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The practicality of popular scientific books of the diversity of Macrozoobenthos in the Sungai Puting

Rara Ramadanti [1] *, Danang Biyatmoko [2], Muhammad Zaini [1]

[1] Master Program of Bioloy Education, Postgraduate Program, Universitas Lambung Mangkurat, Banjarmasin City, South Kalimantan, Indonesia
[2] Study Program of Animal Husbandry, Faculty of Agriculture, Universitas Lambung Mangkurat, Banjarbaru, South Kalimantan, Indonesia

Corresponding Author Email: ramadanti.rara98@gmail.com

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Abstract

Teaching materials based on local potential are teaching materials that contain material or materials that are local in nature, and have ideas that can be understood and are closely related to the management of natural resources and the environment where teaching materials can help improve critical thinking skills. One of them is the application of local potential-based learning resources developed in this teaching material, namely popular scientific books (PSB). This study aims to examine the practicality of the contents, practical expectations and actual practicality of the developed PSB macrozoobenthos diversity. The method used refers to the formative evaluation design from Tessmer. The results of the research based on the readability test for the practicality test of the contents yielded 91.67% with very practical criteria, and student responses to the practicality of expectations obtained results of 93.33% and 95.83% on actual practicality with very practical criteria, and based on the implementation of the PSB that was developed on the implementation of expectations and actual implementation got a result of 85.19% in a very good category to be used as enrichment material for Animal Ecology courses and to improve students' critical thinking skills.

Abstrak

Bahan ajar berbasis potensi lokal merupakan bahan ajar yang berisi materi atau bahan yang bersifat lokal, dan memiliki gagasan-gagasan yang dapat dipahami dan berkaitan erat dengan pengelolaan sumber daya alam dan lingkungan yang mana bahan ajar dapat membantu meningkatkan keterampilan berpikir kritis. Salah satunya penerapan sumber belajar berbasis potensi lokal yang dikembangkan dalam bahan ajar ini ialah buku ilmiah popular (BIP). Penelitian ini bertujuan untuk menguji kepraktisan isi, kepraktisan harapan dan kepraktisan aktual dari BIP keanekaragaman makrozoobentos yang dikembangkan. Metode yang digunakan adalah mengacu pada desain evaluasi formatif dari Tessmer. Hasil penelitian berdasarkan uji keterbacaan untuk uji kepraktisan isi mendapatkan hasil 91,67% dengan kriteria sangat praktis, dan respon mahasiswa pada kepraktisan harapan mendapatkan hasil sebesar 93,33% dan 95,83% pada kepraktisan aktual dengan kriteria sangat praktis, dan berdasarkan keterlaksanaan BIP yang dikembangkan pada keterlaksanaan harapan dan keterlaksanaan aktual mendapatkan hasil 85,19% dengan kategori sangat baik untuk digunakan sebagai materi pengayaan mata kuliah Ekologi Hewan serta dapat meningkatkan keterampilan berpikir kritis mahasiswa.

A. Introduction

Locally-based teaching materials are teaching materials that contain material or materials that are local, have understandable ideas that are wise, full of wisdom, of good value, embedded, contain values, norms, belief systems, and ideas (Nadlir, 2016; Khery et al., 2020)-the ideas of the local community and are closely related to the management of natural resources and the environment (Kun, 2013). The development of locally-based teaching materials was carried out by Ardan (2016) who reported that the development of teaching materials was valid and effective in increasing students' knowledge, and there were changes in behavior towards the environment. Locally based teaching materials have local advantages that must be developed from the potential of each region. One example of teaching materials is PSB.

The PSB are books that contain knowledge based on research results that are presented scientifically using simple, concise and clear language according to the criteria of the reader (Putri et al., 2020), that meets several criteria, namely valid, easy to use (practical) and has broad and effective benefits in learning (Plomp & Nieveen, 2007). Several studies that have developed PSB's such as Rini (2021); Hafizha (2022); Rahayu (2022) report that the developed PSB is very practical and can be used in learning. PSB development can increase students' understanding of the surrounding environment.

PSB development based on student knowledge and experience is very important to do, because students often interact directly with their surroundings. However, the problem that many educators experience is the limited PSB products with the concept of diversity of species of Macrozoobenthos based on local potential in an effort to train students' critical thinking skills. Therefore, it is necessary to study material containing macrozoobenthos which has local potential in an area, one of which is in South Kalimantan. Dharmono et al. (2019) explains that teaching materials can come from local potential possessed by a particular area. The existence of this PSB development can be a source of student learning, and can also improve critical thinking skills. The data for this contextual learning uses macrozoobenthos.

Macrozoobenthos have an important role in food webs. The larval phase of macrozoobenthos is a food source for most of the organisms that live in estuary areas. Besides that, macrozoobenthos also increases oxygen levels in the sediment or substrate by making holes in the substrate (bioturbation). Macrozoobenthos which have a relatively sedentary living habitat, limited movement, live in and on the bottom of the waters are very well used as biological indicators of water. The abundance and diversity of macrozoobenthos is also strongly influenced by changes in water quality and the substrate where it lives (Ulfah et al., 2012). Based on the results of observations in the preliminary tests conducted by Rara Ramadanti, ten types of Macrozoobenthos were found, including *Pila scutata, Corbicula fluminea, Corbicula rivalis, Pila ampullacea, Pomacea insularum, Melanoides tuberculata, Pila globosa, Filopaludina javanica, Chironomus* sp. and *Tubifex tubifex*. In addition, the river area can be a place for environment-based learning and a good habitat for various living things, one of which is macroozobenthos so that the presence of macrozoobenthos in the Sungai Puting area needs to be developed as a learning resource in an effort to improve critical thinking skills.

Thinking skills are one of the assets that students must have as a provision in dealing with the development of science and technology in the present. According to Irwandi & Fajeriadi (2019) using the environment can develop observing skills (with all the senses), taking notes, formulating questions, hypothesizing, classifying, writing, and making pictures or diagrams. The OECD Program for International Student Assessment (2016) states that environment-based learning is classified as contextual learning which can stimulate, train, and develop students' critical thinking skills.

There is a description of the problem in the Animal Ecology course; there is still no research on macrozoobenthos in the Sungai Puting area to improve students' critical thinking skills. The solution to overcome this problem is to develop innovative teaching materials based on local potential. Based on the description above, the researcher is interested in conducting research on the development of PSB in an effort to improve critical thinking skills on the concept of diversity of macrozoobenthos species. This study produces data regarding validity, practicality and effectiveness. The results of this research will later be used as teaching materials in the form of PSB through development research to obtain quality PSB that can add insight and knowledge to students, especially in animal ecology courses.

B. Material and Method

This type of research is development research using formative evaluation design from Tessmer. The product being developed is in the form of a PSB

entitled "Diversity When conducting individual tests (one-to-one) as content practical data which will be used as a basis for revising the prototype and is called the third prototype whose results are then tested on a small group. A small group test was carried out to find out the practicality of expectations and the effectiveness of PSB expectations by involving three undergraduate biology education students participating in animal ecology courses, the students selected in the small group test were different from the individual test (one-to-one). This is to avoid data bias during research. Implementation of field tests (field tests) to determine the actual practicality and actual effectiveness of PSB that were developed involving 15 undergraduate biology education students who had attended animal ecology courses. After that, revised the shortcomings and weaknesses of the PSB based on the suggestions and comments obtained during the field test. Field tests were conducted to obtain data on actual practicality and actual effectiveness. Both use student response instruments as users and implementation instruments by observers. The data obtained from the test results is calculated using Formula 1 by Pratiwi et al. (2014).

The results of the calculations are then categorized according to Table 1. The results of the categorization are then analyzed descriptively.

$$P = \frac{A}{B} \times 100\% \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{Formula 1}$$

Descriptions:
P : Percentage
A : Total score obtained for each aspect
B : Sum of all scores

Table 1 Practicality categorization guide

Percentage	Criteria
80,01< x ≤ 100	Very practical
60,01< x ≤ 80	Practical
40,01< x ≤ 60	Pretty Practical
20,01< x ≤ 40	Less Practical
0 < x ≤ 20	Impractical

(Source: Modified from Fatmawati, 2014)

C. Results and Discussion

1. Readability Test (One-to-one Evaluation)

One-to-one evaluation is carried out after expert review. At this test stage, a student readability test was carried out with three ULM Biology Education Undergraduate students who had taken animal ecology courses as test subjects. The results of the individual test are presented in Table 2. The results of the legibility test on PSB "Macrozoobenthos Species Diversity in Sungai Puting" are at least very practical. At this stage, comments and suggestions were also obtained by three students such as the legibility test aimed at conducting assessments by students who made PSBs to make it easier.

Table 2 One-to-one evaluation results

No.	Indicator	Student			Modus	Percentage
		I	II	III		
1.	The text is easy to understand	4	3	4	3,67	91,67
2.	The image is clear or not blurry	4	4	4	4	100
3.	There is information on the picture	4	3	4	3,67	91,67
4.	The pictures presented are interesting	3	3	4	3,33	83,33
5.	The images presented are in accordance with the material	4	4	3	3,67	91,67
6.	Explain a concept using illustrations of problems related to everyday life	3	3	4	3,33	83,33
7.	Use examples from everyday life	3	3	3	3	75
8.	Encourage discussion with others(Edited	4	3	4	3,67	91,67
9.	Relating to biological material	4	4	4	4	100
10.	The material has crumbled	4	3	4	3,67	91,67
11.	There are no sentences with double meanings	4	4	4	4	100
12.	The symbols or symbols in this PSB are easy to understand	3	4	4	3,67	91,67
13.	The terms in this PSB are easy to understand	4	4	4	4	100
Overal average (%)					**91,67**	
Criteria					**Very practical**	

One-to-one evaluation of development research products is seen from the components of readability, interactive components, and ease of use components (Putri et al., 2020; Latifah et al., 2020; Gani et al., 2022). This is in line with Hafizha (2022) which states that individual tests or audience (student) validation can be used in assessing media developments, including this PSB. Research that is relevant to the existence of a readability test by Nugroho et al. (2019) with a student readability test score of 92.20% with very good criteria so that teaching materials are developed according to student needs. Also, Rahayu (2022) explained that the results of student responses to PSB were included in the very good category in terms of readability, interactive and

ease of use. Based on the statement above, it shows that the developed PSB has very good criteria in the one-to-one test, this shows that the contents of this PSB are in accordance with student needs.

Even though the PSB that was developed obtained very good criteria, all of that was not necessarily obtained without revision or improvement. Revisions were made by taking into account suggestions and comments from students in order to add to the perfection of the product being developed. Suggestions from students regarding PSB are, add supporting pictures to make it more interesting, avoid using complicated terms, and add broader local potential so that there is a lot of additional information. This proves that students expect PSB that they will use to study Animal Ecology to help make it easier for them to understand the material. Therefore, improvements to PSB are carried out according to these suggestions. This is important so that PSB that are developed can meet the demands of students so that they can learn more optimally with quality teaching materials. Researchers review the suggestions and comments that have been given and then make revisions based on the suggestions given.

2. Student Response

The next test stage was student responses obtained from small test steps on three ULM Biology Education Undergraduate students who had taken the Animal Ecology course to obtain data on the practicality of expectations. Meanwhile, the actual practicality was obtained from a field test consisting of 18 students. The expected and actual practical data are presented in Table 3.

Table 3 Expected and actual student response data

No.	Statement	Average (Percentage)	
		Expectations	Actual
1.	This PSB motivates me to study.	83,33	93,33
2.	I can study actively and independently with this PSB.	100,00	95,00
3.	The material presented can be understood easily.	91,67	95,00
4.	PSB is very interesting and not boring when used.	100,00	98,33
5.	If the use of PSB is implemented like this, I can remember the concepts from the lesson material easily and last longer.	100,00	98,33
6.	The use of PSB can help solve problems in everyday life related to learning topics	83,33	93,33
7.	The use of this PSB broadens my horizons.	100,00	95,00
8.	I can understand the material with the help of good quality pictures.	91,67	95,00
9.	I can study according to the needs of independent learning.	91,67	98,33
10.	Learning using this book can help me develop critical thinking skills.	91,67	96,67
Overal average (%)		**93,33**	**95,83**
Criteria		**Very Practical**	

Based on Table 3 it can be seen that PSB can be used by students. The results of the practicality test show that the practical use of the product being developed is classified as very practical to use. Even though there is a decrease, it is still in the very practical category. Likewise in the actual practicality test, it can be seen that PSB can be used by students. The results of the actual practicality test show that the practicality of using the developed product is classified as very practical. Even though there is a decrease, it is still in the very practical category. The PSB entitled "Diversity of Macrozoobenthic Species in Sungai Puting" obtains very practical criteria indicating that the PSB that has been developed is suitable for use in subsequent tests of students' critical thinking skills in studying animal ecology courses. This shows that the developed PSB is effective for use by students in improving critical thinking skills in Animal Ecology courses for students to understand and learn.

The results of the expected and actual practicality tests show differences in the increase in percentage values such as the PSB providing motivation to learn, the PSB can be understood easily, the use of PSB can help solve problems in everyday life related to learning topics, can understand the material with the help of quality images well, can meet the needs of independent learning, can help critical thinking skills, while the other statements get a slight decrease in percentage values.

The results of this expected and actual practicality test, have different average percentage values, there is an increase which is still in the stable category, and it can be said that it is still in the same range, which is very practical. This is because students feel that they experience convenience when using PSB that have been developed.

Practical means that it is practical, meaning that it is easy to use so that learning is more

effective and efficient. Practicality means that it is practical, meaning that it is easy and easy to use. Tessmer (1998) practicality can be seen based on the practical expectations and actual. Expected practicality is the expected practicality of the product being developed.

This was also revealed by several studies, including Rahman (2022) who reported that the results of student responses obtained were not much different between the practicality of expectations and actual practicality, both of which received very practical criteria. This statement was also reinforced by Husna et al. (2017) who explained that scientific work developed is in a very practical category which means it is very easy to use and utilize in learning. Fitriansyah et al. (2018) also reports that PSB are developed in a very practical category which means they are very easy to use and utilize in learning.

3. Implementation of PSB

The practicality data of the PSB that have been described are also supported by data on 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 tests. In this case, the observer observed the entire contents and recorded the results of the observations made on the observation sheet provided. The results of the observer's assessment of the expected and actual implementation of the developed PSB are presented in Table 4.

Table 4 PSB expected and actual implementation data

No.	Statement	Implementation	
		Expectations	Actual
1.	Students read the front (table of contents, instructions and explanation of contents)	33,33	66,67
2.	Students read the introductory information	100	100
3.	Students read descriptions of general information	33,33	33,33
4.	Students examine the pictures along with information on PSB	100	100
5.	Students look at the content and explanation of the diversity of macrozoobenthos	100	100
6.	Students read facts about macrozoobenthos diversity	100	100
7.	Students use PSB about macrozoobenthos diversity when making observations	100	100
8.	Students use PSB about macrozoobenthos diversity when conducting data analysis	100	100
9.	Students read the glossary	100	66,67
Percentage (%)		**85,19**	**85,19**
Overal average (%)		**85,19**	
Criteria		**Very good**	

The results of the data presented in Table 4 obtained the highest score because students were interested in reading introductory information, pictures, content and explanations, facts about the concept of diversity. The lowest score is because students don't read enough about general information, this happens because students think that it is already clear so that students skip reading it. Regardless of the difference in these values, the average results obtained on the expected and actual implementation each scored 85.19% with very good criteria. There are different values from the implementation of expectations, namely in first aspect about students reading the front there was an increase from 33.33% to 66.67%. Then, in the aspect of reading the glossary, there was a decrease in practicality expectations, namely 100% to 66.67%. Even though there has been a decline, it is still in the good category. This shows that the developed PSB is practical for use in learning.

The advantages of PSB developed make this teaching material very practical because of the advantages of PSB developed which contain an attractive appearance, making it easier for students and other readers to recognize macrozoobenthos species. The presentation of PSB that have been developed is structured in such a way as to make it easier to understand and learn. According to Magdalena et al. (2020), teaching materials that are interesting and arranged so that they are easier to understand can help students master the concept of the lesson. In addition, students also have greater opportunities to achieve better learning outcomes.

Research on PSB has been conducted by Rahayu (2022) that developing PSB can improve students' critical thinking skills. Other research which was also reported by Hafizha (2022), there was an increase in the actual effectiveness of the effectiveness of expectations with a very effective category, which means that PSB can improve students' critical thinking skills. Other research was also reported by Rini (2021), who also reported that PSB developed could improve students' critical thinking skills.

Improving students' critical thinking skills is inseparable from the learning process (Almulla, 2018; Fadilla et al., 2021; Pradani & Komalasari, 2022). The purpose of PSB developed in improving critical thinking skills with predetermined indicators is to make it easier for students to understand lecture material in Animal Ecology. Based on students' opinions on the use of PSB in studying Animal Ecology, it is stated that students find it easier to learn and understand the material presented with teaching materials in the form of PSB. This illustrates that PSB that have been developed have been effectively implemented in learning.

D. Conclusion

The results of the development of a PSB with the title "Macrozoobenthos Species Diversity in Sungai Puting" using the Tessmer development design were declared practical to use based on the readability test which obtained a result of 91.67% with very practical criteria, based on the results of student responses to the practicality of the hope of getting results of 93.33% and 95.83% on actual practicality with very practical criteria, and based on the implementation of PSB developed on the implementation of expectations and actual implementation get results of 85.19% with very good categories to be used as enrichment material for courses Animal Ecology and can improve students' critical thinking skills.

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