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Analysis of Students' Responses Towards the Local Potential-Based Encyclopedia of Special Biota on Biodiversity Material

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Abstrak: Pembelajaran materi keanekaragaman hayati seringkali terkendala oleh bahan ajar yang bersifat universal, sehingga siswa kesulitan memvisualisasikan potensi hayati di lingkungan sekitarnya. Penelitian ini bertujuan untuk menguji kepraktisan produk pengembangan berupa Ensiklopedia Biota Khas Berbasis Potensi Lokal sebagai bahan ajar suplemen siswa SMA. Pendekatan yang digunakan adalah deskriptif kuantitatif. Subjek penelitian adalah 25 siswa kelas XI SMA Negeri 1 Darul Imarah, Kabupaten Aceh Besar, yang dipilih menggunakan teknik *purposive sampling*. Pengumpulan data dilakukan menggunakan angket respon siswa yang mencakup tiga dimensi utama: isi, bahasa, dan penyajian. Analisis data dilakukan secara deskriptif kuantitatif. Hasil penelitian menunjukkan bahwa ensiklopedia yang dikembangkan memperoleh respon sangat positif. Rerata skor penilaian pada dimensi isi sebesar 39,60; dimensi bahasa 22,52; dan dimensi penyajian 22,08. Secara keseluruhan, ketiga aspek tersebut berada pada kategori "Sangat Baik". Temuan ini mengindikasikan bahwa ensiklopedia berbasis potensi lokal dinilai praktis, komunikatif, dan menarik secara visual, sehingga layak diimplementasikan untuk mendukung pembelajaran biologi yang kontekstual dan bermakna.
Kata kunci: Analisis; Ensiklopedia; Keanekaragaman Hayati; Potensi Lokal; Respon Siswa.

Abstract: Learning biodiversity is often hampered by the use of universal teaching materials, making it difficult for students to visualize the biological potential of their surroundings. This study aims to examine the practicality of a developed product, namely an Encyclopedia of Typical Biota Based on Local Potential, as a supplementary teaching material for high school students. The research employed a descriptive quantitative approach. The subjects consisted of 25 eleventh-grade students from SMA Negeri 1 Darul Imarah, Aceh Besar Regency, selected using a purposive sampling technique. Data were collected using a student response questionnaire covering three main dimensions: content, language, and presentation. Data analysis was conducted using descriptive quantitative techniques. The results

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showed that the developed encyclopedia received very positive responses from students. The average assessment score for the content dimension was 39.60, for the language dimension was 22.52, and for the presentation dimension was 22.08. Overall, all three aspects were categorized as "Very Good." These findings indicate that the encyclopedia based on local potential is practical, communicative, and visually appealing, making it feasible to implement to support contextual and meaningful biology learning.
Keywords: Analysis; Encyclopedia; Biodiversity; Local Potential; Student Responses.

1. Introduction

Biology learning is essentially a process of studying living organisms and their interactions with the environment. The current curriculum emphasizes a contextual approach, in which students are expected to connect subject matter with real-world situations around them, thereby significantly improving learning outcomes across cognitive, affective, and psychomotor domains [1], [2], [3]. One biology topic that is rich in environmental context is biodiversity. This topic requires students to recognize various types of flora and fauna, understand taxonomic levels, and identify the roles of species within ecosystems.

Numerous researchers have developed innovative learning resources related to biodiversity to support students' scientific literacy and critical thinking [4], [5], [6], [7]. However, conditions in the field indicate that a gap still exists between curriculum demands and the availability of appropriate teaching materials. Textbooks commonly used in schools are generally national and universal in scope; therefore, the species examples presented often originate from other regions or even other countries that are unfamiliar to students. As a result, students experience difficulty visualizing the material concretely and often perceive it as disconnected from their daily lives. In contrast, the coastal ecosystem of Aceh Besar possesses unique biodiversity, such as diverse macrobenthos in tidal zones and specific mangrove vegetation that is not found in other regions.

The neglect of local potential contributes to students' low appreciation of the biological richness of their own region [8], [9], [10]. To address this issue, the

development of supplementary teaching materials that can visualize local potential in an engaging manner is necessary. One effective medium is an encyclopedia. Unlike conventional textbooks, encyclopedias based on local potential offer more visual presentations with original colors and images [11], [12], [13], [14], contain specific information about regional biota, and are presented using more communicative language. Integrating local potential into encyclopedic materials is expected to make learning more meaningful because the objects studied are closely related to students' environments, thereby enhancing learning experiences and improving conceptual understanding, critical thinking, and cultural awareness [15], [16], [17], [18].

Although the development of learning media based on local potential has been widely conducted, the success of such media is determined not only by content validity but also by the level of user acceptance. Effective learning media must meet criteria related to usability, readability, and attractiveness. Student responses, as those of the primary users, serve as a crucial indicator in determining whether the developed encyclopedia is practical, easy to understand, and motivating for learning. While previous studies on local potential-based media often focus generally on terrestrial ecosystems, this encyclopedia offers a distinct novelty by documenting and visually integrating the specific coastal and marine biota of Aceh Besar, such as unique macrobenthos and tidal flora, which have never been comprehensively compiled into a popular educational format for high school students.

Therefore, this study focuses on evaluating student responses to the developed encyclopedia across three specific dimensions: content, language, and presentation. The findings of this study are expected to provide empirical evidence regarding the feasibility of the encyclopedia for broader implementation as a supplementary learning resource for biodiversity education.

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2. Research Method

Research Type

This research is part of a research and development (R&D) program using the Four-D model [19], which aims to produce an encyclopedia on biodiversity. The stages reported in this article focus on product trials conducted to measure the practicality of the developed encyclopedia. A descriptive quantitative approach was employed, in which numerical data obtained from questionnaires were analyzed to describe user responses to the product.

Research Subjects

The practicality test was conducted at SMA Negeri 1 Darul Imarah, Aceh Besar Regency, during the even semester of the 2024/2025 academic year. Twenty-five eleventh-grade students were selected as respondents for the limited-scale trial using purposive sampling. The inclusion criteria for selecting these participants were students who had completed the biodiversity module, demonstrated active engagement in biology classes, and possessed diverse academic performance levels to ensure a representative feedback loop.

Research Instrument

The data collection instrument was a closed-ended student response questionnaire. Prior to its deployment, the questionnaire underwent expert validation by two evaluation and material specialists to ensure its construct and content validity, and a preliminary readability test was conducted to guarantee clarity. The questionnaire was structured using a Likert scale with a score range of 1 to 5. The instrument grid covered three main dimensions, as presented below.

Table 1. Questionnaire Instrument Outline

No	Aspect	Indicator	Number of items
1	Content Dimension	• Material Quality & Accuracy • Presentation Systematics • Specific Conceptual Understanding • Contextual & Educational Value	9 items
2	Language Dimension	• Readability & Comprehension • Linguistic Rules • Sentence Effectiveness • Visual Legibility	5 items

No	Aspect	Indicator	Number of items
3	Presentation Dimension	• Systematics & Navigation • Ease of Use • Readability • Visualization (Images) • Accuracy of Information Presentation	5 items

Data Analysis Techniques

The data from the student questionnaire responses were analyzed using interactive descriptive analysis techniques [20]. The average scores were then converted into qualitative data to determine the practicality category of the product. The categorization was based on a 5-point scale conversion reference [21]. A product is considered practical if the average student response falls at least within the "Good" category.

3. Results and Discussion

a. *Student Responses to the Encyclopedia*

The practicality test aimed to measure the level of usability of the encyclopedia among students. Data were collected from 25 students using a closed-ended questionnaire covering three main dimensions: content, language, and presentation. Student response categories were determined based on scoring intervals adapted from Mardapi [21], as presented in Table 2.

Table 2. Score Interpretation for the Student Response Questionnaire

Content Interval Range		
Score Range	**Grade**	**Criteria**
X > 37,8	A	Very Good
30,6 < X ≤ 37,8	B	Good
23,4 < X ≤ 30,6	C	Adequate
16,2 < X ≤ 23,4	D	Poor
X ≤ 16,2	E	Very Poor
Language & Presentation Interval Range		
Score Range	**Grade**	**Criteria**
X > 21	A	Very Good
17 < X ≤ 21	B	Good
13 < X ≤ 17	C	Adequate
9 < X ≤ 13	D	Poor
X ≤ 9	E	Very Poor

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The student assessment data for the encyclopedia is summarized in the table below:

Table 3. Student Responses to the Encyclopedia

No	Aspect	Maximum Score	Total Score	Average	Criteria
1	Content	45	990	39,6	Very Good
2	Language	25	563	22,52	Very Good
3	Presentation	25	552	22,08	Very Good

Based on the data in Table 3, the encyclopedia used in the learning process generally received a "Very Good" rating across all aspects. This indicates that the encyclopedia has a high level of practicality for use in the learning process, particularly in biology learning, especially in the topic of biodiversity.

Similar findings have been reported in various research contexts, with encyclopedias consistently receiving practicality ratings of over 90% from educators and students [22], [23], [24]. For example, encyclopedia validation scores were reported to reach 97–100% across all expert assessments [14], while practicality scores from students were reported to be 96.2% [24]. These studies demonstrate the widespread application of encyclopedias as effective and easy-to-use learning materials.

b. Content Dimension Analysis

The content dimension achieved the highest average score of 39.60, meeting the "Very Good" criterion. This achievement indicates that the depth of material and conceptual coherence presented in the encyclopedia are highly relevant to students' learning needs. The logical and systematic presentation of the material is considered to facilitate students in constructing conceptual understanding. This finding aligns with the view that a systematic presentation of material forms the foundation of optimal learning [25], [26].

Furthermore, Latifa et al., [27] emphasized that the relationship between conceptual understanding and material representation is highly dependent on structured instructional strategies. A maximum score in the content dimension also reflects the successful integration of theoretical concepts with relevant

contextual facts. The density of information presented, without sacrificing clarity of meaning, is an added value, considering that the encyclopedia serves as a bridge for students to access complex information. This ensures that the material is not only cognitively understandable but also stimulates students' curiosity about real phenomena in their environment, thereby making learning more meaningful.

c. Language Dimension Analysis

The language aspect achieved an average score of 22.52, categorized as "Very Good," indicating that the diction and sentence structures used are communicative and appropriate to the students' cognitive levels. The use of straightforward language minimizes ambiguity, allowing students to absorb information without experiencing excessive cognitive load caused by linguistic complexity. This finding aligns with the view that clear and simple language effectively reduces cognitive load, enabling students to process information more efficiently [28], [29], [30], [31].

Moreover, the "Very Good" rating reflects adherence to standard yet flexible linguistic conventions. Consistency in spelling, punctuation, and effective sentence structure serves a dual function: conveying accurate information and modeling good literacy practices for students. This grammatical accuracy ensures that the information is interpreted consistently, minimizing ambiguity that often arises from poorly constructed sentences. Therefore, the language aspect of this encyclopedia meets the standards required for a valid and reliable learning resource.

d. Presentation Dimension Analysis

The presentation aspect received an average score of 22.08, which falls into the "Very Good" category. The integration of text and illustrations was considered proportional and balanced. The inclusion of visual elements in biodiversity learning materials is crucial for concretizing diverse biological objects. This positive response supports Mayer's multimedia principles [32], [33], which emphasize that the combination of relevant text and images can enhance students' attention and motivation to learn.

Engaging visualizations also facilitate information retention in long-term memory through dual processing of verbal and visual information, thereby enhancing cognitive processing and comprehension [34], [35], [36]. The synergy between aesthetic design and clear structure makes the material more memorable. This indicates that the presentation aspect plays a strategic role in enhancing students' knowledge retention, rather than functioning merely as a visual complement.

However, the encyclopedia also received criticisms and suggestions for improvement from students. These criticisms and suggestions are presented in the following section.

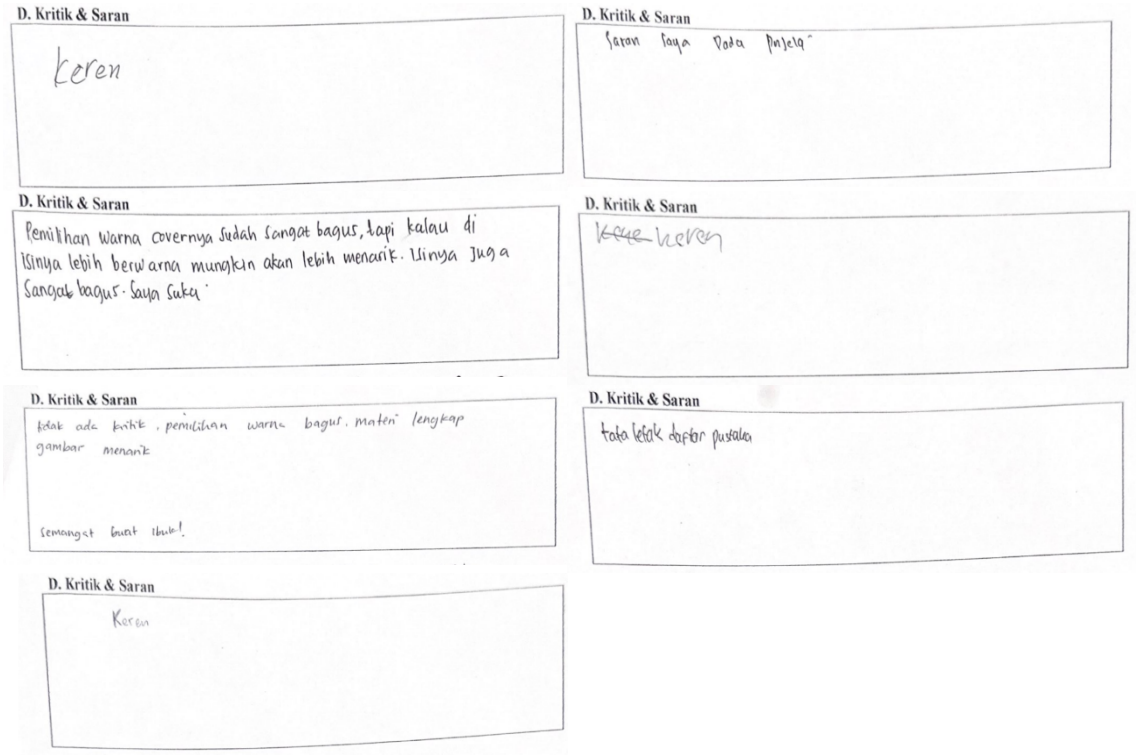


Figure 1. Some Student Criticisms & Feedback on the Encyclopedia

According to Figure 1, the qualitative responses provided by students through the open-ended questionnaire indicate a very positive reception of the developed encyclopedia. Several students expressed their appreciation using terms such as "cool" and "very good," and praised the comprehensiveness of the material presented. The visual aspects and physical practicality of the encyclopedia also received particular attention, with students describing the

medium as concise and practical to use, as well as highlighting its attractive cover design. The enthusiasm reflected in these responses indicates that, from an affective perspective, the developed medium is capable of stimulating students' interest in reading and increasing their motivation to learn.

On the other hand, several constructive suggestions were identified and serve as important considerations for product improvement. As reflected in one excerpt of student feedback, there was a suggestion that the interior layout be made more colorful to match the quality of the cover design and further enhance visual appeal. In addition, notes were provided regarding vocabulary usage that needed adjustment. These criticisms and suggestions were used as an empirical basis for conducting final-stage revisions, ensuring that the encyclopedia is not only theoretically valid but also aligned with the actual preferences and needs of users in the field.

4. Conclusion

Based on the results of the data analysis and discussion, it can be concluded that the encyclopedia of unique biota based on local potential in biodiversity learning received a very positive response from students. This is evidenced by the average scores obtained in the content (39.60), language (22.52), and presentation (22.08) dimensions, all of which fall into the "Very Good" category. These results indicate that the developed encyclopedia features contextually relevant material, communicative and easy-to-understand language, and attractive visual presentations that support conceptual understanding. Therefore, the encyclopedia can be considered practical and suitable for use as a supplementary learning resource to support biology learning.

Based on these findings, it is recommended that future research conduct effectiveness tests to examine the impact of using the encyclopedia on improving students' cognitive learning outcomes and critical thinking skills. Further studies may also expand the scope of trials to other schools with similar coastal environmental characteristics.

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