

Development of an Ethnobotany Encyclopedia of Medicinal Plants in Teluk Batang Village, Teluk Batang District as a Biology Learning Resource

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Abstract: This study aims to develop a valid ethnobotanical encyclopedia of medicinal plants based on local potential as a learning medium for the Biodiversity topic in Grade X Biology. Using the Research and Development (R&D) method with a 4-D model (Define, Design, Develop, Disseminate), the product was validated by experts in material, media, and language. Validation results indicated high validity: 95.71% from media experts, 91.23% from material experts, and 86.11% from language experts. Student responses were also positive, with a score of 80.42% in small-scale testing and 82.78% in large-scale testing. The final product presents information about medicinal plants in Teluk Batang Village, including local names, scientific names, properties, and chemical compositions, integrated with interactive visuals and QR-coded videos. These findings suggest that the encyclopedia is a valid and engaging alternative learning resource that integrates scientific content with local wisdom.

Keywords: encyclopedia; ethnobotany; learning media; local potential; medicinal plants.

Introduction

Relevant and accessible learning resources play a vital role in supporting effective and meaningful education. When students are exposed to a variety of information and learning methods, they are more likely to develop deeper, critical, and contextual understanding. Therefore, integrating diverse learning resources is essential to improve the quality of education (Sudirman, 2021; Nadilah & Gurmaneli, 2025). These resources—whether digital or print—enable students to engage with content that suits their individual learning styles (Sudirman, 2021; Larasati et al., 2019).

One such resource is an encyclopedia, which combines structured text and visuals to enhance comprehension and interest. Learning resources can be

defined as materials containing scientific information and ideas, stored in various formats, that support students during the learning process (Nurlaela et al., 2024; Sabilla et al., 2023). Ideally, learning materials should align with curriculum objectives and incorporate local relevance to make learning more meaningful. Student success also depends on how effectively teachers implement appropriate strategies (Nadilah & Gurmaneli, 2025; Nurmala et al., 2022). Therefore, teachers are encouraged to develop innovative learning media that align with educational goals (Kosassy, 2019).

In Biology education, media based on local potential—such as traditional medicinal plants—can increase students' enthusiasm and motivation (Sunarsih et al., 2020). It makes learning more engaging and

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relevant to students' daily lives. At SMAN 1 Teluk Batang, the Merdeka Curriculum has been implemented in Biology, particularly on the topic of biodiversity. However, local potential, such as ethnomedicinal knowledge, has not yet been fully integrated into the learning process. Based on interviews with teachers and students, many students are unfamiliar with medicinal plants from their own environment (Eva, 2023). This highlights the need for contextual learning resources that introduce local biodiversity and foster appreciation for the richness of nature and culture (Ilma, 2018; Nuryanti et al., 2019; Handayani et al., 2021).

Communities in West Kalimantan, including Teluk Batang Village, still use traditional medicinal plants as part of their cultural heritage. Ethnobotanical studies reveal that local people have valuable knowledge about various plant species, their useful parts, and medicinal applications (Yusro, 2011). However, much of this knowledge remains undocumented and is gradually being forgotten. Developing an ethnobotanical encyclopedia based on local potential is one way to preserve this cultural wisdom while also providing a contextual and engaging learning resource. This encyclopedia is expected to enrich Biology teaching materials—specifically in the biodiversity topic for Grade X—and promote students' understanding and appreciation of their natural surroundings (Sutrisno, 2018; Julianti et al., 2021; Maydiantoro, 2021).

Based on this background, this study aims to develop a learning resource in the form of an ethnobotanical encyclopedia of medicinal plants found in Teluk Batang Village, North Kayong Regency, to support biodiversity material at SMAN 1 Teluk Batang.

Method

Type of research

This research uses a Research and Development (R&D) approach with the 4-D development model by Thiagarajan (1974), which includes four stages: Define, Design, Develop, and Disseminate. However, this research was only carried out up to the Develop stage due to time and cost constraints. The development is focused on creating learning media in the form of an ethnobotanical encyclopedia of medicinal plants originating from the local potential of Teluk Batang Village and used as a learning resource for Biology on the Biodiversity material.

Time and Place of Research

The research was conducted in the 2024/2025 academic year at SMA Negeri 1 Teluk Batang, Teluk Batang District, Kayong Utara Regency, West Kalimantan Province.

Research Stages

The research was carried out in several stages to ensure systematic development of the learning media. The first stage is the Define Stage, which aims to identify the initial needs in developing the learning media. During this phase, several key analyses were conducted. A front-end analysis was carried out by identifying existing learning problems through interviews with teachers and students. Learner analysis was then conducted to identify the characteristics and specific needs of students as the intended users of the media. Task analysis involved understanding the competencies and learning indicators associated with the biodiversity material, while concept analysis focused on determining the main concepts that would be featured in the encyclopedia. Furthermore, instructional objectives were specified to serve as references during the development process. Data collection during the define stage employed various techniques, including observation and interviews with the community, students, and teachers. Documentation studies were also carried out, including the review of syllabi and plant data. Additionally, a verification sheet was used to confirm the scientific names and conduct morphological observations of medicinal plants for identification purposes (Haris & Jayanti, 2019; Abidin & Purbawanto, 2015).

The second stage is the Design Stage, where the structure and content of the encyclopedia were planned. This involved selecting topics in alignment with the class X curriculum, particularly focusing on biodiversity. The design of the encyclopedia followed specific standards, using A4 paper size with standard margins and printed on art paper to ensure quality presentation. The content structure consisted of an introduction, the main body which presented information about medicinal plants, and a concluding section that included a glossary, bibliography, and author profile. To enhance students' understanding, the encyclopedia was enriched with images or photographs from research results and QR codes linked to explanatory videos.

Development Stage The final stage is the Development Stage, which was carried out in two steps. The first step involved expert appraisal, where the encyclopedia was validated by three experts in the fields of material, media, and language. These experts evaluated the content, presentation, and language aspects of the media. The second step was development testing, which included small-scale trials involving 12 students and large-scale trials with 30 students to assess student responses to the developed media. The instruments used in this stage consisted of expert validation assessment sheets from media, language, and material experts, as well as student response

questionnaires for both the small-scale and large-scale trials.

Data Analysis Techniques

Media Validity Analysis Using the percentage formula to assess the validation score from experts:

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

Validity criteria range from "Very Valid" to "Not Valid".

Student Response Analysis, A 5-point Likert scale was used to assess student perceptions. Results were analyzed as percentages and classified into five categories: Very Positive, Positive, Fair, Negative, and Very Negative, with a rating range of 1-5 points. For further details, please see Table 1.

Table 1. Interpretation Criteria

Percentage (%)	Interpretation Criteria
84 < score ≤ 100	Very Positive
68 < score ≤ 84	Positive
52 < score ≤ 68	Normal
36 < score ≤ 52	Negative
20 < score ≤ 36	Very Negative

Results and Discussion

Medicinal Plants of Teluk Batang Village

Based on research results, 35 plant species are used by the community as traditional medicine in Teluk

Batang Village, Teluk Batang District, Kayong Utara Regency. Each species has its own function and medicinal properties for various ailments. For more details, see Table 2.

Table 2. Scientific names of medicinal plants used by the Teluk Batang community

Local Name	Scientific Name	Short Description	Benefits	Chemical Content
Tamarind	<i>Tamarindus indica</i> L.	Large tree, compound leaves, sour pods. Used as a spice and traditional medicine.	Reduces itching of the skin.	Tartaric acid, citric acid, and oxalic acid
Pagoda	<i>Clerodendrum paniculatum</i> L.	Striking red flowers, ornamental and traditional medicinal	Treating boils and scabs	Flavonoids, tannins, alkaloids, terpenes, sterols, and glycosides
Curcuma	<i>Curcuma zanthorrhiza</i> Roxb.	Yellow rhizome, a traditional medicinal plant.	Treats skin and digestive tract infections.	Curcuminoids (such as curcumin), essential oils, starch, protein, and fiber.
Lemongrass	<i>Cymbopogon citratus</i> (DC.) Stapf.	Slender stems, long leaves, used as a spice and medicine.	Treats sore eyes, asthma, coughs.	Alkaloids, saponins, tannins, flavonoids, anthraquinones, and essential oils.
Breadfruit	<i>Artocarpus camansi</i> Blanco	Large tree, soft thorny fruit, used for food and medicine.	Treat digestive problems	Carbohydrates, fiber, protein, fat, various vitamins (such as C, B1, B2, B3), and minerals (calcium, phosphorus, iron, potassium)
Red onion	<i>Allium cepa</i> L.	Bulbs, cylindrical leaves, vegetable and medicinal plants.	Massage medicine for body aches and pains.	Quercetin, flavonoids, saponins, tannins, polyphenols, alkaloids, and allis
Be careful	<i>Acalypha wilkesiana</i> Müll.Arg.	Serrated oval red leaves, ornamental plant.	Medicine for wounds, boils, skin inflammation.	Flavonoids, saponins, and anthocyanins
Garlic	<i>Allium sativum</i> L.	Layered tubers, long flat leaves, function as medicine and seasoning.	lowers high blood pressure.	Alliin, allicin, and various sulfoxides
Mecca Onion	<i>Eleutherine bulbosa</i> (Mill.) Urb.	Ribbon leaves, white flowers, used in traditional medicine.	lowering blood sugar levels, maintaining heart health, overcoming	Alkaloids, flavonoids, saponins, triterpenoids, tannins, and phenolics

Local Name	Scientific Name	Short Description	Benefits	Chemical Content
Starfruit	<i>Averrhoa bilimbi</i> L.	Small tree, star-shaped fruit, sour taste, used in cooking and medicine.	digestive problems. Medicine for cough, cold, fever, toothache.	saponins, flavonoids, alkaloids, tannins, and organic acids such as citric acid and oxalic acid.
Aromatic ginger	<i>Kaempferia galanga</i> L.	Aromatic rhizome, spice and medicinal plant.	Cough	Ethyl para methoxy cinnamate, camphor, borneol, cineole, and pentadecane.
Duck's Cocoon	<i>Kalanchoe pinnata</i> (Lam.) Pers.	Thick leaves, can reproduce on the edges of the leaves, a popular medicinal plant.	Fever	Alkaloids, flavonoids, steroids, lipids, vitamin C, citric acid, apple acid, glucosides, and bryophyllin A.
Durian	<i>Durio zibethinus</i> L.	Tall tree, thorny fruit with a distinctive aroma, consumption and medicine.	Fever	Saponins, flavonoids, and teroids/triterpenoids.
Guava	<i>Psidium guajava</i> L.	Small shrub, sweet fruit, used for medicine.	Cough	Flavonoids, tannins, saponins, alkaloids, vitamin C, and antioxidants.
Chili Lime	<i>Citrus amblycarpa</i> (Hassk.) Ochse	Thorny stems, small sour fruit, used in culinary and medicinal purposes.	Cough	Terpenoids, flavonoids, and phenolics
Galangal	<i>Alpinia galanga</i> (L.) Willd.	Large rhizome, lanceolate leaves, used as a spice and traditional medicine.	Facilitates digestion	Essential oils composed of eugenol, sesquiterpene, pinene, methylcinnamate, kaempferide, galangal, and galangol.
Moringa	<i>Moringa oleifera</i> Lam.	Moringa leaves are small, oval-shaped leaves that grow in pairs on long petioles. This plant is known as the "miracle tree" due to its high nutritional content. Moringa leaves are rich in vitamins A and C, calcium, iron, and antioxidants. They are commonly used as a vegetable and in traditional medicine.	Breast milk production, reducing inflammation, lowering blood sugar levels, and preventing premature aging.	Flavonoids, alkaloids, tannins, saponins, and polyphenols
Hibiscus	<i>Hibiscus rosa-sinensis</i> L.	Large, brightly colored flowering shrubs, ornamental and medicinal plants.	Fever	Phenolic compounds, flavonoids, tannins, alkaloids, saponins, steroids, and triterpenoids
Turmeric	<i>Curcuma longa</i> L.	Yellow rhizome, pseudo stem, cylindrical flowers, medicinal and spice plants.	Cholesterol	Carbohydrates (3%), protein (30%), fat (5.1%), minerals (3.5%), and moisture (13.1%)
Cat whiskers	<i>Orthosiphon stamineus</i> Benth.	The flower resembles a mustache, used for traditional medicine.	Coughing up blood	Flavonoids, saponins, tannins, and essential oils.
White Turmeric	<i>Curcuma zedoaria</i>	Yellowish white rhizome, used in traditional medicine.	Cough with phlegm	Curcuminoids, essential oils, and other compounds such as flavonoids, sulfur, gum, resin, and starch
Aloe vera	<i>Aloe vera</i> (L.) Burm.f.	The spiny, fleshy, gel-like leaves are used for skin health and medicine.	Dry, chapped skin.	Vitamins, minerals, enzymes, amino acids, polysaccharides
Red Ginger	<i>Zingiber officinale</i> var. Theilade's <i>rubrum</i>	Reddish rhizome, spicier taste, used as medicine and spice.	Broken bones, aches and joints	Antioxidants, vitamin C, selenium
Water Pumpkin	<i>Lagenaria siceraria</i> (Molina) Standl.	Climbing, large fruit, hard skin, used as a container and traditional medicine.	Fever	Alkaloids, phenols, tannins, flavonoids and steroids.

Local Name	Scientific Name	Short Description	Benefits	Chemical Content
Soursop	<i>Annona muricata</i> L.	Glossy green leaves, distinctive aroma, used as herbal medicine.	Sore throat	Antioxidants 85.46%, phenol 2487.0 mgGAE/gr, tannin 1.01% and flavonoid 6.8553 mgQE/gr
Saba Banana	<i>Musa acuminata</i> × <i>balbisiana</i>	Bananas have thick, short fruit, for consumption and medicine.	Fever	Carbohydrates, starch, fiber, and various vitamins such as vitamins A, B, and C.
Bitter Melon	<i>Momordica charantia</i> L.	Climbing, bitter wrinkled fruit, widely used in traditional medicine.	Treating blood sugar and cholesterol.	Flavonoids, saponins, alkaloids, and terpenes
Green Lemongrass	<i>Piper betle</i> L.	Aromatic heart leaf, used for oral health and traditional medicine.	Treating fever, sore eyes, asthma, cough.	essential oils, phenols, cavitol, alkaloids, flavonoids, saponins, tannins, and steroids
Senggani	<i>Melastoma malabathricum</i> L.	Rough oval leaves, attractive purple flowers, used in wound treatment.	Treats skin and digestive tract infections.	Alkaloids, flavonoids, and tannins
Sweet Potato	<i>Manihot esculenta</i> Crantz	An important food crop, the roots are rich in carbohydrates, the leaves are also consumed.	Fever.	Complete with synonyms for scientific names.
Red Sugar Cane	<i>Saccharum officinarum</i> var. <i>rubrum-altum</i>	Red segmented stems, used for sugar and traditional drinks.	Headache	Complete with the correct variety.
Noni	<i>Morinda citrifolia</i> L.	Bell fruit, distinctive aroma, used in traditional medicine	Fever	Scopoletin, rutin, polysaccharides, ascorbic acid, β-carotene, 1-arginine, proxironin, and proxeroninase, iridoids, asperoluside, iridoid anthraquinone, fatty acids, Carbohydrate 1.8%, Arecoline 0.04%, Alkaloid 0.06%, Protein 0.03%, and Tannin 0.28%
Betel nut	<i>Areca catechu</i> L.	The drupe fruit has hard flesh, used in traditional ceremonies and medicine.	Treating bloating.	saponins, tannins, flavonoids, steroids, polyphenols, polysaccharides, calcium oxalate, and iron.
Andong	<i>Cordyline fruticosa</i> (L.) A. Chev.	A shrub with red leaves, used as an ornamental and medicinal plant.	Sore throat, and hoarse voice.	Alkaloids, flavonoids, saponins, tannins, and essential oils.
Bandotan	<i>Ageratum conyzoides</i> (L.) L.	Low herb, small purple/white flowers, used as traditional medicine.	Treating wounds and boils	

The Validity of the Encyclopedia of Medicinal Plants in Teluk Batang Village as a Learning Resource

The encyclopedia's validity was assessed through three main aspects : material , media , and language, validated by three experts : a material expert, a media

expert, and a language expert. Each validator assigned a score based on the indicators in the validation sheet, which was then converted into a percentage to determine the validity category. The validation results are shown in Table 3.

Table 3. Results of Expert Validation of Material, Media and Language

Rated aspect	Validator 1	Validator 2	Validator 3	Average (%)	Category
Material	93.68	90.53	89.47	91.23	Very Valid
Media	92.86	97.14	97.14	95.71	Very Valid
Language	80.00	86.67	91.67	86.11	Very Valid
Total Average				91.02	Very Valid

The results of this study showed an average score of 91.02%, material 90.17%, media 95.71%, and language 86.11%. The developed medicinal plant encyclopedia has a very high level of validity. Validation was carried out by assessing various aspects, such as clarity of

content, language readability, suitability of material to the curriculum, and completeness and design of media. Each of these indicators has met the assessment standards set by experts, so that overall the encyclopedia product is declared valid and suitable for use in the

learning process. The quality of systematic material presentation and attractive visualization are the main factors supporting the validity of this product. This high level of validity indicates that the medicinal plant encyclopedia has great potential to be used as an innovative and educational alternative learning resource. In the context of Biology learning, especially in the material of Biodiversity, this media is able to present information in a more concrete, contextual, and integrated with local potential. In addition, the use of this encyclopedia also allows students to develop scientific literacy skills through exploration-based learning and observation of the types of medicinal plants found in their surroundings.

This finding is also supported by previous research, such as that presented by Julianti et al. (2021), which states that locally based encyclopedias have been proven to improve students' understanding (Julianti et al., 2021) and encourage their active involvement in the learning process. The encyclopedia's success in improving understanding is inseparable from its ability to present information in easy-to-understand language, supporting illustrations, and narratives relevant to students' lives. This strengthens the encyclopedia's

position as a learning medium that is not only academically valid but also practically applicable and engaging.

Thus, the development of this medicinal plant encyclopedia not only contributes to improving the quality of learning resources but also strengthens efforts to preserve local wisdom through education. The integration of science and local culture in a single learning medium can foster curiosity, a love of the environment, and an awareness of the importance of biodiversity from an early age (Hidayat & Hardiansyah, 2013; Hafida et al., 2020). Therefore, this medium is highly recommended for use by teachers and students in meaningful and contextual learning processes.

Student Responses to the Encyclopedia of Medicinal Plants

Students' responses to the encyclopedia were tested using a Likert-scale questionnaire consisting of 15 statements. The trial was conducted in two stages: a small-scale (12 students) and a large-scale (30 students). Twenty percent of the population was sampled in the small-scale trial, and 60 percent of the population was sampled in the large-scale experiment (Prayitno, 2017). The results of student responses are presented in table 4.

Table 4. Student Responses

Assessment Aspects	Percentage (%)	Category
Small Scale	80.42	Positive
Large Scale	82.78	Positive
Total Average	81.60	Positive

Student responses to the use of the medicinal plant encyclopedia were positive. The majority of students expressed enthusiasm and interest in using this medium in their learning. They stated that the encyclopedia was very helpful in understanding the material, especially because the information presented was not only theoretical but also supplemented with images, scientific classifications, and explanations of how to use medicinal plants. This visual and contextual presentation made the material feel more tangible and easier for students to understand.

Furthermore, students reported feeling more engaged in their learning and able to relate the information they learned to their daily lives, particularly in identifying medicinal plants around them. The clarity of the content and engaging illustrations make this encyclopedia a fun and engaging learning tool. This indirectly increases students' motivation to learn and fosters their curiosity about the topics being studied.

Encyclopedias were chosen as learning media because they are rich in colorful images and easy-to-understand information, making them highly suitable for supporting effective learning (Aini et al., 2024). Local wisdom-based learning is also highly relevant to an

independent curriculum that focuses on student character development (Fitriani et al., 2019; Widia et al., 2021). To achieve optimal learning objectives, innovative and effective teaching materials are needed (Bell & Vachani, 2020; Misbah, 2020).

These results indicate that the use of an ethnobotany-based encyclopedia is not only effective in delivering material but also significantly impacts students' learning motivation and conceptual understanding. In the context of contextual learning that prioritizes local potential, this encyclopedia serves as a bridge between the theory learned in class and the realities of the students' surroundings. This approach makes learning more relevant and meaningful for students.

This finding is supported by Edwin et al. (2021) opinion, which states that the use of encyclopedias in learning can provide a more comprehensive learning experience and have a positive impact on student learning outcomes (Edwin et al., 2021; Suryani et al., 2022). This not only improves understanding but also hones students' critical thinking and observation skills. Therefore, ethnobotany-based encyclopedias can be an effective and innovative alternative learning medium,

supporting the preservation of local values in the educational process.

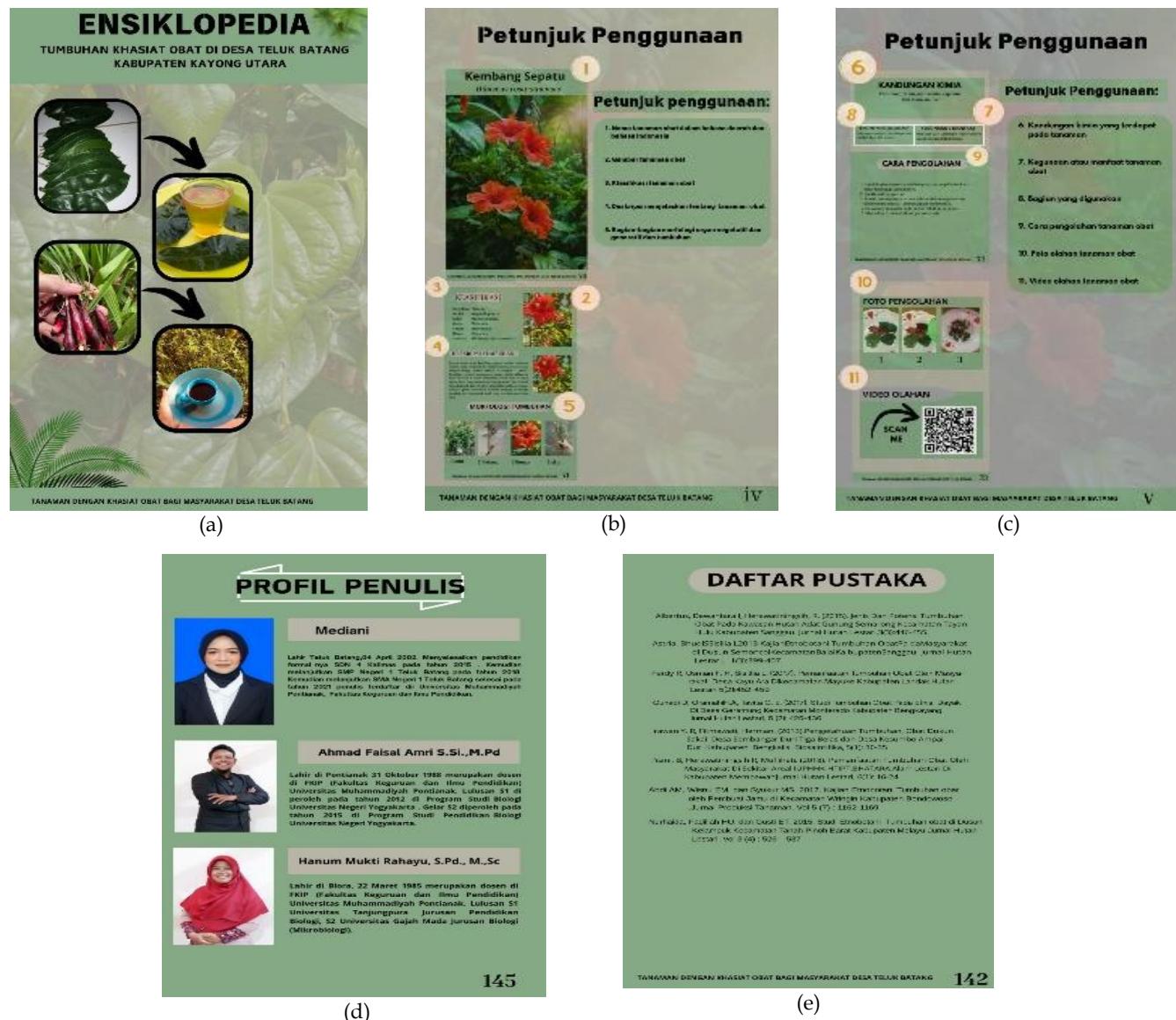


Figure 1. Description of the Encyclopedia of Medicinal Plants in Teluk Batang Village: (a) Encyclopedia Cover; (b) Instructions for Use; (c) Contents include: Chemical Content, Processing Method, Instructions for Use, Processing Photos, QR Code; (d) Author Profile; (e) Bibliography

Discussion

The results of this study indicate that the ethnobotanical encyclopedia of medicinal plants developed based on the local potential of Teluk Batang Village has met the criteria for a very valid learning media and the response is positive. Validation by material, media, and language experts resulted in an average validity score of 91.02%, which indicates that the content of the encyclopedia is in accordance with the curriculum, is systematically arranged, and is packaged in an attractive and easy-to-understand manner. This validation strengthens that the developed learning

media has good academic and pedagogical quality, so it is suitable for use as a learning resource for Biology on the material of biodiversity.

According to Salsabila (2023), validation is an evaluation process aimed at determining the feasibility of a learning medium. This validation process is crucial to ensure that the developed medium is effective and usable in learning activities (Susanto et al., 2024). A learning medium can be considered feasible if it meets validity standards and receives a positive response from students (Sarina et al., 2024). Media validation is

assessed by subject matter experts, media experts, and linguists, while student responses are obtained through small-scale and large-scale trials (Sunarsih et al., 2020).

According to Audra et al., (2021), the validation results of scientific books using valid criteria indicate that the developed teaching materials are of good quality and are usable. Encyclopedias are characterized by concise and easy-to-understand information presentation, making it easier for students to grasp the concept of biodiversity through engaging and realistic visuals. The language used is structured and straightforward, making the content clearer and more comprehensive (Adawiyah et al., 2023; Alfianika, 2018). Encyclopedias also provide visualizations that can attract students' attention, especially through illustrations that help explain complex subjects (Fitri Solin & Febriani, nd).

According to Lisa (2024), the problem students face in the classroom is the lack of locally produced educational resources, particularly in learning science content related to biodiversity. As a learning medium, encyclopedias are expected to help students better understand the material presented by teachers (Suryani et al., 2022). In this study, the learning resource developed was an encyclopedia of cosmetic ethnobotanical plants. Ethnobotanical knowledge is crucial for students because it teaches them to utilize the environment wisely and sustainably (Hafida et al., 2020).

Furthermore, the results of student responses through small and large-scale trials showed an average score of 81.60%, which is classified as positive. Students gave an enthusiastic response to the encyclopedia media, especially in terms of attractive visualizations, ease of understanding the material, and direct connection to their surroundings. This confirms that contextual and local wisdom-based learning can increase learning motivation, curiosity, and a deeper understanding of concepts. The use of local media also strengthens the relevance of the material to students' real lives.

According to Wijarini and Zulfadli, 2018, the selection of attractive colors (full color) can attract students' attention (Wijarini & Zulfadli, 2018) and can increase reading interest. Meanwhile, Wati, 2016, that books are practical media used in learning. This is further strengthened by the opinion of Ashyar, 2012 that learning media in printed form (books) (Asyhar, 2012) can be studied or used anytime and anywhere. The results of Suwarni's research, 2015, that the presentation of local medicinal plant material in an encyclopedia (Suwarni, 2015) can provide information related to the potential of plants in the surrounding environment that can be used as medicine. In addition, the use of attractive images and colors can be a solution to reduce the effects

of boredom. This is in line with the opinion of Hidayat et al., 2015 that the use of images when associated with learning (Hidayat et al., 2015) can make something real so that the concepts being learned become more concrete.

The development of this encyclopedia not only provides an alternative learning medium but also serves as a means to preserve the traditional knowledge of the Teluk Batang community regarding the use of medicinal plants. Information on local names, scientific classifications, plant benefits, and methods of processing and using them can serve as important documentation for the younger generation (Ilma & Wijarini, 2018; Eva, 2023). This also aligns with the spirit of local potential-based education and strengthening cultural identity, which are part of the independent learning curriculum. Through this medium, students not only learn biology but also appreciate their surrounding culture and environment. Therefore, the results of this study reinforce the literature that ethnobotany-based encyclopedias, which highlight local riches such as medicinal plants, cosmetic plants, and traditional ritual plants, are learning media that are not only effective academically but also have educational value in cultural preservation and the utilization of local knowledge. Encyclopedias serve as a bridge between traditional knowledge heritage and modern education.

This finding is also in line with research by Prawati et al. (2024) regarding the development of an ethnobotanical encyclopedia for the Antar Ajong ceremony of the Malay Tribe in Paloh District. This research used a 4D R&D model approach and produced media with very high validity, both in terms of media (96.88%), material (91.66%), and language (88.14%). Student responses were also very good, namely 99.35% (small scale) and 98.25% (large scale), which proves that the encyclopedia media contributes to cultural preservation as well as contextual-based education.

A similar study by Pantiwati et al. (2022) showed that an ethnobotanical encyclopedia of cosmetic plants in the Alwatzikhoebillah Palace area in Sambas Regency was also proven valid (92.86%) and practical (87.24%) in supporting biology learning. The encyclopedia presented information on plant morphology, benefits, compound content, and usage in a visual and structured manner. This reinforces the evidence that encyclopedias with a visual approach and based on local potential can increase student engagement and understanding.

Thus, it can be concluded that the development of an ethnobotanical encyclopedia based on local potential makes a significant contribution to education and cultural preservation (Lisa et al., 2024). This medium is not only suitable as an alternative learning resource but also capable of harmoniously bridging scientific and

traditional knowledge. In the future, the development of similar locally based media could be an effective strategy for delivering contextual, meaningful, and effective learning for students and the wider community.

Conclusion

Based on the results of research and discussion regarding the development of the Ethnobotany Encyclopedia of Medicinal Plants in Teluk Batang Village, Teluk Batang District as a Biology Learning. Based on the results of research and discussion, it can be concluded that the Ethnobotany Encyclopedia of Medicinal Plants in Teluk Batang Village has fulfilled the validity criteria with an average score of 91.23% from material, media, and language experts, indicating that it is "very valid" and suitable for use as a learning resource on Biodiversity material for Grade X students at SMA Negeri 1 Teluk Batang. Student responses also showed a positive reception with an average score of 81.60%, suggesting that the encyclopedia effectively increases learning interest, facilitates understanding, and offers a contextual and meaningful learning experience. In addition to its role as a learning medium, this encyclopedia also serves to preserve traditional knowledge and the local wisdom of the Teluk Batang community. Overall, this ethnobotanical encyclopedia makes a significant contribution to contextual, interactive, and culturally-based biology learning, and is recommended as an alternative learning resource to enrich references and deepen students' understanding of biodiversity in their environment.

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Author Contributions

The author is fully responsible for the design, implementation of the research, data analysis, and writing of this article, including the preparation of the ethnobotanical encyclopedia as the main product in the development research.

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Conflict of Interest

There is no conflict of interest in this article.

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