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The effectiveness of the popular scientific book Dayak Ngaju ethnopharmacology in Pendahara Village to train students' critical thinking abilities

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Abstract

One effort that can be made to build students' critical thinking skills is to develop popular scientific books (PSB) that are systematic and easy for students to understand. This research aims to describe the effectiveness of the PSB Ethnopharmacology in Pendahara Village, Ngaju Dayak Community Area, for Training Students' Critical Thinking Skills. The development stage includes self-evaluation, expert testing, individual testing, small group testing, and field testing. The research subjects were five students for the small group test and 20 for the field test. The effectiveness of PSB is analyzed descriptively. The research results show that the developed PSB was declared effective. Based on this data, the average N-Gain value is 0.5, resulting in a medium N-Gain category. Base on this research results, it can be concluded that the PSB on ethnopharmacology in Pendahara Village, Ngaju Dayak Community Area, is effectively used in training students' critical thinking skills.

Abstrak

Salah satu usaha yang dapat dilakukan dalam membangun keterampilan berpikir kritis mahasiswa adalah mengembangkan buku ilmiah popular (BIP) yang sistematis dan mudah dipahami mahasiswa. Penelitian ini bertujuan mendeskripsikan keefektifan BIP Etnofarmakologi Desa Pendahara Kawasan Masyarakat Dayak Ngaju untuk Melatihkan Keterampilan Berpikir Kritis Mahasiswa. Tahap pengembangan meliputi evaluasi diri, uji pakar, uji perorangan, uji kelompok kecil, uji lapangan. Subjek penelitian adalah 5 mahasiswan untuk uji kelompok kecil dan 20 mahasiswa untuk uji lapangan. Keefektifan BIP dianalisis secara deskriptif. Hasil penelitian menunjukan BIP yang dikembangkan dinyatakan efektif. Berdasarkan data tersebut maka nilai rerata N-Gain 0,5 sehingga diperoleh kategori N-Gain sedang. Berdasarkan hasil penelitian ini dapat disimpulkan bahwa BIP etnofarmakologi Desa Pendahara Kawasan Masyarakat Dayak Ngaju efektif digunakan dalam melatih keterampilan berpikir kritis mahasiswa.

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A. Introduction

Rapid developments in education encourage students to adapt to learning (Fitriansyah et al., 2018). Learning is a systematic process to provide learning resources so that the teaching and learning process occurs in the classroom. The effort to organize the environment is carried out by providing learning resources (Adi et al., 2020). According to Samsinar (2020), learning resources are all types of media, objects, data, facts, ideas, people, etc., that make learning more accessible for students. Based on these developments, educators need to determine innovative learning resources to support the learning process in the classroom, and students, through learning resources, can learn independently and creatively in discussing problems through these sources.

Developing learning resources is very important (Achadah, 2019). Therefore, the learning resources developed can be designed innovatively to increase and encourage students' willingness to learn because the reading sources are interesting (Fajeriadi, 2018). One source of learning is the development of PSB. Popular scientific books explain knowledge based on scientific research results using short, simple, and straightforward language to make the material more accessible to students and the public (Dharmono, 2022).

The development of PSB leads to implementing knowledge based on life experience, which refers to the surrounding environment based on local potential regarding plants (Fajrin et al., 2022). Therefore, learning resources can be developed by utilizing local potential. The learning process can gain experience and knowledge to train one's intellectual abilities using local potential. Based on the development of this book, it will be easier for students to understand learning material based on the possibility of local plants and references in biology learning at universities regarding ethnobotany material (Putri et al., 2020).

Ethnobotany development is an effort to utilize local potential in an area, especially plants. Central Kalimantan has quite an enormous potential for local plants. Pendahara sub-district, Katingan district, became a place to research because the villagers used natural resources such as plants as temporary relief. It was a tradition passed down from their parents to use plants as medicine. Using these plants is a reference for studying Ethnobotany in the Village. Researchers found facts based on observations in the sub-district that residents had no scientific knowledge regarding the use of plants as medicine.

Ethnobotany studies botany (plants) related to people culture (Ristanto et al., 2022). Furthermore, according to Hidayati et al. (2019), ethnobotany is a science that studies the direct relationship between humans and plants in traditional use. According to Dharmono (2018), ethnobotanical studies are divided into six studies: botanical studies, ethnopharmacological studies, ethno-ecological studies, ethnoanthropological studies, ethno-economic studies and ethnolinguistic studies. The focus of the material refers to ethnopharmacology studies.

Ethnopharmacology is a study of ethnobotany, namely the use of plants that function as medicine or concoctions produced by local residents for treatment. Through this study material, students can learn about the use of plants by society, especially using plants as medicines, which are processed based on guidance from their parents from generation to generation (traditional). Relevant research was conducted by Fajrin et al. (2021) with N-Gain results of 5.1 showing that PSB can make it easier for students to understand the material presented by the lecturer. This is the basis for creating a PSB on ethnobotany based on local potential, which is expected to improve students' critical thinking skills and help the potential of local plants to be widely known to the public. Apart from that, as additional information about locally based medicinal plants in Central Kalimantan Province, especially in Pendahara Village.

Critical thinking is an intellectual process that deliberately assesses the quality of one's thinking using reflective, independent, transparent, and rational thinking (Irwandi & Fajeriadi, 2019). This process is a form of critical thinking that needs to be developed in solving problems, formulating conclusions, gathering various possibilities, and making decisions (Apiati & Hermanto, 2020). Indicators of critical thinking include interference, analysis, evaluation, inference, explanation, and self-regulation.

Meanwhile, based on the results of an initial survey by researchers regarding the learning carried out in the Biology Education Study Program at Lambung Mangkurat University in the Ethnobiology course, they do not yet have a PSB on Ethnopharmacology of the Dayak Ngaju Community to train students' critical thinking skills. Popular scientific books are old published books and do not cover material, especially ethnopharmacology. Previous PSB were also not oriented towards learning skills that were critical thinking and had learning skills in the 21st-century era. Because of this, PSB were not yet in line with learning demands in the 21st-century era, so they were less effective in student learning activities.

The description above encourages researchers to research "The effectiveness of PSB on ethnopharmacology in the Pendahara village of the Dayak Ngaju community area to train students' critical thinking." Hopefully, this research will help and motivate students in their learning.

B. Material and Method

This type of research is development research, which refers to Tessmer's (1998) development design. A preliminary study was carried out to analyze essential materials that can be used in ethnobotany courses.

In assessing the effectiveness of a PSB, two parameters are tested, namely the results of students working on the College Student Worksheets (CSW) and the evaluation questions. Effectiveness is tested in a small group of seven students and a field test of 20 students.

Effectiveness data is divided into two, namely expected and actual effectiveness. Expected effectiveness data was obtained from small group results, and actual effectiveness was obtained from field test results. Students' critical thinking abilities include six indicators: 1) Interpretation, 2) Analysis, 3) Evaluation, 4) Inference, 5) Explanation, and 6) Self-regulation, then calculated using the normalized n-gain value formula (N-Gain or g) by Facione (1990) as Formula 1.

$$g = \frac{S\ Posttest - S\ Pretest}{S\ Maximum - S\ Pretest} \text{.....Formula 1}$$

Based on this, g is the gain value (in percent), and S is the yield value. This test value is adjusted to Table 1 to obtain the effectiveness criteria.

Table 1 Effectiveness Criteria

N-gain	Category
g ≥ 0,7	High
0,7 > g > 0,3	Medium
g ≤ 0,3	Low

(Source: Adapted from Fajrin et al., 2021)

C. Results and Discussion

Based on the development results, a PSB was prepared which students can use in studying ethnobotany. One of the advantages of the PSB being developed is its attractive cover appearance, which triggers students' curiosity to use it (see Figure 1).

The effectiveness of PSB is obtained from student responses and the implementation of PSB in small group tests. Actual effectiveness is based on the results of students working on CSW and evaluation questions in field tests. Data on students' critical thinking skills was analyzed by filling in the CSW and answering evaluation questions. In the small group and field tests, the results of students' expected critical thinking skills and actual critical thinking skills were obtained.

Figure 1
Cover of the Popular Scientific Book Ethnopharmacology (in Indonesian)

Based on the results of Table 2, the expected effectiveness of PSB gets the effective category with an average value of 74%. This shows that the PSB is expected to be included in the effective category, which means that this PSB can help students learn ethnobotany, which is shown by the results of working on the LKPD and the results of working on evaluation questions which received an average score of 74%, where it can be assumed that PSB have a role in exploring students' critical thinking skills in the effective category.

Based on the results of Table 3, the actual effectiveness of PSB was categorized as effective, namely at meeting one, was 78%, and at meeting four, with an average value of 88%. This shows that PSB can actually explore students' critical

thinking skills in an effective category. Improving students' critical thinking skills includes six indicators of critical thinking skills in small group tests and field tests calculated using the normalized Gain value formula (N-Gain or g). The results are shown in Table 4.

Table 2 Expectation Effectiveness Test Results of Popular Scientific Books

No	Indicator	Meeting 1 (CSW scores and evaluation questions)	
		Expectation	
		Amount	Average
1	Interpretation	145	73
2	Analysis	148	74
3	Evaluation	150	75
4	Inference	145	73
5	Explanation	150	75
6	Self-regulation	152	76
Amount		**890**	
Average (%)		**74**	

(Source: Data Processing Results)

Table 3 Actual Effectiveness Test Results of Popular Scientific Books

No	Indicator	Meeting 1		Meeting 4	
		(CSW scores and evaluation questions)			
		Amount	Average	Amount	Average
1	Interpretation	153	77	180	90
2	Analysis	147	74	173	86
3	Evaluation	153	77	175	88
4	Inference	152	76	170	85
5	Explanation	148	74	179	89
6	Self-regulation	155	78	180	90
Amount		**907**		**1057**	
Average (%)		**76**		**88**	

(Source: Data Processing Results)

Table 4 N-Gain Test Results for Students' Critical Thinking Skills

No	Indicator	N-gain	
		Small Group	Field Test
1	Interpretation	0,5	0,5
2	Analysis	0,4	0,5
3	Evaluation	0,5	0,5
4	Inference	0,4	0,4
5	Explanation	0,5	0,6
6	Self-regulation	0,4	0,6
Average		**0,4**	**0,5**
Category		**Medium**	**Medium**

(Source: Data Processing Results)

The expected effectiveness results obtained were 74% in the Good category. The effectiveness results came from working on the CSW and evaluation questions by five students in small groups and carried out in 1 meeting. The following data on actual effectiveness results comes from before and after using PSB and continuing simultaneously working on CSW and evaluation questions by 20 students using field tests obtained from the 1st and 4th meetings. The actual effectiveness results obtained were 88% in the category Very good. This data shows that the PSB, developed to be used as enrichment material for ethnobiology courses to train students' critical thinking skills, has an initial category of effective to very effective.

The use of PSB, which is developed based on expected and actual effectiveness results, can train students' critical thinking skills as seen from their improvement. This can be caused by the

advantages contained in the PSB. Fajrin et al. (2022) explained that learning by practicing critical thinking skills will make students accustomed to developing or discovering original (original), aesthetic, constructive ideas directly related to conceptual views and emphasize aspects of intuitive and rational thinking.

1. Interpretation Indicators

Based on the N-gain data regarding students' critical thinking skills in Table 4, the N-gain value obtained in the small group was 0.5, and the field test was 0.5 in the medium category. This skill is visible when students do a practicum; then, students describe the information in the CSW and process concepts/statements appropriately according to the discourse. Students can also understand the initial picture of information from the narration on the sheet. This makes students formulate problems correctly.

This PSB also has the advantage of having critical thinking skills questions in the form of interpretations adapted to the material in the PSB. This aligns with Putra et al. (2020) that PSB can encourage students to identify problems correctly.

2. Analysis Indicators

Based on the N-gain data regarding students' critical thinking skills in Table 4, an increase can be seen in the indicators. The N-gain value obtained in the small group was 0.4, and the field test was 0.5 in the medium category. This skill is visible when students do a practicum, then students identify problems and analyze the arguments in the CSW according to the discourse. This allows students to analyze questions according to their context. This statement is relevant to the report by Ramadhan et al. (2020) that students who can carry out observation activities correctly and analyze problems precisely have good analytical skills.

This PSB also has the advantage of having critical thinking skills questions in the form of analysis adapted to the material in the PSB. This encourages students to be active in analyzing problems in scientific books.

3. Evaluation Indicators

Based on the N-gain data regarding students' critical thinking skills in Table 4, an increase can be seen in the indicators. The N-gain value obtained in the small group was 0.5, and the field test was 0.5 in the medium category. This skill is visible when students do a practicum and then students determine the arguments in the CSW according to the discourse. This allows students to determine arguments that originate from assumptions.

This PSB also has the advantage of having critical thinking skills questions in the form of evaluations adapted to the material in the PSB. This encourages students to actively recognize relevant factors from information (Zaini et al., 2020).

4. Inference Indicator

Based on the N-gain data regarding students' critical thinking skills in Table 4, an increase can be seen in the indicators. The N-gain value obtained in the small group was 0.4, and the field test was 0.4 in the medium category. This skill is visible when students do practicum; then, students provide conclusions based on their point of view on the CSW. This allows students to conclude from facts or problems. This statement is relevant, according to Fajrin et al. (2022), when students can make reasonable conclusions using PSB, they have good inference skills.

This PSB also has the advantage of having critical thinking skills questions in the form of inferences adapted to the material in the PSB. This encourages students to recognize and look for sources that support existing information.

5. Explanation Indicator

Based on the N-gain data regarding students' critical thinking skills in Table 4, an increase can be seen in the indicators. The N-gain value obtained in the small group was 0.5, and the field test was 0.6 in the medium category. This skill is visible when students do practicum and produce statements from relevant information sources in CSW. This allows students to provide strong opinions from the information presented (Yennita et al., 2018).

This PSB also has the advantage of having critical thinking skills questions in the form of explanations adapted to the material in the PSB. This encourages students to provide reasons for the information presented (Husna et al., 2020).

6. Self-Regulation Indicators

Based on the N-gain data regarding students' critical thinking skills in Table 4, an increase can be seen in the indicators. The N-gain value obtained in the small group was 0.4, and the field test was 0.6 in the medium category. This skill is visible when students do practicum and produce statements from relevant information sources in CSW. This allows students to self-assess after implementing the skills.

The development of this scientific book has several advantages, namely that it has content or material that is arranged neatly and clearly and is developed to contain colorful pictures to resemble the original form. This makes it easier for students

to identify problems encountered during learning. However, there are several weaknesses in the PSB being developed, such as the development of the material, which is still not extensive enough so that the learning material developed can only be used in specific lessons. The advantages presented by the PSB can positively influence the development of student's critical thinking skills so that the PSB is effectively used in ethnobotany courses.

The results of the development of a PSB show that there is effectiveness in its use so that it can make it easier for students to describe the function and role of local plants in Pendahara Village, the Ngaju Dayak community area, especially in the field of ethnopharmacology so that it can be implemented in everyday life and can support ethnobotany lectures. This is relevant according to Fajrin et al. (2021), who argue that effective PSB can facilitate and train students' critical thinking skills. Nisyapuri et al. (2018) also stated that ethnobotanical studies on local community plants can provide knowledge that can be applied in everyday life.

D. Conclusion

Research on the development of PSB can be concluded that the PSB that were developed obtained effective criteria based on the results of the small group test and field test, then the N-Gain results showed an average value of 0.5 with medium N-Gain criteria. Therefore, PSB are declared effective in training students' critical thinking skills in ethnobotany courses. It can make it easier for students to describe the function and role of local plants in Pendahara Village, Ngaju Dayak community area, especially in ethnopharmacology, so they can be implemented in everyday life.

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