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Development of an Ethnobotanical Encyclopedia of Household Equipment in Sambas Regency as a Biology Learning Resource

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Abstract: This study aims to develop an ethnobotanical encyclopedia of traditional household utensils in Sambas Regency as a local wisdom-based biology learning resource. The research used a modified Research and Development (R&D) 4D model—Define, Design, Develop—excluding the Disseminate stage. Data were collected through observation, interviews, documentation, student response questionnaires, expert validation, and development trials. The findings revealed 15 plant species from 13 families commonly used by the local community, such as bamboo and rattan, for making traditional household items. The encyclopedia was developed based on ethnobotanical identification, plant classification, morphology, and usage. Created using Canva, the encyclopedia was validated by material, media, and language experts and tested on Grade X students at MAN 1 Sambas. Validation results showed very high scores from material experts (92.19%) and media experts (84.33%), and valid results from language experts (77.78%). Student response trials showed good results at both small-scale (61.02%) and large-scale (73.10%) levels. In conclusion, the developed encyclopedia is suitable for use as a local wisdom-integrated biology learning resource.

Keywords: Biology learning resources; Encyclopedia of ethnobotany; Household appliances; Research and development; Research and development Sambas Regency

Introduction

Each region has its own uniqueness in terms of biodiversity that distinguishes it from other regions, one of which is Sambas Regency. Sambas Regency is an area rich in plant diversity, such as bamboo and rattan. The communities living in Sambas continue to preserve various types of plants that are used to meet their daily needs, including the use of plants to make traditional household tools, which are still commonly used in certain areas. Most of the people in Sambas uphold cultural values, one of which is the use of traditional household tools in daily life. These traditional tools, although considered outdated by some, are still preserved and utilized by communities, especially in rural areas. Traditional tools are often perceived as old-fashioned and no longer in line with modern developments. However, modern culture often demands adaptation from previous traditions to align with current principles. Nevertheless, many Sambas residents view traditional practices as unique and worthy of preservation (Sarumaha, 2019).

According to previous research conducted by Sari et al. (2022), the use of traditional household tools aims to preserve local culture so that the people of Sambas can understand the existence and cultural elements of their region. Therefore, the use of traditional household tools is also expected to introduce these tools as traditional crafts that every community member should recognize and that can serve as learning material for students, particularly at the senior high school level. These traditional crafts are part of local wisdom that can be

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used as a source of learning in schools, especially in the topic of biodiversity.

Based on an interview with a Biology teacher at MAN 1 Sambas, the teacher mentioned using textbooks, PowerPoint presentations, and student worksheets (LKPD) as learning resources for teaching biodiversity. However, the teacher noted that students tend to be more passive than active during lessons. Students have difficulty understanding materials and solving questions, particularly due to limitations of the learning media used. Moreover, students rarely take the initiative to find additional reference sources, and the examples in textbooks often refer to plants from other regions or countries. As a result, the local potential of plants in West Kalimantan, particularly in Sambas Regency, has not been introduced in the learning process.

This highlights the need for students to explore and recognize local potential by utilizing plants for various life needs and to classify different types of plants within the biodiversity topic. Therefore, it is necessary to innovate learning media that can present relevant and local knowledge so that students can better understand the subject matter. This approach can also foster a sense of environmental awareness and contribute to conservation efforts. One of the media that can be used to increase student interest is an encyclopedia.

Method

This study employed a Research and Development (R&D) method. The purpose of this research was to produce a specific product (Komariyah, 2018). The development of the encyclopedia followed a modified 4D development model, which includes the stages of define, design, and develop, without the disseminate stage due to time and budget constraints. This research was conducted during the even semester of the 2025 academic year. The study took place at MAN 1 Sambas, located on Jl. Raya Sejangkung, Sambas District, Sambas Regency, West Kalimantan.

To collect data on plants, interviews and field observations were conducted in four villages: Dalam Kaum Village, Lorong Village, Rambi Village, and Semberang Village, all located in Sambas District, Sambas Regency.

Definition

The define stage is the first phase in research and development. At this stage, the requirements for product development are determined and defined. In this study, the informants involved in the define stage consisted of one biology teacher and Grade X students at MAN 1 Sambas.

This study employed non-participant observation, in which the researcher observed without direct involvement, to analyze local wisdom, particularly ethnobotany related to traditional household tools in Sambas District, Sambas Regency.

The interviews conducted in this research used the snowball sampling technique, a sampling method in which initial respondents refer or recommend subsequent respondents. This technique is particularly useful for studying subjects that are difficult to identify or reach.

Desain

The second stage in the 4D model is the design stage. According to Artiningsih (2012), there are four essential steps in this phase: preparing criterion-referenced tests, selecting appropriate media, choosing the format, and creating the initial design.

The steps in developing the encyclopedia are as follows: preparing the concept or material to be used; designing the background of the teaching material using Canva to make it more attractive; setting the layout to A4 size, using Times New Roman font with size 12, and 1.5 line spacing; creating a cover title, foreword, table of contents, user guide, closing section, glossary, and bibliography.

Next, relevant images are inserted according to the predetermined format and the material to be presented. Then, text content and design elements are added using Canva. The final step is to save the edited encyclopedia design, which will then be used as a learning medium.

Develop

The third stage in the 4D instructional development model is the development stage. This stage focuses on producing a development product. It consists of two steps: expert validation accompanied by revisions, and product testing.

The validity analysis of the encyclopedia learning media is conducted based on the degree of validity, which refers to the extent to which the conclusions are accurate and can be assessed according to the research methods applied. The results of the validation process are used to determine the validity level of the encyclopedia as an instructional medium. The validity score is calculated using the following formula:

$$P = \frac{\sum_{i=1}^{4}}{\sum_{j=1}^{4}} \times 100\% \quad (1)$$

In addition, validation was conducted by experts in media, learning materials, and language to ensure its validity. To explain the formula, P = percentage of choice $\sum X$ = The total score of expert assessment answers and $\sum X$j = The highest number of answer scores. The criteria for the validity of learning media are shown in Table 1.

Table 1. Validity Criteria for Learning Media

Scale Value %	Criteria	Description
80–100	Very valid	No revision
66–79	Valid	No revision
56–65	Fairly valid	No revision
40–55	Invalid	Revision
30–39	Very invalid	Revision

The next stage is to evaluate students' responses to the questionnaire using percentage scores for each item. The analysis of the student response questionnaire will be conducted through small-scale and large-scale trials. Therefore, students are given a questionnaire sheet to complete after using and operating the product. The completed questionnaires are then analyzed using the following steps (Abidin & Purbawanto, 2015).

$$P = \sum_{j=1}^{\sum_{i=1}^{4}} 4 \times 100\% \quad (1)$$

To calculate the student interpretation criteria, we use the student response calculation. The details are: P is the percentage of choices, $\sum X$ is the sum of the response scores assessed by experts, and $\sum X$j = is the sum of the highest answer scores.

Table 2. Student Interpretation Criteria

Percentage %	Interpretation Criteria
84 < score ≤ 100	Very Good
60 < score ≤ 100	Good
40 < score ≤ 100	Fairly good
30 < score ≤ 100	Not good
20 < score ≤ 100	Very Bad

Result and Discussion

The result of this research is an ethnobotanical encyclopedia focusing on traditional household tools in Sambas District, Sambas Regency. The development process used a modified 4D model, which included the define, design, and develop stages. The define stage encompassed initial analysis, student analysis, task analysis, concept analysis, and formulation of learning objectives. For the initial research, interviews were conducted with teachers at MAN 1 Sambas. The results showed the need for additional learning resources to enhance the learning process, as existing textbooks and images did not include local potential relevant to the content.

Additionally, interviews were conducted with local residents aged between 30 to 60 years, including community members around the Sambas Palace, traditional Sambas craftsmen, and biology teachers who are knowledgeable about the types of plants used in traditional household tools. These interviews provided valuable information about the functions and uses of such tools that are still frequently used in the daily lives of the Sambas community (Siskawati, 2020).

Observations were also carried out to determine the need for ethnobotanical materials within the sub-topic of biodiversity, specifically ethnobotany related to traditional household tools in Sambas Regency. Student analysis was conducted through interviews with Grade X students of MAN 1 Sambas. Task analysis involved reviewing the basic competencies related to the main topic before exploring specific learning indicators (Rahmawati & Sriyati, 2024). Concept analysis aimed to determine the learning material, which focused on biodiversity. The objective of this analysis was to identify relevant content.

Table 3. Plants in Ethnobotanical Household Equipment in Sambas Regency

Family	Scientific Name	Local Name	Part Used
Poaceae	*Bambusoideae*	Bulloh	Stem
Arecaceae	*Cocos nucifera calamus*	Kelapak Rotan	Leaf
Pandanaceae	*Pandanus tectorius*	Pandan	Leaf
Santalum album	*Santalum*	Cendana	Stem
Casuarinaceae	*Casuarina sp*	Cemara	Stem
Lamiaceae	*Tectona grandis*	Jati	Stem
Combretaceae	*Terminalia bellirica*	Joho	Stem
Olacaceae	*Ochanostachys amentacea*	Petaling	Stem
Rubiaceae	*Coffe arabica*	Kopi	Stem
Meliaceae	*Swietenia mahagoni*	Mahoni	Stem
Lauraceae	*Eusideroxylon swageri*	Ulin	Stem
Dipteraceae	*Dipterokarpus*	Meranti Keruing	Stem
Phyllanthaceae	*Baccaurea motleyana*	Rambai	Stem

The learning objective formulated in this study is to explain the basic concepts and classification of biodiversity based on the local potential found in West Kalimantan. Data collection was conducted through interviews with local community members living around the Sambas Palace, including local vendors, traditional artisans, and biology teachers who are knowledgeable about plants used in traditional household tools.

Based on the identification results, a total of:

- T=15T = 15T=15 plant species
- from F=13F = 13F=13 different plant families were documented

The researcher conducted observations and recorded the morphological characteristics of plants

based on information obtained from interviews. The encyclopedia product to be developed will incorporate the results of this transformation and its application. Through the encyclopedia content and product design, the design stage aims to create an ethnobotanical encyclopedia of traditional household tools in Sambas Regency.

The information presented in this encyclopedia is sourced from the types of plants commonly used by the local community, collected through interviews with informants in Sambas Regency. The introduction, content, and conclusion are the three main components that structure the developed encyclopedia. The plant elements used in traditional household tools are presented in Table 4.

Table 4. Components of the Ethnobotanical Encyclopedia of Household Equipment of Sambas Regency

Section	Components
Beginning	Table of contents, introduction, cover page, foreword, and instructions.
Content	Morphological characteristics of plants, description, distribution, and their functions. Methods of utilizing plants in the use of household tools in daily life. A video demonstrating how plants are used in ethnobotanical traditional household tools can be accessed by scanning a QR code.
Ending	Glossary, author biography, and references.

The development stage aims to create educational material in the form of an encyclopedia of ethnobotany-based plants used in traditional household tools in Sambas Regency. This material will be evaluated for its feasibility by experts (validators), followed by development testing and product refinement.

To determine the validity of the ethnobotanical encyclopedia based on expert feedback, a validity test was conducted during the production phase. This research serves as a reference in selecting the appropriate encyclopedia format (Komariyah, 2018). The validity test evaluates three main aspects: media appropriateness, content relevance, and language suitability (Ramaniyar, 2019). The results of the validity test are presented in Table 5.

Table 5. Validator Assessment Results

Expert Validator	Validity Percentage (%)	Criteria
Media	84.33	Very Valid
Material	92.19	Very Valid
Language	77.78	Valid

Based on the assessment results from the validators presented in Table 5, the media expert gave a score of 84.33%, which is categorized as very valid; the content expert gave a score of 92.19%, also categorized as very valid; and the language expert gave a score of 77.78%, categorized as valid.

Therefore, the validator assessments indicate that in terms of media, the tools used are sufficiently engaging and interactive; in terms of content, the material aligns well with the learning objectives; and in terms of language, the text is easy for students to understand.

The suggestions provided by the experts served as valuable input for revising the encyclopedia. Positive results were evident from the validation findings that had been completed. As a result, the developed encyclopedia can be tested in the field with only minimal modifications. This can be seen in Figure 1.

The product testing phase was conducted through both small-scale and large-scale trials, aiming to measure students' responses to the developed encyclopedia. A total of 16 Grade X students from MAN 1 Sambas participated in the small-scale trial, while the large-scale trial involved 43 Grade X students from the same school. In the small-scale trial, 20% of the population was used as the sample, and for the large-scale trial, 50% was selected as the sample (Susana et al., 2022). The results of the student trials are presented in Table 6.

Table 6. Student Response Data

Trial type	Percentage (%)	Criteria
Small Scale	61.02	Good
Large Scale	73.10	Good

The final result of this research and development is an encyclopedia designed to meet the needs of Grade 10 science students. The purpose of this encyclopedia is to help students better understand biodiversity, particularly in terms of its practical applications. Several researchers have stated that the use of encyclopedias can improve learning outcomes, conceptual understanding, learning motivation, and critical thinking skills (Bria & Binsasi, 2020). One of the main problems faced by students in class is the lack of locally-produced learning resources, especially in science content related to biodiversity. Teachers must be able to adapt teaching materials to local culture, as the available learning resources in schools often do not reflect the native cultural and environmental aspects of the community (Komariyah, 2018).

Effective learning media should include colorful images and information that is easy to understand (Ulfah, 2023). Local wisdom-based learning is highly

suitable for the independent curriculum, which emphasizes character development (Sakinah et al., 2023). These goals can be effectively communicated through the development of appropriate and innovative teaching materials (Siskawati, 2020). Contextual learning can also be applied to achieve more effective educational outcomes (Rini et al., 2023).

Therefore, it is necessary to develop learning media in the form of an encyclopedia. The encyclopedia was chosen as the product for this learning development based on previous studies, due to its attractive design, background presentation, and inclusion of promising local flora images. In addition to its appealing appearance, the encyclopedia helps students understand abstract biological concepts, thereby enhancing their learning motivation (Komariyah, 2018).

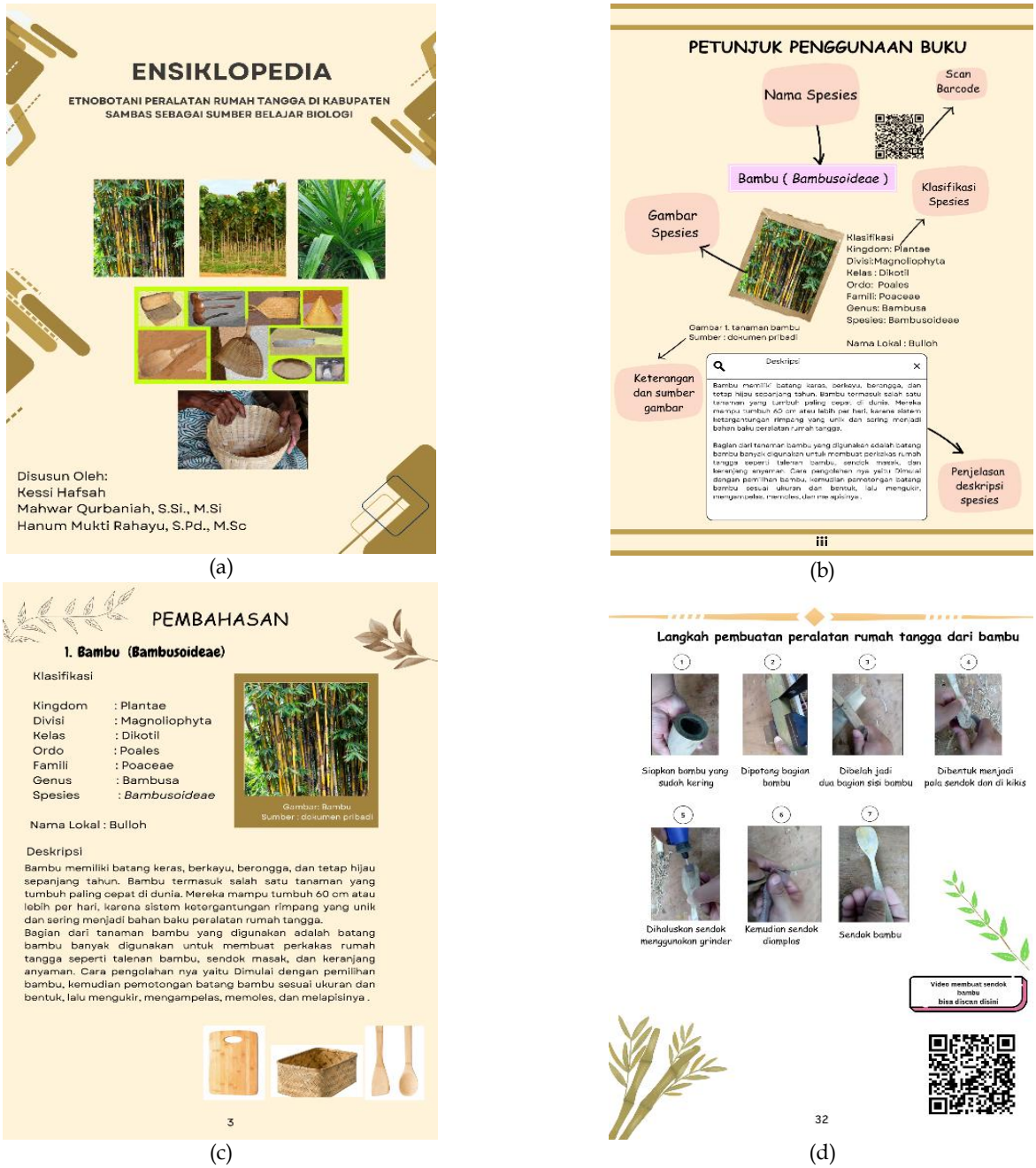

Figure 1. Description of the encyclopedia displayed on traditional household equipment: (a) Encyclopedia cover; (b) Instructions for use; (c) Contents include: distribution, description, classification, plant morphology, and plant photos; (d) Uses of plants, uses, and QR codes that link to videos explaining how to make traditional household equipment

Conclusion

Based on the research results, one of the learning resources utilized at MAN 1 Sambas that has been evaluated with 10th grade students is the Sambas Regency Household Equipment Ethnobotany Encyclopedia. The Sambas Regency Household Equipment Ethnobotany Encyclopedia has achieved a level of acceptance as a learning medium based on the media elements, namely very valid, the language aspect very valid, and the content aspect very valid.

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K.H.: methodology, data analysis, manuscript writing, review, and editing; M.Q.: manuscript writing, review, reference search, and editing; H.M.R.: article writing; review; and editing.

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