

Kebun Raya Banua medicinal plant species of the Fabaceae family as popular scientific books: Practicality test

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Article Information	Abstract
<p>Keyword: Practicality; Popular scientific books; Critical thinking; Higher plant botany</p> <p>Kata Kunci: Kepraktisan; Buku ilmiah populer; Berpikir kritis; Botani tumbuhan tinggi</p>	<p>Education in the 21st century is required to produce generations who have and master various kinds of skills, one of which is critical thinking skills. Therefore, learning is needed that can prepare students to think critically. One of them is applying local potential-based learning resources developed in popular scientific book teaching materials. This study aims to examine the practicality of the content, the practicality of expectations, and the actual practicality of the popular scientific books developed. The method used is based on Tessmer's formative evaluation design. The results of the research on the readability test obtained results of 87.18% with very good criteria, based on student responses, the results were 89.60% on the practicality of expectations and 92.59% on the actual practicality with very practical criteria, and based on the implementation of popular scientific books that developed which got the results of 92.59% on the implementation of expectations and 96.69% on the actual implementation with a very good category. This result shows that a popular scientific book titled "Types of Plants in the Fabaceae Family with Medicinal Properties in the Banua Botanical Gardens" is very practical to use as enrichment material in the Higher Plant Botany (BTT) course and can improve students' critical thinking skills.</p>
<p>History: Received : 16/05/2022 Accepted : 18/06/2022</p>	<p>Abstrak</p> <p>Pendidikan abad ke-21 dituntut untuk dapat menghasilkan generasi-generasi yang memiliki dan menguasai berbagai macam keterampilan salah satunya adalah keterampilan berpikir kritis. Oleh karena itu diperlukan pembelajaran yang dapat menyiapkan peserta didik untuk berpikir kritis. Salah satunya dengan menerapkan sumber belajar berbasis potensi lokal yang dikembangkan dalam bahan ajar buku ilmiah populer. Penelitian ini bertujuan untuk menguji kepraktisan isi, kepraktisan harapan dan kepraktisan actual dari buku ilmiah populer yang dikembangkan. Metode yang digunakan adalah mengacu pada desain evaluasi formatif dari Tessmer. Hasil penelitian pada uji keterbacaan mendapatkan hasil sebesar 87,18% dengan kriteria sangat baik, berdasarkan respon mahasiswa mendapatkan hasil sebesar 89,60% pada kepraktisan harapan dan 92,59% pada kepraktisan aktual dengan kriteria sangat praktis, dan berdasarkan keterlaksanaan buku ilmiah populer yang dikembangkan yang mendapatkan hasil 92,59% pada keterlaksanaan harapan dan 96,69% pada keterlaksanaan aktual dengan kategori sangat baik. Hal ini menunjukkan bahwa buku ilmiah populer dengan judul "Jenis-Jenis Tumbuhan Famili <i>Fabaceae</i> Berkhasiat Obat di Kebun Raya Banua" sangat praktis digunakan sebagai materi pegayaan pada mata kuliah Botani Tumbuhan Tinggi (BTT) serta dapat meningkatkan kemampuan berpikir kritis mahasiswa.</p>

A. Introduction

Entering the 21st century, various skills need to be possessed by every individual, one of which can be obtained through the education process. Some of the skills that educational institutions provide include students having learning and innovation skills, skills in using technology and information media, and being able to work, and survive by using life skills (Sole & Anggraeni, 2018). Therefore, education is expected to be able to prepare students to master various skills so that later they will be able to give birth to a skilled and successful generation. One of the skills that must be possessed in the 21st century is critical thinking skills.

Critical thinking is a way of thinking by producing the ability to identify a problem, analyze, determine problem solving steps, make conclusions, and make decisions. Critical thinking is needed to prepare oneself to face the advancement of science and technology in the 21st century (Maryam et al., 2020). Satwika et al. (2018) added that critical thinking skills are one of the Higher Order Thinking Skills (HOTS) needed to face challenges and problems in the future. Critical thinking is an organized mental process and plays a role in making decisions to solve problems. Critical thinking includes activities in the form of analyzing and interpreting data in a scientific inquiry activity. Therefore, learning is needed that can prepare students to think critically, creatively, logically, and take the initiative in responding to a problem in order to become qualified human resources and able to compete.

One of the suitable learning for the problem above is science learning. This is because in its implementation, science learning provides opportunities to grow analytical, inductive and deductive thinking skills to solve problems related to natural events around. In particular, the role of Biology in everyday life is very important, not only theoretically mastering concepts but also in their application and attachment to other sciences (Kusumastuti et al., 2019; Listiana, 2020; Pertiwi et al., 2018).

Learning science requires students to play a direct role both individually and in groups. But in reality, this is very rare. In contrast, the teacher's role is only as a transfer of knowledge to students. This is what ultimately causes gaps in the learning process (Rahmatiah, 2015). Therefore, to produce a generation that has the ability to think critically and systematically can be obtained through a learning model that also encourages critical thinking. This is because critical thinking can help students find and understand a concept and the

concepts learned will be remembered for a longer period of time (Ilaah & Yonata, 2015).

As for the implementation, learning can be done by utilizing the environment as a learning resource. This is because the environment has a lot of potential that can be used as a learning resource so that it can be used as an approach in the learning process. This environment-based learning resource will certainly provide a good understanding of students, because students can directly see, observe and interact with the object being studied. Utilization of the environment as a learning resource can be done by conducting a study of the local potential that exists in the surrounding environment. This is also supported by Lase (2016) who explained that the use of local potential as a learning resource is one of the characteristics expected by the curriculum so that the learning process becomes applicable and meaningful.

The studied local potential can be used as the content of teaching materials. The content of teaching materials can be divided into general and specific information. Teaching materials that contain general content contain general learning materials, while teaching materials with special content can also be called local content which contains information and studies on regional potential. Teaching materials have a variety of views, one of which is popular scientific books (BIP).

Based on the research results of Latifah et al. (2019) showed a significant increase in student learning outcomes towards critical thinking using BIP. Therefore, BIP based on local potential in the botanical subject of higher plants can help students to develop critical thinking, solve problems, and increase curiosity and participation in learning. This is in line with the nature of current learning which refers to a constructivist view based on learning through the active involvement of students in the construction of meaning and knowledge. Teaching science from the perspective of constructivism aims to provide students with scientific knowledge in such a way that they not only understand concepts and principles, but can also observe the object of learning directly.

This constructivism emphasizes learning with direct inquiry methods so that students will be more active in making discoveries, experimenting, and solving problems found (Sugrah, 2019). This is also supported by Bruner (1973) which states that learning is a process of building new concepts and knowledge through the knowledge possessed. This constructivism view is in the form of the activeness of students in selecting information, formulating

hypotheses, and making decisions, with the aim of linking new experiences with experiences that students already have.

The BIP should meet several criteria including valid, practical, and effective. Research on the development of BIP teaching materials has previously been reported. Fajrin et al. (2021) the developed BIP is stated to be practical and effective as an enrichment material in learning. Irwandi et al. (2019) the development of BIP based on local potential is stated to be practical to use in learning. Nufus et al. (2022), the developed BIP is stated to be very practical to use and attract students' interest in reading in ethnobotany learning.

The place for this research is the Banua Botanical Gardens (KR) which is a conservation area for medicinal plants, but the information related to this has not been packaged in the form of a BIP. Therefore, it is necessary to develop BIP's on medicinal plant species of the Fabaceae family in the Banua Botanical Gardens to improve students' critical thinking skills. The results of the development will later become a means of information for the community and as material for student enrichment for higher plant botany courses at universities.

B. Material and Method

This type of research is development research using a formative evaluation design from Tessmer. The product developed is in the form of a BIP entitled "Types of Plants from the Fabaceae Family with Medicinal Properties in the Banua Botanical Gardens". Practical data were obtained from a one-to-one test (individual test) consisting of 3 undergraduate Biology Education ULM students who had passed the BTT course and from student opinions about BIP, the results were then analyzed using the following formula.

$$\text{Response score (\%)} = \frac{\text{Total score obtained}}{\text{Maximum score}} \times 100\%$$

The percentages that have been obtained are then matched with the criteria adapted from (Sugiono, 2015) as presented in Table 1.

Table 1 Category of Contents Practicality Assessment

No.	Score	Description
1	85,1 - ≤100%	Very Practical
2	70,1 - ≤85%	Practical
3	60,1 - ≤70%	Practical enough
4	50,1 - ≤60%	Less Practical
5	0 - ≤50%	Not Practical

Modification of Sugiono (2015)

The results of the one to one test are called the third prototype, which then the results are tested on a small group test to find out the practicality of expectations. In this one-to-one test, 3 undergraduate students of Biology Education ULM have passed the BTT course. The field test aims to determine the actual practicality of BIP being developed. This field test involved 20 students using student response instruments. The percentage of student responses was calculated using the following formula.

$$\text{Percentage of student responses} = \frac{A}{B} \times 100\%$$

Description:

A = Proportion of students who choose

B = Total ideal score

The responses obtained were analyzed descriptively. The scoring for the results of the questionnaire can be seen in Table 2.

Table 2 Percentage of Response

Percentage	Statement/Practicality level
80,01 - ≤ 100%	SS/Totally Agree
60,01 - ≤ 80,00%	S/Agree
40,01 - ≤ 60,00%	KS/Enough Disagree
20,01 - ≤ 40,00%	TS/Disagree

Modification of Fatmawati (2014)

C. Results and Discussion

1. Readability Test

The readability test was carried out to analyze the extent of the readability and difficulty of the developed BIP which then the results will be used as the basis for conducting a small group test (Pratiwi et al., 2014). Individual tests were conducted to obtain the practicality of the content and suggestions for improvement of the developed BIP. As stated by Hidayati (2016) that the purpose of individual testing is to obtain empirical evidence about the feasibility of the initial product on a limited basis. The following is a cover display of the developed BIP.

The results of the individual test are presented in Table 3. The results of the readability test phase (one to one) aim to assess the skills and presentation aspects of the BIP. Based on the results of the presentation of the values in Table 3, it can be seen that the BIP "Types of Plants from the Fabaceae Family with Medicinal Properties in the Banua Botanical Gardens" has an average overall score of 87.18% with very good criteria. Based on this value, the developed BIP can be used in terms of appearance, presentation of material, and ease of use. The results of these responses indicate that BIP

are very easy to understand because the presentation of the material is accompanied by pictures, associated with knowledge and adapted to student experience. As explained by Mulyadi (2015) which states that 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.

Respondents stated that the BIP developed was very good, it could be seen from the results obtained in the individual test starting from the

presentation and display aspects. The overall point of each aspect has a high value because the material presented is related to biological material and is accompanied by clear images, so that this aspect has a value of 100.00%. Meanwhile, BIP still lacks students to discuss with friends so that the score obtained is only 75.00%. Riefani & Mahrudin (2020) explained that materials related to everyday life, appropriate and clear placement and pictures can help students understand learning materials more easily.



Figure 1

(a) Front cover and (b) back cover populas scientific book entitle “Jenis-Jenis Tumbuhan Famili Fabaceae Berkhasiat Obat”

Table 3 Individual Test Results (One to One)

No	Validated Aspect Indicators	Student			Average
		1	2	3	
A	Aspect of BIP Display				
	1) Text is easy to understand	3	3	4	83,33
	2) Image is clear or not blurry	4	4	4	100,00
	3) There is a description on the picture	4	4	3	91,67
	4) The images presented are interesting	4	3	4	91,67
	5) Images are presented according to the material	3	4	3	83,33
B	Aspects of BIP Material Presentation				
	6) Explain a concept using illustrations of problems related to everyday life	3	3	4	83,33
	7) Using daily life examples	3	3	4	83,33
	8) Encourage discussion with other friends	3	3	3	75,00
	9) Related to biological material	4	4	4	100,00
	10) The material is coherent	3	4	3	83,33
	11) There is no sentence that has double meaning	3	3	4	83,33
	12) Symbols or symbols in BIP are easy to understand	3	4	3	83,33
	13) The terms in BIP are easy to understand	3	4	4	91,67
Overall Average (%)					87,18
Criteria					Very good

(Source: data processing results)

Although the developed BIP obtained very good criteria, all of these were not obtained without revision or improvement. Revisions are made by paying attention to suggestions and comments from students in order to increase the perfection of the products developed. The most important suggestions from students regarding BIP are to correct mistakes in writing. This proves that students expect BIP that they will use to study Higher Plant Botany can help make it easier for them to understand the material. Therefore, it is necessary to revise BIP according to these suggestions. It is important to do so that BIP

developed can meet the demands of students so that they can learn more optimally with quality teaching materials. Therefore it is necessary to improve the BIP based on the suggestions and inputs that have been given.

2. Student Response

The next test stage is a small test to get data on the practicality of expectations. The actual practicality is obtained from field tests. The expected and actual practicality data are presented in Table 4.

Table 4 Expected and Actual Student Response Data

No.	Statement	Practicality	
		Hope	Actual
1	This BIP motivates me to study	92,00	93,00
2	I can learn actively and independently with this BIP	84,00	87,00
3	The material presented can be understood easily	84,00	92,00
4	BIP is very interesting and not boring when used	88,00	94,00
5	If the use of BIP is carried out like this, I can remember concepts from learning materials easily and for longer	84,00	90,00
6	The use of this BIP has broadened my horizons	80,00	90,00
7	The use of this BIP has broadened my horizons	88,00	93,00
8	I can understand the material with the help of good quality pictures	92,00	95,00
9	I can study according to the needs of independent study	80,00	91,00
10	Learning using BIP can help me develop critical thinking skills	80,00	90,00
Overall Average (%)		89,60	92,59
Criteria		Totally Agree	Totally Agree

(Source: data processing results)

Based on the data obtained in Table 4 regarding the results of student responses to practicality, the expectation of obtaining an overall percentage of 89.60%. Meanwhile, for actual practicality, the overall percentage is 92.59%. The criteria based on these results are that students strongly agree that the BIP entitled "Types of Plants in the Fabaceae Family with Medicinal Properties in the Banua Botanical Gardens" is very practical to be used as teaching material in BTT courses.

The results of the expected practicality test are not much different from the actual practicality test results. The increase in grades can be seen from students giving assessments on each different aspect. Some students are known to be very easy to understand the material presented and there are those who still do not understand the material presented. However, based on the overall score obtained, the BIP developed is quite clear and very practical as a teaching material.

Based on students' opinions on the use of BIP in studying Plant Botany, it was stated that it was easier for students to learn and understand the material presented with teaching materials in the form of BIP. Students are of the opinion that studying plants using BIP containing descriptions

and pictures can facilitate students in the learning process. Another reason that causes students to agree to study using BIP is because the pictures in BIP make learning in the Plant Botany course more interesting. Popular scientific books can foster a positive attitude for Higher Plant Botany courses so that students strongly agree to use BIP as teaching materials for Higher Plant Botany learning. Dharmono et al. (2019) stated that the presentation of illustrated teaching materials related to students' knowledge and experience was able to improve students' critical thinking skills in the learning process.

This was also revealed by several studies, including Fitriansyah (2018) which stated that BIP were developed in the very practical category, which means that they are very easy to use and use in learning. Then by Nurlita (2021) stated that the BIP which was developed in the practical category means that the BIP is easy to use and utilize in the learning process. Based on practicality data, there are still students who say "no" in the field test. This is thought to be caused by the characteristics of students who are the subjects in this study. As is the case with Sudjana (2002), which states that each individual student is individualistic, each of

which has their own intellectual abilities, talents, interests, and character in terms of learning.

3. Implementation of BIP

The data on the practicality of BIP that have been described are also supported by data from the results of the implementation of product use by observers in the form of the implementation of expectations obtained from the results of the small

group test and the actual implementation obtained from the results of the field test. In this case, the observer observes the entire content and writes the results of the observations made on the observation sheet that has been provided. The results of the observer's assessment of the expected and actual implementation of the developed BIP are presented in Table 5.

Table 5 Data on the Implementation of Expected and Actual BIP

No	Statement	Execution	
		Hope	Actual
1	Students read the front (table of contents, instructions, and explanation of contents)	100,00	100,00
2	Students read the introductory information	100,00	100,00
3	Students read descriptions of general information	100,00	100,00
4	Students look at pictures and descriptions in BIP	100,00	90,00
5	Students look at the writing on the colored boxes	100,00	100,00
6	Students read facts about concepts	66,67	100,00
7	Students reading the glossary	66,67	90,00
8	Students use BIP when making observations	100,00	100,00
9	Students use BIP when conducting data analysis	100,00	90,00
Overall Average (%)		92,59	96,67
Criteria		Very Good	Very Good

(Source: data processing results)

Based on the data obtained in Table 5, it is found that the results of observations on the implementation of expectations get an overall average result of 92.59%. The actual implementation got an overall average result of 96.67. The percentage of these results indicates that the expected and actual implementation tests of the developed BIP are very well used. The results of the assessment of the implementation tests are not much different even though there is an increase in the value of the actual test. This can be seen from the results of the assessment through the implementation questionnaire, where in the expectation test the lowest value is 66.67%. While in the actual test the lowest value is 90.00%. One of these differences is in the statement that students read facts about concepts and students do not read the glossary because it is considered less important so that students pay less attention to and read the glossary.

The results of the implementation aim to prove that learning has gone according to the plan in the RPS. The plan is made to make learning more conducive and to increase students' motivation to learn. Good learning is done interactively, inspiring, fun, challenging, and motivating students to play an active role (Akbar, 2013). The high implementation results are due to the fact that learning has been planned systematically, coherently, and in accordance with curriculum developments that require students to be more active in the learning process. The results of the implementation of the

use of BIP in the very good category are expected to have an influence on students' learning and critical thinking skills. The BIP that has been developed is expected to be one of the references in choosing good teaching materials to be used in practical learning to achieve learning objectives.

D. Conclusion

The results of the development of a BIP with the title "Types of Plants of the Fabaceae Family with Medicinal Properties in the Banua Botanical Gardens" using the Tessmer development design were declared practical to use based on the readability test which obtained a result of 87.18% with very good criteria, based on the response students get results of 89.60% on expected practicality and 92.59% on actual practicality with very practical criteria, and based on the implementation of BIP's developed which get 92.59% results on expected implementation and 96.69% on actual implementation with a very good category to be used as an enrichment material for high plant botany (BTT) courses and can improve students' critical thinking skills.

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