

The practicality of Cyperaceae popular scientific books in mangrove areas to college students' criticial thinking skill

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History: Received : 26/11/2021 Accepted : 25/01/2022 Critical thinking is one of the fundamental competencies needed by humans in the 21st century to produce quality human resources which can be seen in the implementation of the Tri Dharma Higher Education activities, it is necessary to develop learning resources that can direct students to improve and bring up knowledge, attitudes and critical thinking skills. One of the learning resources that can train students' critical thinking skills is a learning resource in the form of popular scientific books based on local potential which is presented and described in simple sentences, looks attractive and easy to understand and in accordance with the characteristics of critical thinking skills to facilitate students in the learning process. This study aims to describe the practicality of the popular scientific book Cyperaceae in the Mangrove area of Sungai Bakau Village on students' critical thinking skills. Data on the practicality of BIP were obtained from individual tests to determine student readability using a readability questionnaire, small test and field test to determine the practicality of expectations and actual practicality using student response questionnaires and observations on the implementation of BIP use using an implementation questionnaire. Research respondents are students who have passed the Higher Plant Botany course with research design development through formative evaluation from Tessmer.

Abstrak

Berpikir kritis merupakan salah satu kompetensi fundamental yang diperlukan manusia di abad 21 untuk menghasilkan SDM yang berkualitas yang terlihat dalam pelaksanaan kegiatan Tri Dharma Perguruan Tinggi maka perlu adanya pengembangan sumber belajar yang dapat mengarahkan mahasiswa untuk meningkatkan dan memunculkan pengetahuan, sikap dan keterampilan berpikir tingkat kritis. Salah satu sumber belajar yang dapat melatihakn keterampilan berpikir kritis mahasiswa adalah sumber belajar berupa buku ilmiah populer berbasis potensi lokal yang disajikan dan dijabarkan dengan kalimat sederhana,tampilan menarik dan mudah dipahami serta sesuai dengan karakteristik keterampilan berpikir kritis untuk memudahkan mahasiswa dalam proses pembelajaran. Penelitian ini bertujuan untuk mendeskripsikan kepraktisan buku ilmihah populer Cyperaceae di daerah Mangrove Desa Sungai Bakau terhadap keterampilan berpikir kritis mahasiswa. Data kepraktisan BIP diperoleh dai uji perorangan untuk mengetahui keterbacaan mahasiswa menggunakan angket keterbacaan, uji kecil dan uji lapangan untuk mengethaui kepraktisan harapan dan kepraktisan aktual menggunakan angket respon mahasiswa dan observasi terhadap keterlaksanan penggunaan BIP menggunakan angket keterlaksanaan. Responden penelitian merupakan mahasiswa yang telah lulus mata kuliah Botani Tumbuhan Tinggi dengan desain penelitian pengembangan melalui evaluasi formatif dari Tessmer.

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A. Introduction

Based on the Constitution Number 20 of 2003 Article 1 concerning the National Education System defines education as a conscious and planned effort to create a learning atmosphere and learning process so that students actively develop their potential to have religious spiritual strength, selfcontrol, personality, intelligence, noble character and Skills.

Fakhriyah (2014) stated that the need for high-quality human resources, able to develop potential and be able to solve problems in the future. Universities have a real role in realizing the improvement of the quality of human resources as seen in the implementation of the Tri Dharma of Higher Education activities. Efforts to improve the quality of students are a challenge for universities by learning to develop students' hard skills and soft skills. However, in reality so far, lectures sometimes only strengthen hard skills or in terms of assignments and materials.

Critical thinking is one of the competencies needed by humans in the 21st century. Critical thinking is a reasonable or reasoned reflective way of thinking that is focused on determining what to believe and do (Ennis, 2013). Critical thinking is one of the competencies needed by humans in the 21st century besides communication, collaboration, and creativity. These competencies are important to be taught to students in the context of core fields of study and 21st century themes (Griffin *et al.*, 2012; Zubaidah, 2016).

Critical thinking skills are fundamental skills in solving problems and need to be considered in universities, especially students as prospective teachers to face 21st century education and become one of the main competencies of graduates (Zubaidah, 2016). Permendikbud No. 3 of 2020 article 1 explains that the higher education curriculum has the aim of delivering students to master certain knowledge and skill.

Some of the problems facing our world of education today are the weakness of the learning process that leads to learning to think and the lack of learning resources that specifically detail and raise the local potential of an area in particular and are developed in the form of popular scientific books. Popular scientific books are books that contain scientifically presented knowledge in simple, concise, clear and easy-to-understand language for students, students and the general public (Pammai, 2014).

One example of teaching materials that can be applied to influence students' critical thinking skills is through popular scientific books containing information presented in various forms of media to make it easier for students to learn according to the demands of the curriculum. Several studies have shown that popular scientific books have an effect on the learning process. Patmawati *et al.*, (2017) explains that the use of popular scientific books on pale wood morphology is very good and suitable for use by students in supporting the learning process. Utami *et al.*, (2017) explained that popular scientific books are very good and suitable for use in learning materials on biodiversity in high school and Putri *et al.*, (2020) explained that popular scientific books are appropriate and very well used for students in the Higher Plant Botany course.

The Cyperaceae family has good potential to be developed as learning resource material, adding student information materials to explore critical thinking skills and books discussing Cyperaceae in mangrove areas specifically in the form of books do not yet exist and very few are used for research, especially in Biology Education, Lambung Mangkurat University.

Based on the explanation above, the development of popular scientific books in this study aims to overcome the problem of student boredom in the material for Higher Plant Botany and the lack of learning resources that practically detail material specifically about the Cyperaceae family on students' thinking skills in the Higher Plant Botany course.

B. Method

This research method is development research focusing on Tessmer Formative Evaluation which includes self-evaluation, expert test, individual test, small group test and field test.

Preliminary research was conducted to obtain the initial product, namely BIP "Cyperaceae in Mangrove". Then the initial product design was developed through individual tests to determine the practicality of the content, small group tests to determine the practicality of expectations and large group tests to determine the actual practicality obtained. The data collection techniques for the practicality of BIP Cyperaceae in Mangroves on students' critical thinking skills are as follows:

- Practicality of content to determine student readability of BIP Cyperaceae in Mangrove obtained through the opinions of 3 students on individual tests categorized based on the criteria of practicality of content.
- 2) The practicality of expectations to determine student responses obtained through the opinions of 3 students on the small group test which is categorized based on the criteria of practicality of expectations

3) The actual practicality for determining the implementation of BIP obtained through the opinions of 15 students on the Field Test includes: critical thinking skills obtained from the results of working on practicum guides and evaluation questions based on popular scientific books using the critical thinking ability rubric. Categorized based on actual practicality criteria.

The data on the practicality of popular scientific books that were developed were obtained from data on the practicality of content, practicality of expectations and actual as well as the implementation of the use of popular scientific books as follows:

1. Practical content, expectations and actual

The practicality result data is measured by using the categories of (Ramadhan *et al.*, 2020) presented in Table 1.

Table 1 Categories of content practicality

Percentage (%)	Criteria
80,00 < x ≤ 100	Very good
60,00 < x ≤ 80.00	Good
40,00< x ≤ 60.00	Pretty good
$20,00 < x \le 40.00$	Not good
< 20.00	Not very good

Table 2 Category of practicality assessment

Percentage (%)	Criteria
85,1< x ≤ 100	Very practical
70,1< x ≤ 85	Practical
60,1< x ≤ 70	Quite practical
50,1< x ≤ 60	Less practical
< 50	Tidak praktis

2. Implementation of product use

The results of the implementation are measured by the modified category from Sugiyono (2015) which is presented in Table 3.

Table 3 Product implementation categories

Percentage (%)	Criteria
85,1< x ≤ 100	Very good
70,1< x ≤ 85	Good
60,1< x ≤ 70	Pretty good
50,1< x ≤ 60	Not good
< 50	Very not good

3. Critical thinking skills

Students' critical thinking skills through learning using BIP are obtained from the results of formulating questions, identifying assumptions, making problem solutions, analyzing arguments and drawing conclusions. Then calculated by the following formula:

Student grades = $\frac{\text{Total score obtained}}{\text{Maximum number of scores}} \times 100\%$

Table 3 Categories of critical thinking scores

Percentage (%)	Criteria
85,1< x ≤ 100	Very good
70,1< x ≤ 85	Good
60,1< x ≤ 70	Pretty good
$50,1 < x \le 60$	Not good
< 50	Not very good

The amount of increase in learning outcomes is calculated using the gain formula by Hake (1999) as follows:

 $g = \frac{S after - S before}{S maximum - S before}$

Table 5 Classification of N-Gain

Score g	Criteria					
g ≥ 0,7	High					
$0,3 \le g \le 0,7$	Medium					
g ≤ 0,3	Low					
	<i>(a</i>) (a a a)					

(Source: Hake, 1999)

C. Result and Discussion

The data obtained from the practicality of the popular scientific book Cyperaceae in the Sungai Village Mangrove showed that students responded well to the use of Cyperaceae BIP, it was helped in identifying Cyperaceae. This is also evidenced by the results of the student legibility test who scored very well as shown in table 6, the practical results of expectations on the small test and actual practicality on the large group test with very practical criteria as in Table 7.

Based on the results of the data on the readability test on the BIP, "Family Cyperaceae in Mangroves" has very good criteria for use both in terms of appearance, presentation of material, and convenience. The results of the readability test stage (one to one) indicate that the popular scientific books developed are suitable for use without revision, but there are some aspects that are still not perfect, especially in aspect 6, there are still typos and grammatical errors that are not correct so that with improvements to make This beep just got even better.

Table 6 Readability test results

No	Validated Indicators/Aspects			t	Doncontago	anitonio	
NO				3	Percentage	criteria	
1	Every part learned is easy to understand	4	4	4	100	Very good	
2	Instructions on how to use popular science books			4	91,6	Very good	
3	The entire contents of popular scientific books are complete			3	91,6	Very good	
4	The words used are easy to understand		4	4	100	Very good	
5	The picture quality is good and the meaning is understandable		4	4	100	Very good	
6	No typos or grammar errors found			3	75	Not good	
7	The photo on the cover is clear and understandable		4	4	100	Very good	
	Overall percentage %				94		
	Overall criteria	Very good					

Mulyadi (2015) explains that the interest and motivation of an individual to read or learn a material in a book needs to be adjusted to the level of readability and experience of students. Based on this explanation, it is very natural when the score on the one to one test is high because students feel a good impact and get a different learning experience through popular scientific books that have been adapted to a student's thinking skills and are based on regional potential.

This popular scientific book has several advantages and advantages so that it gets very good results, including: a) Cover BIP has an attractive design because it clearly describes the contents of the material in it, b) has pictures of native plants found in the mangrove area of Sungai Village Mangroves thus strengthen the contextualization of this book, c) this popular scientific book has fulfilled various aspects of a popular scientific book as evidenced by the average results of the assessment by the validator obtaining very good criteria.

This readability test is important to do with the aim of being an additional reinforcement that the books to be used for students are good and suitable for use. This is in line with Hidayat (2017) who explains that the purpose of the readability test is to obtain limited empirical evidence about the feasibility of the initial product, so that it focuses on emphasizing more on process factors than learning outcomes.

Table 7 Practical results of student expectations

No	Statement		Student		- Dorcontago	Critoria	
NU	Statement		2	3	reitentage	Citteria	
1	Popular Science Books motivate me to study	5	4	4	86	Very practical	
2	I can learn actively and independently with this book	4	5	4	86	Very practical	
3	The material presented can be understood easily	5	5	4	93,3	Very practical	
4	Books are very interesting and not boring when used	5	4	5	93,3	Very practical	
5	If the use of the book is carried out like this, the concepts	5	5	5	100	Very practical	
	from the lesson material can be remembered easily and						
	for longer						
6	The use of this book can help solve problems in everyday	5	5	4	93,3	Very practical	
	life related to learning topics						
7	The use of this book has broadened my horizons.	5	4	4	86	Very practical	
8	I can understand the material with the help of good	5	5	5	100	Very practical	
	quality pictures						
9	I can study according to the needs of independent study	4	4	4	80	Practical	
10	Learning by using this book can help me develop critical	5	5	5	100	Very practical	
	thinking skills.						
Overall percentage				92			
Overall criteria Very prac				prac	tical		

Data results Student responses on the practicality of expectations where the percentage is included in very practical criteria and on actual practicality with very practical criteria. This can happen because students show a sense of joy when carrying out learning using popular scientific books. The use of the development of popular scientific books has the aim of students' critical thinking skills with predetermined indicators to make it easier for students to understand the lecture material on higher plant botany. The popular scientific book Cyperaceae also makes it easier for students to understand the material presented, especially material about plants found in the environment, especially plants of the Cyperaceae family and has been equipped with illustrations of various images that are adapted to the material so that it can make it easier to understand and increase interest in studying the material in a book. The joy and positive response from students is in line with Akbar's opinion (2013) which explains that good learning is carried out interactively, inspiring, fun, challenging and motivating students to participate actively.

No	Statement	Percentage	Criteria
1	Popular Science Books motivate me to study	89,3	Very practical
2	I can learn actively and independently with this book	86,6	Very practical
3	The material presented can be understood easily.	96	Very practical
4	Books are very interesting and not boring when used	90,6	Very practical
5	If the use of the book is carried out like this, the concepts from the lesson material can be remembered easily and for longer.	94,6	Very practical
6	The use of this book can help solve problems in everyday life related to learning topics.	90,6	Very practical
7	The use of this book has broadened my horizons.	94,6	Very practical
8	I can understand the material with the help of good quality pictures.	90,6	Very practical
9	I can study according to the needs of independent study.	88	Practical
10	Learning by using this book can help me develop critical thinking skills.	92	Very practical
Overall percentage			
Overall criteria			al

Table 8	The results	of the actual	practicality	of 15 students	in the large	group test
			P = = = = = = = = = = = = = = = = = = =			8

Barnawi & Arifin (2015) explain that the presentation, appearance and inclusion of material in a book, including popular scientific books, is adjusted to advances in science, technology and education levels. This is reinforced by Lucardie (2014) explaining that interactive and fun learning is considered a mechanism that encourages students' concentration and helps in the absorption of learning material.

The implementation of popular scientific books can be measured other than through student responses but also by looking at the implementation of the use of popular scientific books. Based on the data contained in the previous explanation, observations on the implementation of popular scientific books obtained very good criteria which have a range of 80.01 - 100%. These results provide an illustration that the BIP that has been developed can be said to be very practical to use in learning, especially in the Higher Plant Botany course material Cyperaceae.

The data on the implementation of BIP were obtained from 5 observers who observed all practicum activities and put them on the observation sheet provided. The results of observations on implementation can be seen in Table 9.

Based on the data contained in Table 4.7 above, the results of observations on the

implementation of popular scientific books obtained an average of 84.42% in the small group test and in the field test test of 91.10%, which results are included in the criteria from good to very good which has a range of 80.1%-100%. This shows that the popular scientific book of the Cyperaceae Family in Mangroves is in the very good category. The results of this implementation are aimed at prove that learning has proceeded according to the plan contained in the lesson plans and is designed to increase motivation. In addition, this excellent result is also expected to have an influence on students' critical thinking skills and can be used as a reference as a source of student learning and can be used in practical learning. The following are the results of critical thinking skills data contained in table 10.

Based on the results of the data that has been obtained, the evaluation scores of students before using BIP are still in the low category, while the results of the evaluation scores of students after using BIP entitled "Family Cyperaceae in Mangroves" have an average score in the good category. This explains that there is a change in learning outcomes, mastery of the material and gives an influence to students between before and after using BIP. These data illustrate that the BIP that has been developed is effectively used in learning.

		Average score			
No	Student Activities	Small Group	Field test		
1	read the front (table of contents, instructions and explanation of contents)	2	3		
2	read introductory information	3	5		
3	read the description of general information	5	5		
4	look at the pictures and descriptions in popular scientific books	5	5		
5	look at the writing on the colored box	5	5		
6	read facts about the family Cyperaceae	5	5		
7	reading the glossary	5	5		
8	using popular scientific books when making observations	5	5		
9	Using popular scientific books when doing data analysis	3	3		
Aver	age percentage of all aspects	84,42	91,10		
Crite	ria	Good	Very good		

Table 9 Results of BIP implementation

No.	Critical Thinking Indicator	Field test			Critoria
		P.first	P.final	N-gain	CITTEITA
1	Interpretation	51,2	72,34	0,43	Medium
2	Assumption	62,33	79,84	0,46	Medium
3	Deduction	60	87,17	0,68	Medium
4	Argument analysis	66,22	90,11	0,7	High
5	Inference	60	95,5	0,89	High

These results cannot be separated from the ongoing learning process and the ability of students in the learning process through the environment and can carry out the process of critical thinking skills, so that the material is easy to understand, understand, and recall, which means critical thinking skills can have an influence on students' cognitive abilities. Al Hakim et al. (2018) explains that a systematic, effective and efficient learning process can improve students' critical thinking skills.

Critical thinking skills are a type of thinking that involves the use of analytical and evaluative cognitive processes, especially analysis related to arguments based on logical consistency which aims to identify biases and errors in reasoning (Arends, 2012). Therefore, an assessment of critical thinking skills is very necessary, the objectives include: 1) being able to diagnose students' critical thinking skills; 2) being able to provide feedback on students' critical thinking skills; and 3) able to motivate students to become better critical thinkers.

D. Conclusion

Overall, the popular scientific book "Family Cyperaceae in Mangroves" that has been developed is stated to be practical to use based on student responses to the learning of Higher Plant Botany courses. Popular scientific books that have been developed also have an influence on students' critical thinking skills. The discussion in the book is only about the morphology and species diversity of the Cyperaceae family and can only be used as enrichment material for higher plant Botany courses. Therefore, it is hoped that further research will be carried out on popular scientific books of the Cyperaceae family in ethnobotany studies in the fields of pharmacology, ecology and anthropology both in areas that the same or another region.

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