatakan praktis karena hasil respon mahasiswa dengan rata-rata nilai 90,74% dengan kriteria sangat baik, hasil keterlaksanaan BIP rata-rata 92,80% dengan kriteria sangat setuju. Berdasarkan hal tersebut BIP yang dikembangkan sangat praktis digunakan dan memudahkan mahasiswa dalam pembelajaran.

A. Introduction

Learning resources are needed to improve learning outcomes (Arisandi et al., 2019). Learning resources that have been developed are very helpful in facilitating the learning process. Utilization of learning resources can be used as topics which are then included in a teaching material that can be developed through development research. According to Suniasih (2019), development research is a research method used to produce certain products and test the effectiveness of these products.

Based on the preliminary study, the research begins with small-scale research conducted in the form of collecting data on the problems encountered and finding solutions to solve the problems encountered (Fahmi et al., 2019). Therefore, it is necessary to develop learning resources that can facilitate the learning process both at school and at tertiary institutions in accordance with the demands of the applicable curriculum.

Curriculum demands in the future will be higher to improve critical thinking skills in teaching and learning activities in the classroom (Surahman & Surjono, 2018). Critical and systematic thinking skills in students can be developed by applying learning that focuses on students' ability to think critically (Irwandi, 2019; Fajeriadi et al., 2019). Efforts to help students understand a material must use systematic concepts so that learning will be remembered for a longer period of time. In this regard, a teaching material that can be developed with a systematic arrangement of material and can be understood easily is one of them, namely the development of popular scientific books.

Popular scientific books or commonly abbreviated as (BIP) contain knowledge based on research results that are presented scientifically using simple, concise and clear language, so that they are easily understood by the public and students (Putri et al., 2020). BIP that meets several criteria, namely valid, easy to use (practical) and has broad benefits and is effective in learning (Plomp & Nieveen, 1992).

The problem experienced by many educators is that there are limited BIP products with the concept of Poaceae plants based on local potential in an effort to train students' critical thinking skills. Therefore, it is necessary to study material containing Poaceae plants which are local potentials in a certain area, one of which is in South Kalimantan.

South Kalimantan is an area consisting mostly of wetlands and mangrove swamps (Arisandi et al., 2019). The research that utilizes a

local potential has been carried out by Irwandi (2019) which examines the local potential of the coastal area which is then included in a BIP in training students' critical thinking skills. The use of BIP can motivate students to learn so that this high interest in learning causes students to learn more easily and quickly understand the subject matter. (Fajrin et al., 2020). A material that is easy for students to find in everyday life is by developing BIP based on the local potential (Majid, 2012).

According to Fajrin et al. (2020) suggests that local potential that can be used as a source of learning is a potential where the plants being studied can be easily found in a certain area. Local potential which is currently felt to be a source of learning for students is found in the mangrove swamp area of the Bakau River, one of which is the Poaceae plant (Al-Sghair et al., 2019).

Poaceae ecologically function as pioneer plants and resist excessive evaporation on sandy soils. Economically, Poaceae plants are also used as human staple food, animal feed, medicine, craft materials, paper, seasonings, household utensils, ornamental plants and building materials (Hutasuhut, 2018). Phylogeneticists have named this family as one of the winners in the evolution of diversified angiosperms throughout the Cenozoic. Poaceae is in fifth position with the most species ranking behind Asteraceae which has 23,000 species. Poaceae is ecologically the dominant plant that covers about 40% of the land surface on Earth (Arisandi et al., 2019).

Research related to Poaceae conducted by Hikmah & Dharmono (2018) found 11 species in the mangrove swamp of the Bakau River, Takisung District, Tanah Laut District. There are still many Poaceae that have not been identified, so this research has the potential to be used as a source of learning as well as in an effort to preserve flora diversity, especially Poaceae. The material about Poaceae in Biology Education at Lambung Mangkurat University is one of the sub-materials in the Panemogame course.

Based on the description above, it is the basis for researchers to develop the development of Poaceae BIP in the mangrove swamps of the Bakau River on students' critical thinking skills. The development of BIP is expected to be a new innovation in developing teaching materials based on local potential.

B. Material and Method

The type of research used refers to Tessmer's Formative Evaluation research. Tessmer's formative evaluation design was chosen because it

was systematic and suitable for testing the use of BIP. Preliminary research was conducted to obtain the initial product, namely BIP Poaceae mangrove swamp in the Sungai Bakau Village.

The initial product design was developed through formative evaluation according to Tessmer's (1998) model. The stages of its development consist of 3 steps, namely one to one test, small group test and field test test.

In evaluating the practicality of a popular scientific book, there are three parameters tested, namely readability, implementation, and student response. Readability was tested on a one to one test to 3 students. The implementation and student responses were tested through a small group consisting of 5 students and a field test consisting of 15 students. Based on the results of the one to one readability test, the practicality of the contents of the BIP was obtained, in addition to the small

group test, the expected implementation value or student response was obtained, while the field test obtained the actual implementation value or the actual student response.

C. Results and Discussion

In detail, the practical results of popular scientific books are obtained in the data below.

1. Student Readability

The practicality of the contents of the popular scientific book Poaceae in the mangrove swamp of the Bakau River aims to determine the practicality of the BIP used which was developed for students who use it during learning. The practicality of the content or student readability test was obtained based on three students which are detailed in Table 1.

Table 1 Student Readability

No	Validated indicators/aspects	Students		
		I	II	III
1	Easy to understand text	3	3	3
2	Image is clear or not blurry	4	4	4
3	There is a description on the picture	4	4	4
4	The images presented are interesting	3	3	4
5	The images presented are in accordance with the material	3	4	3
6	Explain a concept using illustrations of problems related to everyday life	4	3	3
7	Using everyday life examples	3	4	3
8	Encourage discussion with other friends	4	3	4
9	Relate to Biology material	4	4	3
10	The material is coherent	4	3	4
11	There are no sentences that have a double meaning	4	4	3
12	The symbols or symbols in this popular science book are easy to understand	4	3	4
13	The terms in this popular science book are easy to understand	4	4	4
Amount		48	46	46
Category (%)		92.3	88.46	88.46
Average (%)		89.74		
Criteria		Strongly agree		

(Source: Data Processing Results)

The final results of the student readability test are categorized based on Table 2.

Table 2 Readability Test Category

No	Average Score	Performance Classification
1	85,00 - 100	Strongly agree
2	70,00 - < 85,00	Agree
3	60,00 - < 70,00	Disagree
4	50,00 - < 60,00	Do not agree
5	0 - < 50,00	Strongly Disagree

Modified from Ramadhan et al. (2020)

The results of the readability test on the popular scientific book "Family Poaceae in the Mangrove Swamp of the Sungai Bakau Village" in Table 1 mentions an average of 89.74% in the very good category. The results of the practicality of the student content indicate that the popular scientific books developed are suitable for further testing in an effort to improve students' critical thinking skills in studying Phanerogame learning. The results of the student legibility test (one to one) stage of the popular Poaceae scientific book in the mangrove swamp of the Sungai Bakau Village are aimed at assessing the appearance and presentation aspects of the popular Poaceae

scientific book in the mangrove swamp of the Sungai Bakau Village. At this stage, students got suggestions as shown in Table 1.

The readability test aims to conduct an assessment by students who make BIP to make it easier for students. The assessment is viewed from the readability component, interactive component, and ease of use component (Utami, 2017). This is in line with Noorannisa et al. (2022) which states that individual tests or audience validation (students/readers) can be used in assessing media development, including this BIP. Research that is relevant to the existence of a readability test in the development of BIP has been reported by Nugroho et al. (2019) with a student readability test score of 92.20% with very good criteria so that the teaching

materials developed are in accordance with the needs of students. Based on the statement above, it shows that the BIP developed has very good criteria on the one to one test, this shows that the contents of this BIP are in accordance with the needs of students.

2. The Implementation of Popular Scientific Books

The implementation of BIP was obtained from a small test step (small group) which was carried out on 3 observers of ULM Biology education undergraduate students who had taken Phanerogame courses. In detail, the student response data can be seen from table 3.

Table 3 Implementation of Popular Scientific Books

No	Statement	Implementation	
		Hope	Actual
1	Students read the front (table of contents, instructions and explanation of contents)	100,00	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 the pictures and descriptions in the book.	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 read facts about the concept of diversity	100,00	100,00
Percentage (%)		92,59	88,89
Average (%)		90,74	
Criteria		Very good	

(Source: Data Processing Results)

The final results of the student readability test are categorized based on Table 4.

Table 4 Categories of BIP Implementation

Percentage (%)	Criteria
85,00 - 100	Very Good
70,00 - < 85,00	Good
60,00 - < 70,00	Pretty Good
50,00 - < 60,00	Not Good
0 - < 50,00	Very Not Good

Modified from Ramadhan et al. (2020)

The results of the data presented in table 3 above, obtained the highest score of 100% because students were interested in reading preliminary information, facts about the concept of diversity and a glossary on the developed BIP. While the lowest score is 33.33% because students do not read descriptions of general information, it is because students think that it is clear so that part of it is skipped by students. Regardless of the

difference in value, when the average results obtained on the implementation of expectations and actual each got a value of 90.74% with very good criteria. This shows that the BIP developed is practical for use in learning.

Based on student opinions on the use of popular scientific books in studying Phanerogames, it is stated that students are easier to learn and understand the material presented with teaching materials in the form of popular scientific books (Yuniar et al., 2019). Students argue that studying plants using popular scientific books containing descriptions and pictures can make it easier for students to determine plant characteristics and the process of plant identification (Yunizarrakha et al., 2018).

This was also expressed by Fitriansyah (2018) who stated that popular scientific books developed with a very practical category would have the meaning of being very easy to use and use in learning. This statement is also reinforced by

Husna et al. (2020) who explained that scientific work must be easy to use with the aim of motivating students not to be lazy, not bored, and more enthusiastic in the teaching and learning process (Hikmah, & Dharmono. 2018). Based on the above statement, it shows that the developed BIP has very practical criteria on the results of BIP implementation. This shows that the BIP that has

been developed is very easy to understand by students and can be used in the learning process.

3. Student Response

The practicality of the popular scientific book Poaceae in the Mangrove Swamp of the Sungai Bakau Village was obtained based on the results of student responses to the practicality of expectations and actual as shown in Table 5.

Table 5 Student Responses to BIP

No	Statement	Implementation	
		Hope	Actual
1	This BIP motivates me.	86.67	90.67
2	I can learn actively and independently.	100.00	96.00
3	The material presented can be understood easily.	100.00	90.67
4	Beep is very interesting and not boring when used.	93.33	88.00
5	If the use of BIP is carried out like this, I can remember the concepts from the lesson material easily and for a longer time.	93.33	85.33
6	The use of BIP can help solve problems in everyday life related to learning topics	100.00	86.67
7	The use of this BIP has broadened my horizons.	93.33	96.00
8	I can understand the material with the help of good quality pictures.	93.33	89.33
9	I can study according to the needs of independent study.	93.33	93.33
10	Learning by using this book can help me develop critical thinking skills.	100.00	86.67
Percentage (%)		95.33	90.27
Average (%)		92.80	
Criteria		Very Practical	

(Source: Data Processing Results)

Table 6 Categories of Student Response Test

Percentage (%)	Criteria
85,1 < x ≤ 100	Very Practical
70,1 < x ≤ 85	Practical
60,1 < x ≤ 70	Practical enough
50,1 < x ≤ 60	Less Practical
<50	not practical

Modified from Ramadhan, *et. al.*, (2020)

Based on Table 5 regarding student response data for practicality, the highest score is 100% because the BIP developed can make students learn actively and independently. This is influenced because the material presented in the BIP can be understood easily by students while the lowest score is 85.53% because the BIP developed does not motivate students to learn, it is influenced by the desire of the students themselves and also because of the physical condition factor. students who are less supportive because data collection is carried out during the fasting month. From these results, the average student response is not much different. On the practicality of expectation, the average result is 95.33% and the actual practicality is 90.27% with very practical criteria. So it can be concluded that the BIP developed is practically used in learning (Mahanal et al., 2018).

Students think that studying using popular scientific books is very useful and fosters interest in participating in Phanerogame learning activities which have been known as boring subjects. This is in line with the statement of Dharmono et al. (2019) found that the cause of Phanerogame learning is boring because the material is standard and does not develop. The pictures contained in popular science books make learning in Phanerogame courses not boring and even more interesting. Popular scientific books can foster a positive attitude for Phanerogame courses so that students strongly agree to use popular scientific books as teaching materials for Phanerogame learning.

The advantages of the popular scientific books that have been developed make these teaching materials very practical because the advantages of the popular scientific books that have been developed contain plant material from the Poaceae family which are found around students, especially those who live in settlements. The popular scientific book that was developed contains the characteristics and benefits accompanied by the pictures shown in popular scientific books are pictures with original colors that match the original plants, making it easier to

identify the Poaceae family species studied (Murti, 2018). The presentation of popular scientific books that have been developed is arranged in such a way as to make it easier to understand and learn. According to Fajrin et al. (2020) interactive and fun learning is considered a mechanism that encourages students' concentration and helps in the absorption of learning material.

Based on the description of students' responses to the practicality of popular scientific books being developed, the elements of practicality of popular scientific books have been fulfilled. Based on practicality data, there are still students who say no to the field test. This is thought to be caused by the characteristics of students who are the subjects in this study. As stated by Fitriansyah et al. (2018) that each individual student is individualistic, each of which has their own intellectual abilities, talents, interests, and characters in terms of learning.

D. Conclusion

Research and development using the Tessmer design has succeeded in producing a popular scientific book, The Poaceae Family in the Mangrove Swamp of the Sungai Bakau Village so that it can be concluded.

- 1) The popular scientific book of the Poaceae Family in the Mangrove Swamp of the Sungai Bakau Village that has been developed is declared to be very good based on the readability test which got results of 89.74% with the criteria of strongly agreeing.
- 2) The results of the implementation test of the popular scientific book Poaceae Family in Mangrove Swamp, Sungai Bakau Village which was developed which got an average of 90.74% with a very good category for use in teaching Phanerogame courses on students' critical thinking skills.
- 3) The results of the student response test are used to determine the practicality of expectations and actual with an average value of 92.80% with a very practical category so that the developed BIP can be used by students easily.

E. Acknowledgement

The completion of the writing of this journal cannot be separated from the help of several parties; therefore the authors are very grateful to Author's parents. Also, thanks to supervising lecturer; administrative staff; and research team from Master Program of Biology Education Universitas Lambung Mangkurat (ULM).

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