

Bird diversity in the coastal forest area of Tabanio developed to popular scientific book for students' critical thinking ability: The practicality test

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Article Information	Abstract
<p>Keyword: Practicality; Bird diversity; Popular scientific book; Critical thinking ability</p> <p>Kata Kunci: Kepraktisan; Keanekaragaman burung; Buku ilmiah populer; Kemampuan berpikir kritis</p>	<p>The main problem experienced by educators is the lack of innovation in teaching materials that can facilitate students and increase learning motivation in understanding a material so that it is necessary to develop innovative teaching materials, one of which is popular scientific books (BIP). This development research went through several tests such as the practicality of BIP bird species diversity in the Tabanio coastal forest area so that BIP development was obtained which could train students' critical thinking skills. The development stages include self-evaluation, expert test, individual test, small group test, field test. However, this research is limited to practicality tests only. The types of data are descriptive data, using readability instruments, BIP implementation and student responses are used for practicality of content, practicality of expectations and actual. The results showed that the Popular Scientific Book on the Diversity of Bird Species that had been developed was stated to be very practical based on the BIP individual test which was stated to be very good with an average of 83.59%. The Popular Scientific Book on Bird Species Diversity that has been developed is declared practical because the results of student responses with an average score of 92.30% with very good criteria, results of BIP implementation on average 83.33% with criteria strongly agree. Based on this, the developed BIP is very practical to use and makes it easier for students to learn.</p>
<p>History: Received : 17/12/2021 Accepted : 17/02/2022</p>	<p>Abstrak</p> <p>Permasalahan utama yang dialami oleh pendidik yaitu kurangnya inovasi bahan ajar yang dapat memudahkan mahasiswa dan menambah motivasi belajar dalam memahami suatu materi sehingga perlu adanya pengembangan sutau bahan ajar yang inovatif salah satunya yaitu buku ilmiah populer (BIP). Penelitian pengembangan ini didapatkan melalui beberapa uji seperti kepraktisan BIP keanekaragaman jenis burung di kawasan hutan pantai Tabanio sehingga didapatkan pengembangan BIP yang dapat melatih kemampuan berpikir kritis mahasiswa. Tahap-tahap pengembangan meliputi evaluasi diri, uji pakar, uji perorangan, uji kelompok kecil, dan uji lapangan. Akan tetapi, penelitian ini dibatasi hanya uji kepraktisan. Jenis data yaitu data deskriptif, menggunakan instrument instrumen keterbacaan, keterlaksanaan BIP dan respon mahasiswa digunakan untuk kepraktisan isi, kepraktisan harapan dan aktual. Hasil penelitian menunjukkan buku ilmiah populer Keanekaragaman Jenis Burung yang telah dikembangkan dinyatakan sangat praktis berdasarkan uji perorangan BIP ini dinyatakan sangat baik dengan rata-rata 83,59%. Buku Ilmiah Populer Keanekaragaman Jenis Burung yang telah dikembangkan dinyatakan praktis karena hasil respon mahasiswa dengan rata-rata nilai 92,30% dengan kriteria sangat baik, hasil keterlaksanaan BIP rata-rata 83,33% dengan kriteria sangat setuju. Berdasarkan hal tersebut BIP yang dikembangkan sangat praktis digunakan dan memudahkan mahasiswa dalam pembelajaran.</p>

A. Introduction

At this time there are many assumptions that consider that lecturers are not serious in developing their profession. This can be seen from the lecturers who do not have teaching preparation and the teacher's lack of interest in developing his quality (Putri et al., 2020). Cahyani & Azizah (2019) A lecturer is required to be able to develop teaching materials, but currently there is still a lack of availability of innovative teaching materials to support learning. The importance of developing teaching materials is because teaching materials must be in accordance with curriculum demands, student characteristics, and can solve problems in learning (Latifah et al., 2018). Based on a preliminary interview with one of the biology education lecturers who stated that the quality and productivity in meeting the demands of developing teaching materials was still lacking, perhaps due to problems and limitations in educational facilities. This relates to the situation experienced by the teacher on a daily basis. One way to overcome problems or limitations in developing teaching materials by lecturers is to develop teaching materials in the form of popular scientific books that contain a local potential. This is proven through research conducted by Astuti et al. (2021) in his research that developed BIP, so that it was found that practical BIP can improve students' critical thinking skills.

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 in the field of science (Irwandi et al., 2019). Popular science books are more than simple scientific knowledge handed down to the general public. Popular scientific books synthesize, reorganize and present knowledge to various audiences including the disciplines of society from the authors themselves (Schirmacher, 2009). Based on the description above, popular scientific books are books written from the results of scientific studies, but are not bound by the rules of scientific writing so that the presentation is interesting and easily understood by the general public.

The development of popular scientific books that lead to the implementation of knowledge and life experiences is very important, especially in understanding the surrounding environment and in improving critical thinking skills. As reported by (Hervianto, 2020) in his research which shows that there is a significant increase in students' critical thinking skills using popular scientific books that are valid, practical and effective in learning. This is in line with Setiawan et al. (2019) in his research

suggests that the development of practical and validated scientific books can increase the critical thinking ability of readers to the maximum.

Good material can indeed facilitate students in achieving learning objectives. However, packaging attractive teaching materials in the form of developing popular scientific books that are easy for students to understand with a simple language style can be a solution for innovative learning (Fitriansyah et al., 2018). Materials that can be included in a teaching material are materials based on local potential or the environment around students. In fact, there are not many teaching materials that utilize local potential, one of which is the Vertebrate Zoology course.

Vertebrate Zoology is one of the courses in the ULM Biology study program. This course has sub-materials about bird diversity so that it can be used as material to be included in a popular scientific book. Several types of birds can be found in the coastal forest area of Tabanio which is a tourist area so that it has its own charm for visitors and can be used as an effective learning place (Dharmono et al., 2019).

Tabanio Coastal Forest, Tanah Laut Regency is an area used by the community as a place for livestock, plantations and agriculture. Tabanio Beach Forest, Tanah Laut Regency is an area that will be used as a place for tourism development, and is good for additional learning material. Based on the results of preliminary observations in the coastal forest area of Tabanio, Tanah Laut Regency, it was found that there were Karuang Beard (*Alphoixus bres*), Cabak Kota (*Caprimulgus affinis*), Buffalo Starling (*Acridotheres javanicus*) and others. Therefore, it is necessary to conduct research as an effort to utilize the area as a learning resource by utilizing local potential that can improve students' critical thinking skills.

Based on the description above, it can be seen that the development of innovative teaching materials can be developed in an effort to improve students' critical thinking skills. This is because the developed teaching materials contain materials that are easily understood by readers and have images that are similar to the original.

Based on the description above, it is the basis for researchers to develop BIP through a practical test of popular scientific books on the diversity of bird species in the Tabanio Coastal Forest Area on students' critical thinking skills.

B. Material and Method

This type of research is development research. The development research used refers to the

development design of Tessmer (1998). A preliminary study was conducted to find out what obstacles were experienced by educators, the teaching materials used and to analyze the essential materials that could be used in learning Vertebrate Zoology which were then published in a popular scientific book.

In assessing the practicality of BIP, there are three parameters tested, namely readability, implementation, and student response. Readability was tested on a one to one test to three students. The implementation and student responses were tested through a small group consisting of five students and a field test consisting of 20 students. From 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.

The requirements for students to test the practicality of BIP are as follows. First, students have taken Vertebrate Zoology courses. Second, students who are involved in one to one are no longer involved in small groups and field tests. Third, five students who were involved in the small group were also involved in the field test. In other words, five out of 10 students in the field test have been involved in small groups and the other five have never been involved.

The instrument for the readability test is a content practicality questionnaire consisting of 13 indicators. Each indicator is assessed by students with a score of one (which means very illegible), two (unreadable), three (readable), or four (very legible). The average value of each indicator is calculated by the following formula.

$$P = \left(\frac{A}{B}\right) \times 100 \text{ (Formula 1)}$$

Based on this, P is the value of each indicator (in percent), A: the total score obtained by each indicator, and B: the maximum number of scores for each indicator. Furthermore, the values of all these indicators are averaged so that the readability test value is obtained. This test value is adjusted to Table 1, so that the qualitative criteria for the readability test are obtained.

The instrument for testing the implementation of BIP is an implementation questionnaire consisting of nine indicators (statements), both for the implementation of expectations and actual implementation. The score for each indicator is zero (which means it is not implemented by students) or one (implemented).

The next calculation is like Formula 1 and Table 1 (on the readability test).

The instrument for student responses to BIP is also in the form of a questionnaire consisting of 15 indicators (statements), both for expected student responses and actual student responses. The score for each indicator is one (which means strongly disagree), two (disagree), three (undecided), four (agree), and five (strongly agree). The process for determining the next student response is like Formula 1 and the criteria are as in Table 2.

Table 1 Values and criteria for the results of the readability test

Mark (%)	Criteria
80,00 – 100	Very good
60,00 – < 80,00	Well
40,00 – < 60,00	Currently
20,00 – < 40,00	Not good
0 – < 20,00	Very Not Good

(Source: Ramadhan et al., 2020)

Table 2 Student response scores and criteria

Mark (%)	Criteria
80,00 – 100	Strongly agree
60,00 – < 80,00	Agree
40,00 – < 60,00	Disagree
20,00 – < 40,00	Do not agree
0 – < 20,00	Strongly disagree

(Source: Modified by Ramadhan et al., 2020)

C. Results and Discussion

In detail, the practicality of popular scientific books is presented in the data below.

1. Student Readability

The practicality of the contents of popular scientific books on the diversity of bird species in the Tabanio Coastal Forest Area on students' critical thinking skills aims to determine the effectiveness of BIP 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 3.

The popular scientific book on the diversity of bird species in the Tabanio Coastal Forest Area on students' critical thinking skills in Table 3 mentions getting an average score of 83.59% with a very good category on the student readability test. The purpose of the student readability test is to find out to what extent the BIP developed has an important value both in terms of the material presented in the book so that it can help facilitate students in learning. The results of the student legibility test showed that the BIP bird species diversity in the Tabanio Coastal Forest Area which

was developed was suitable for further testing in an effort to improve students' critical thinking skills in studying Vertebrate Zoology learning. The results of the student legibility test phase (one to one). This popular scientific book on the diversity

of bird species in the Tabanio Coastal Forest Area aims to assess the appearance and presentation aspects of BIP. At this stage, suggestions were obtained by 3 students who had taken the Vertebrate Zoology course for BIP improvement.

Table 3 Student Readability Test Results

Indicators/Aspects	Student		
	1	2	3
Aspects of the Display			
1) Text is easy to understand	3	4	4
2) Image is clear or not blurry	4	3	3
3) There is a description on the picture	4	4	3
4) The images presented are interesting	4	4	4
5) The images presented are in accordance with the material	4	3	3
Aspects of Material Presentation			
1) Explaining a concept using illustrations of problems related to everyday life	4	4	4
2) Using everyday life examples	4	4	4
3) Encourage discussion with other friends	4	4	4
4) Relating to biological material	4	4	4
5) The material is coherent	4	4	3
6) There is no sentence that has a double meaning	4	4	4
7) The symbols or symbols in this popular science book are easy to understand	4	4	3
8) The terms in this popular science book are easy to understand	4	3	3
Average (%)	83,59		
Criteria	Strongly agree		

(Source: Data processing results)

In the aspect of the appearance of popular scientific books, it becomes the basis for obtaining student readability test results on very good criteria. This is due to several things, including interesting pictures, using everyday life examples, encouraging discussion with other friends, relating to biological material, and there are no sentences that have multiple meanings. Surahman & Surjono (2018) states that readers will find it easy to learn a book with interesting pictures, because the display of pictures can facilitate understanding and strengthen students' memories of a material. There are low scores on some indicators, this is because there are some terms in this popular science book that are not understood. Dharmono et al. (2019) explains that in a teaching material it is necessary to use language that is in accordance with good and correct Indonesian writing rules so that readers can easily understand what is being conveyed through a teaching material.

In the aspect of presenting the material for popular scientific books, it is one of the factors in achieving very good criteria in the student readability test. This is based on the systematic preparation of material and conformity to the conditions of students or readers who will use it in real learning in the field. This statement is in line with the opinion of Latifah et al. (2018) which

suggests that a popular scientific book must have good and systematic material so that it is easily understood by students and is proven by research results that get very good criteria.

The results of the student legibility test are the stage to obtain empirical evidence about the feasibility of the initial product on a limited basis (Putri et al., 2020). Yunizarrakha (2018) 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 (Arsanti, 2018) explaining that individual tests are important to do so that the teaching materials developed are in accordance with the conditions of students in the field. In addition, teaching materials according to student needs makes it easier for students to learn independently, thereby increasing interaction as a process in the learning experience.

In the student legibility test, several comments and suggestions were obtained from students following the vertebrate zoology course, one of which was to increase the number of images in the BIP. This proves that students expect the BIP that they will use in learning vertebrate zoology can help and make it easier for them to describe the diversity of bird species in an area. Hikmah (2018) explains that images or photos in a learning

resource serve to clarify information, help memory and understanding, provide variety so that it is not boring, and beautify to attract the interest of the reader. So that in the developed BIP, researchers have arranged it systematically and facilitated students in the learning process.

2. Implementation of Popular Scientific Books

The implementation of BIP was obtained from a small test step (small group) conducted on three observers of undergraduate biology education ULM students who had taken the Vertebrate Zoology course. Student response data can be seen from Table 4.

Based on the data obtained in Table 4 shows that the results of observations on the implementation of expectations and actual BIP obtained an overall average of 83.33%. These results are classified as very good but there are scores below 80.00, this is presumably because there are still many students who do not read the preliminary information. The percentage of these results indicates that the test has very good criteria.

The BIP that has been developed is also practical to use as an enrichment material for vertebrate zoology courses in exploring students' critical thinking skills.

The expectation test got a value of 82.22% while the actual average had a higher value, which was 84.44%. The results of the assessment of the implementation test were not much different even though they obtained a slightly increased value in the actual test. This can be seen from the results of student assessments through implementation questionnaires, where in the expected test the lowest value is 40.00% while in the actual test 70.00% this difference in value occurs because some students read carefully the preliminary information presented before using the BIP because consider that preliminary information is very necessary. Meanwhile, some students skip the preliminary information because it is considered less important so that students pay less attention to the contents of the introduction presented in the BIP. This is what causes some values at the implementation point to differ.

Table 4 Implementation of BIP

No	Statement	Implementation	
		Hope	Actual
1	Students read the front (table of contents, instructions and explanation of contents)	100	80,00
2	Students read the introductory information	40,00	70,00
3	Students read the description of BIP.	60,00	80,00
4	Students look at pictures and descriptions in popular scientific books	100,00	90,00
5	Students look at the writing on the colored boxes	80,00	80,00
6	Students read facts about the concept of diversity	80,00	80,00
7	Students reading the glossary	80,00	80,00
8	Students use popular scientific books when making observations	100,00	100,00
9	Students use popular scientific books when conducting data analysis	100,00	100,00
Category (%)		82,22	84,44
Average (%)		83,33	
Criteria		Strongly agree	

(Source: Data processing results)

The implementation of the BIP is one of the date to measure the practicality of the developed BIP. Based on the data obtained, the score was very good because students were interested in reading preliminary information, facts about the concept of diversity and a glossary in the developed BIP. There are indicators that get low scores, this is because students do not read descriptions of general information, this is because students think that it is clear so that part of it is skipped by students. Fahmi et al. (2019) explained that learning outcomes will be achieved optimally when the teaching and learning process goes well. When learning is carried out well, it will lead to learning motivation.

The data obtained from the average on the implementation of expectations and actual each got a score with very good criteria. This shows that the BIP developed can be said to be practical so that it is feasible to use in the learning process, especially vertebrate zoology which is later expected to be able to explore students' critical thinking skills. In addition, the BIP developed is expected to be used as a reference in choosing good teaching materials so that they can be used in practical learning to achieve a predetermined learning goal.

The advantage of the BIP that was developed to be practically used based on its implementation is that on certain pages in the BIP that was developed, statements were found to explore

students' critical thinking skills. This is in line with Desyandri et al. (2019) that the teaching materials developed must contain statements to explore students' critical thinking skills, because these statements will make students sequentially or systematically study part by part of the material presented in the BIP.

3. Student Responses to Popular Science Books

Student responses were obtained through a small test step which was carried out on 5 undergraduate students of Biology Education ULM following the vertebrate zoology course to obtain data on practical expectations. As for the actual practicality data obtained from field tests

consisting of 10 students. Expected and actual practicality data are presented in Table 5.

Based on the data obtained in Table 5 regarding the results of student responses to the practicality of expectations and actual, obtained an average of 92.30%, thus the percentage is included in the criteria for strongly agree. The results of the data are classified as high, it is suspected because of several factors, one of which is that students can learn according to their independent learning needs through these popular scientific books. So that it can be seen that students strongly agree to use this popular scientific book as teaching material. These results explain this BIP is practical for use in vertebrate zoology studies.

Table 5 Student Responses

No	Statement	Implementation	
		Hope	Actual
1	This BIP motivates me to study.	92,00	92,00
2	I can learn actively and independently with this BIP.	96,00	90,00
3	The material presented can be understood easily.	88,00	96,00
4	Beep is very interesting and not boring when used.	96,00	90,00
5	If the use of BIP is carried out like this, I can remember the concepts from the lesson material easily and for longer	92,00	94,00
6	The use of BIP can help solve problems in everyday life related to learning topics	88,00	90,00
7	The use of this BIP has broadened my horizons	84,00	96,00
8	I can understand the material with the help of good quality pictures	92,00	92,00
9	I can study according to my independent study needs	100,00	92,00
10	Learning by using BIP can help me develop critical thinking skills.	88,00	98,00
Percentage (%)		93,00	
Average (%)		92,30	
Criteria		Strongly Agree	

(Source: Data Processing Results)

The expected practicality test result is 91.60% where this result is not much different from the actual practicality test result which gets a value of 93.00%. The increase in value occurs due to several things, one of which is seen from the value of students who assess each aspect differently where some students are very easy to understand the material presented and some are still not understanding the material presented. Learning using BIP according to some students is very helpful in learning this happens because students in the actual test have different views on the BIP developed, where according to them the delivery of material in BIP is clear and practical enough to be used in learning. However, both students on the actual and expected tests strongly agree with the use of BIP which was developed as a teaching material.

Student responses to produce practicality data obtained very good scores because the developed BIP can make students learn actively

and independently. This is influenced because the material presented in the BIP can be understood easily by students. Mahanal et al. (2018) active student involvement will contribute to psychological readiness and respect for students which will later affect the ability to receive material, remember and be able to solve problems related to the subject students are studying. There are low scores on several indicators, this is because the developed BIP does not motivate students to learn, it is influenced by the wishes of the students themselves and also because the students' physical condition is not supportive because data collection is done when the sun is hot. Fajrin et al. (2020) said that health factors will affect students' interest in learning.

The results of the average student responses obtained on the practicality of expectations and actual practicality get very good criteria. These results indicate that students respond positively when using BIP. This shows that the BIP developed

according to students is very practical to use, which is expected to be able to explore students' critical thinking skills. 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 Nugroho (2018) that teaching materials can be interesting, when using pictures or illustrations that clarify the content of the material that is easily understood by students.

The advantage of the developed BIP is that the presentation of the BIP is written in a simple way using popular, simple, concise and concise language style, so that it attracts reading interest and is easily understood by a wide audience. This is to make BIP easier to learn, not boring, 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 Dharmono et al. (2019) that good learning is carried out interactively, inspiring, fun, challenging and motivating students to participate actively.

The practicality of BIP development products is very important 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 (Agnafia, 2019).

D. Conclusion

Development research with the Tessmer design has produced a teaching material in the form of a popular scientific book on the diversity of bird species in the Tabanio Coastal Forest Area with the following criteria.

1. Popular scientific books that have been developed are stated to be very good based on the readability test which got results of 83.59% with very good criteria in an effort to improve students' critical thinking skills.
2. The popular scientific book on the diversity of bird species in the Tabanio Coastal Forest Area that was developed which received an average of 83.33% with a very good category to be used as an enrichment material for the Vertebrate Zoology course in an effort to improve students' critical thinking skills.
3. The results of the student response test are used to determine the practicality of expectations and actuals with an average value of 92.30% in the category of strongly agree so that the BIP developed is very practical, making it easier for students to learn.

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