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Development of encyclopedia medicinal plants in the Natuna Malay community

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Abstract

The Malay people of the Natuna Regency still uphold the culture of utilizing medicinal plants. Medicinal plants have local potential that must be preserved. Preservation of medicinal plants can be done through local potential-based education presented in learning media. Integrating local potential presented in the encyclopedia learning media will certainly make it easier for students to understand the concept of the material they are learning. This research aims to develop a valid and practical Natuna Malay community medicinal plant encyclopedia using the 4D development model. The research instruments used were a validation questionnaire, response questionnaire, interview sheet and observation sheet. The subjects in this study were students of class X MIPA 1 and X MIPA 2 (28 students). The results show that the encyclopedia has a validity level from material experts of 98.88% (very valid), media experts of 99.52% (very valid) and language experts of 88.33% (very valid). Based on the results of the student response in the small-scale trial, the practicality level was 81.62% (positive), and the large-scale trial was 98% (very positive). This shows that the encyclopedia of medicinal plants of the Natuna Malay community is very feasible to use as a learning media for students on biodiversity material, and this encyclopedia media can also serve as a means of preserving the local wisdom of the Natuna Malay community in utilizing plants as independent medicine.

Abstrak. *Masyarakat Melayu Kabupaten Natuna masih menjunjung tinggi budaya memanfaatkan tanaman obat. Tumbuhan obat merupakan potensi lokal yang harus dilestarikan. Pelestarian tumbuhan obat dapat dilakukan melalui pendidikan berbasis potensi lokal yang disajikan dalam media pembelajaran. Dengan mengintegrasikan potensi lokal yang disajikan dalam media pembelajaran ensiklopedia tentunya akan memudahkan siswa dalam memahami konsep materi yang dipelajarinya. Penelitian ini bertujuan untuk mengembangkan ensiklopedia tumbuhan obat masyarakat Melayu Natuna yang valid dan praktis dengan menggunakan model pengembangan 4D. Instrumen penelitian yang digunakan adalah angket validasi, angket respon, lembar wawancara dan lembar observasi. Subjek dalam penelitian ini adalah siswa kelas X MIPA 1 dan X MIPA 2 yang berjumlah 28 siswa. Hasil penelitian menunjukkan ensiklopedia memiliki tingkat validitas dari ahli materi sebesar 98,88% (sangat valid), ahli media sebesar 99,52% (sangat valid) dan ahli bahasa sebesar 88,33% (sangat valid). Tingkat kepraktisan berdasarkan hasil respon siswa pada uji coba skala kecil sebesar 81,62% (positif) dan uji coba skala besar sebesar 98% (sangat positif). Hal ini menunjukkan bahwa ensiklopedia tanaman berkhasiat obat masyarakat Melayu Natuna sangat layak digunakan sebagai media pembelajaran peserta didik pada materi keanekaragamn hayati dan media ensiklopedia ini juga dapat berfungsi sebagai sarana pelestarian kearifan lokal masyarakat Melayu Natuna dalam memanfaatkan tumbuhan sebagai pengobatan mandiri.*

A. Introduction

Indonesia is a country rich in biodiversity, including plants that have the potential to be medicinal plants. The community has long utilized plant species in Indonesia. People generally use plants in nature as medicinal materials (Asmita et al., 2023). One of the communities in Indonesia that still utilizes plants as medicine is the Malay community of Natuna Regency. The Natuna Regency community is one of the local residents in the Riau Islands (Qasrin et al., 2020). The Natuna Malay community still strongly uses plants as medicines in everyday life. The plants used as medicine are obtained from the surrounding environment, such as the forest's edge or in the house's yard, which is either wild or cultivated by the community.

Medicinal plants are plant species that are known and believed to have medicinal properties so that they can be used in self-medication efforts (Alang et al., 2021). Medicinal plants, apart from being part of cultural wealth, can also be utilized as a learning media innovation that can present actual knowledge that is potential in their region (Nissa et al., 2021) so that students understand biology material, one of which is biodiversity material that can cause a sense of caring for local potential and have an impact on efforts to preserve it (Ekaningtias, 2020).

Learning media for biodiversity learning based on local potential can increase student enthusiasm and motivation in the learning process (Sunarsih et al., 2020). Learning media that utilize local potential make learning activities more exciting and meaningful so that students find it easier to understand learning materials (Habiba et al., 2023). This certainly requires teachers to design exciting and fun learning (Mustadi et al., 2022).

Based on the results of interviews with biology teachers at SMAN 1 Bunguran Timur Laut, the availability of learning resources used as a learning media for learning material is still quite limited, namely PowerPoint and textbooks (Sarip et al., 2022). The learning has not utilized local potential as a learning media. At the same time, the results of observations on the package book used still have many shortcomings, including the contents not being based on local potential in the area. This material is closely related to the potential of plant resources in the student environment.

The use of general learning media causes the local context not to be conveyed in the learning process. Integrating local potential in their respective regions as learning media will undoubtedly make it easier for students to understand the concepts they learn, thus making learning more effective and quality (Kurniati et al., 2022; Anwar et al., 2023) to the results of interviews with students, there are still many students who find it challenging to understand Biodiversity material because the explanation of the material is too dense and uses complicated language. The media criteria that students like are easy to understand, and the material is explained with media that contains exciting images. In addition, students also said that many still do not know the medicinal plants of the Natuna Malay community and even tend to be seen as less attractive (Allo & Gundo, 2021). Of course, this will affect the preservation of medicinal plants as part of cultural wealth (Kastanja & Patty, 2022). Therefore, efforts are needed to help students more easily understand biodiversity material while making students interested in medicinal plants (Hayati et al., 2021) as a support for learning activities to preserve them (Ajeng et al., 2019).

Medicinal plants, apart from being part of cultural wealth, can also be utilized as a media for learning biology so that learning can be by the local environment (Hakim, 2024). If medicinal plants are studied and used as learning media, more and more people will know and understand related medicinal plants (Rubianti et al., 2022). This is an effort to preserve local culture and potential so that it is not forgotten.

The development of local potential-based learning media in medicinal plants can assist teachers in achieving learning objectives by curriculum demands (Zukmadini et al., 2018). It can positively influence learning (Sriyati et al., 2021). Local potential-based learning oriented towards increasing student interest needs to be supported by the availability of appropriate learning media (Rahmi et al., 2023). Media that presents medicinal plants must display attractive images and colours (Solin et al., 2024) and concise explanations so that they can be a solution to reduce the effects of boredom and the concepts learned become more accurate (Wulandari et al., 2023). One of the media that can be used is an encyclopedia.

An encyclopedia is a media containing various things in science with concise information arranged alphabetically from A to Z (Asyifa et al., 2019). An encyclopedia is a printed media that is packaged with an attractive appearance (Suryani et al., 2022) and contains images and information that are presented clearly and are easy to understand (Rima et al., 2022). Generally, encyclopedias contain information equipped with attractive images, colours and illustrations per the topic being discussed (Huda et al., 2019). The nature of the encyclopedia is to provide information that is packaged lightly (Febriani & Widodo, 2021).

As a biology learning resource, the plant encyclopedia has proven feasible and valid for use (Ilma & Wijarini, 2018; Solin et al., 2024). In addition, Julianti et al. (2021) reported that developing an encyclopedia of medicinal plants of the Kerinci community as a high school learning resource gave a very good response to students. The Encyclopedia of Medicinal Plants as a learning media in schools provides many benefits, including adding a variety of exciting learning media, increasing knowledge for

students, and fostering student enthusiasm to increase student understanding. Indirectly, it will also foster an attitude of environmental conservation in students, where students will be encouraged to preserve and maintain existing local potential and utilize natural resources sustainably. Thus, conservation activities in students will be able to become a collective culture or habit that has a positive impact. Based on the background that has been described, this research aims to develop a valid and practical encyclopedia of medicinal plants for the Natuna Malay community.

B. Material and method

This study used research and development (RnD) methods. The model used is Thiagarajan's 4D development (Thiagarajan et al., 1974), which has four stages: Define, Design, and Development. However, the dissemination stage was not carried out due to time and cost constraints.

In the define stage, learning needs are determined and defined. This begins with an analysis to determine the objectives and constraints of learning. Through this stage, researchers conduct an analysis to study students' needs in the learning process, such as student problems, selected materials, curriculum adjustments, and how to present good media.

The design stage aims to design learning media. The design of this Encyclopedia refers to Renita et al. (2020), which is divided into several parts: the initial part, the content part, and the closing part.

The development stage in this research includes expert validation and testing. Activities at this stage, namely validation, are the follow-up results of the design stage. Validation is carried out by assessing teaching materials to validators who have competence in their respective fields, then revisions are made to improve the results of the assessment by the validator.

Data from the analysis of medicinal plants involved interviews with informants, namely villagers in Ceruk Village, Selemam Village and Tanjung Village, using a snowball sampling technique.

The subjects in this study were 28 students from X MIPA 1 and X MIPA 2 classes at SMAN 1 Bunguran Timur Laut. Product validity is measured from the validation sheet based on the assessment of experts, namely material experts, media experts, and linguists. Practicality is done by giving questionnaires to students through small-scale trials and large-scale trials. A Likert scale measurement scale was used to determine several categories of validity of this media. The categories are shown in Table 1 and Table 2.

$$P = \frac{\sum x}{\sum xi} \times 100\% \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{Formula 1}$$

Description:
P = Percentage score
$\sum x$ = The number of scores obtained per item
$\sum xi$ = Total number of scores
100% = Constant

Table 1 Validation assessment category

Percentage	Criteria	Description
81%-100%	Very Valid	No Revision
61%-80%	Valid	No Revision
41%-60%	Valid Enough	Revision
21%-40%	Less Valid	Revision
0%-20%	Highly Invalid	Revision

(Source: Prayitno, 2017)

Table 2 Student response assessment category

Percentage	Criteria
84% < skor ≤ 100%	Very Positive
68% < skor ≤ 84%	Positive
52% < skor ≤ 68%	Regular
36% < skor ≤ 52%	Negative
% < skor ≤ 36%	Very Negative

(Source: Abidin & Purbawanto, 2015)

C. Results and discussion

The result of this research is an encyclopedia of medicinal plants of the Natuna Malay Community. This research uses the 4D development model. The stages carried out by researchers consist of Define, Design and Develop.

1. Define

The results of this stage found problems related to learning media used in the form of textbooks and powerpoints that have not utilized local potential, so teachers still have difficulty exploring students in learning biology on biodiversity material. Furthermore, the material presented is only in writing and only given visuals in the form of images, reducing students' interest in learning it. Students also get bored quickly, resulting in low concept understanding. If the biodiversity material is associated with local potential and is equipped with exciting pictures, it will increase student interest in learning and understanding it (Sarip et al., 2022). This is by the results of interviews with students who prefer learning biodiversity material with media that contains many images, attractive appearance, easy explanation and related to local potential. Therefore, teachers and students expect learning media that are contextual and based on local potential. Based on the analysis results, it is necessary to innovate learning media based on local potential to make learning materials easy to understand and increase students' knowledge and creativity. The analysis results of medicinal plants obtained as many as 22 types of medicinal plants used by the Natuna Malay community were identified, as shown in Table 3.

Based on the findings of the interview, researchers conducted observation and documentation of the morphological characteristics of vegetative and generative plants. The results of identification and morphological utilization are included in the encyclopedia product.

Table 3 Medicinal plants in the Natuna Malay community

Local Name	Scientific Name	Parts Used	Processed	Benefit
Daun Kulet Adep	*Mussaenda frondosa*	Leaves	Soaked	Rash in baby
Duduk	*Melastoma malabathricum*	Leaves	Pounded	Iincision wound
Durian Belanda	*Annona muricata*	Leaves	Boiled	Cholesterol
Juluk Andu	*Cedrela montana*	Root	Boiled	Asthma
Kayu Manes	*Cinnamomum verum*	Bark	Soaked	Diarrhea, Cough
Kembes	*Desmodium gangeticum*	Root	Soaked	Barren
Kunyit	*Curcuma longa*	Rhizome	Pounded	Gout
Leben	*Vitex pinnata*	Root	Scrubbed	Eczema
Linggeng	*Cassia alata*	Leaves	Pounded	Tinea versicolor, Ringworm
Musi	*Callicarpa longifolia*	Leaves	Boiled	Malaria, Hepatitis
Mundeng	*Rhodomyrtus tomentosa*	Leaves	Boiled	Diabetes
Ngujin	*Acanthus ilicifolius*	Leaves	Soaked	Heatiness
Pandan	*Pandanus amaryllifolius*	Leaves	Soaked	HypertensionPasak
Bumi	*Eurycoma longifolia*	Root	Soaked	Heatiness
Peti	*Syzygium zeylanicum*	Root	Soaked	Dengue fever
Pinang	*Areca catechu*	Root	Soaked	Magh
Simbo	*Dillenia suffruticosa*	Root	Scrubbed	Burns
Sirih Hijau	*Piper betle*	Leaves	Boiled	Vaginal discharge
Sirih Merah	*Piper crocatum*	Leaves	Soaked	Diabetes, Rheumatism
Tapak Liman	*Elephantopus scaber*	Root	Boiled	Jaundice
Tumbung	*Tabernaemontana divaricata*	Root	Scrubbed	Flu
Ubi Kayu	*Manihot esculenta*	Leaves	Boiled	Anemia, Worms

2. Design

The Design stage aims to design learning media. The design of this encyclopedia by Renita et al. (2020) is divided into several parts, namely the initial part, the content part, and the closing part. In the design stage, the tasks that the researcher must complete are determining the topic for the encyclopedia learning media according to class X material biodiversity, designing encyclopedia media by designing the front cover and back cover and choosing contrasting colours attractive to students. The material preparation of the encyclopedia consists of the results of research carried out on medicinal plants by the Natuna Malay community. The material is organized, complete with pictures of each type of plant. The introductory section consists of the front cover of the encyclopedia, which contains the title, author's name and illustrations of medicinal plants. The cover design is designed with a medicinal plant theme to provide an overview of what is presented in the encyclopedia and to attract readers. Media attractiveness is related to the visual appearance of the media (Mustadi et al., 2022). According to the opinion Paramita et al. (2019), the presentation of clear image displays on the media is needed to convey learning messages effectively and attract more students' attention.

The content section contains the introductory wording pages, list of contents, instructions for use, introduction, picture of medicinal plants, plant classification, description of each image consisting of morphology, plant morphology, classification of the plant, descriptions of each picture which consists of plant morphologies, parts used, methods of processing, benefits. There is a QR code that contains video processing of the medicinal plant Natuna Malay community which can help students to understand the material and make the encyclopedia have a high level of literacy. The material content section is the central part of the encyclopedia that describes the knowledge that students must learn (Aini et al., 2024). The closing part of this encyclopedia is composed of a glossary, bibliography and author profile.

3. Development

The Development stage aims to produce encyclopedias as learning media that are feasible to use based on the revision of criticism and input from experts (validator). Hidayat & Mulyawati (2022) and Salsabila et al. (2023) states that validation is an assessment of the media to prove that the media is suitable for use. This validation is very important to ensure that the learning media developed is suitable for use as learning media (Susanto et al., 2024). The learning media that has been produced can be said to be feasible if it meets the aspects of validity and student response. Aspects of validity assessment are based on material experts, media experts, and linguists, and student responses are based on small-scale trials and large-scale trials (Puspitasari & Febrinita, 2021). Before the trial, the product can be revised based on the experts' assessment. The media validity test involved nine selected validators, divided into three material experts, three media experts and three language experts. The validity test results are shown in Table 4.

Table 4 Validation result by validator

No	Expert validator	Percentage	Criteria
1	Material	98,88%	Very Valid
2	Media	99,52%	Very Valid
3	Language	88,33%	Very Valid

The validation results that have been carried out show very valid criteria. The material validation results show a percentage value of 98.88% (very valid) on four assessment indicators, namely, the accuracy of the material, activities that support the material, the currency of the material, and the material's development of thinking skills. Media validation results amounted to 99.52% (very valid). This result shows that in terms of quality, the developed encyclopedia design has met the required elements, from the size and cover design to the overall encyclopedia design. The result of language validation was 88.33% (very valid). The six components of language assessment measured in the encyclopedia include straightforwardness, communicativeness, interactiveness, dialoguality suitability to the intellectual level of students, language, and the use of terms and symbols. According to research conducted by Febrianti & Sunandar (2024), the media is considered valid or feasible if it is in the range of >61%. In addition, research conducted by Sabilla et al. (2023) on the findings of the ethnobotanical-based encyclopedia of wrapping plants in the Malay Tribe in Meliau District showed a high level of validity, with a validity percentage of 91.67%. The encyclopedia was also revised based on validator suggestions until it was feasible to produce in the learning process. The following is a comparison of products 1 (see Figure 1 (a) before revision) with products 2 (see Figure 1 (b) after revision).

Figure 1 Encyclopedia cover: (A) before revision, and (B) after revision (in Indonesian)

The illustration of medicinal plants on the encyclopedia cover is enlarged, and the font size of the title on the encyclopedia cover is also enlarged to make each word more visible. Revisions contained in this section are changed, and increasing the size of the image background by adding illustrations of medicinal plants (see Figure 2). The revision in this section is to clarify the background to make it look more attractive and increase the size of the image so that it looks clear (see Figure 3). The revision in this section is to increase the contrast of the background in the design to make it clearer and more attractive. The size of the processing photo also needs to be enlarged to make it look clearer, and the QR code also needs to be enlarged. This aims to make it easier for students to scan the QR code (see Figure 4).

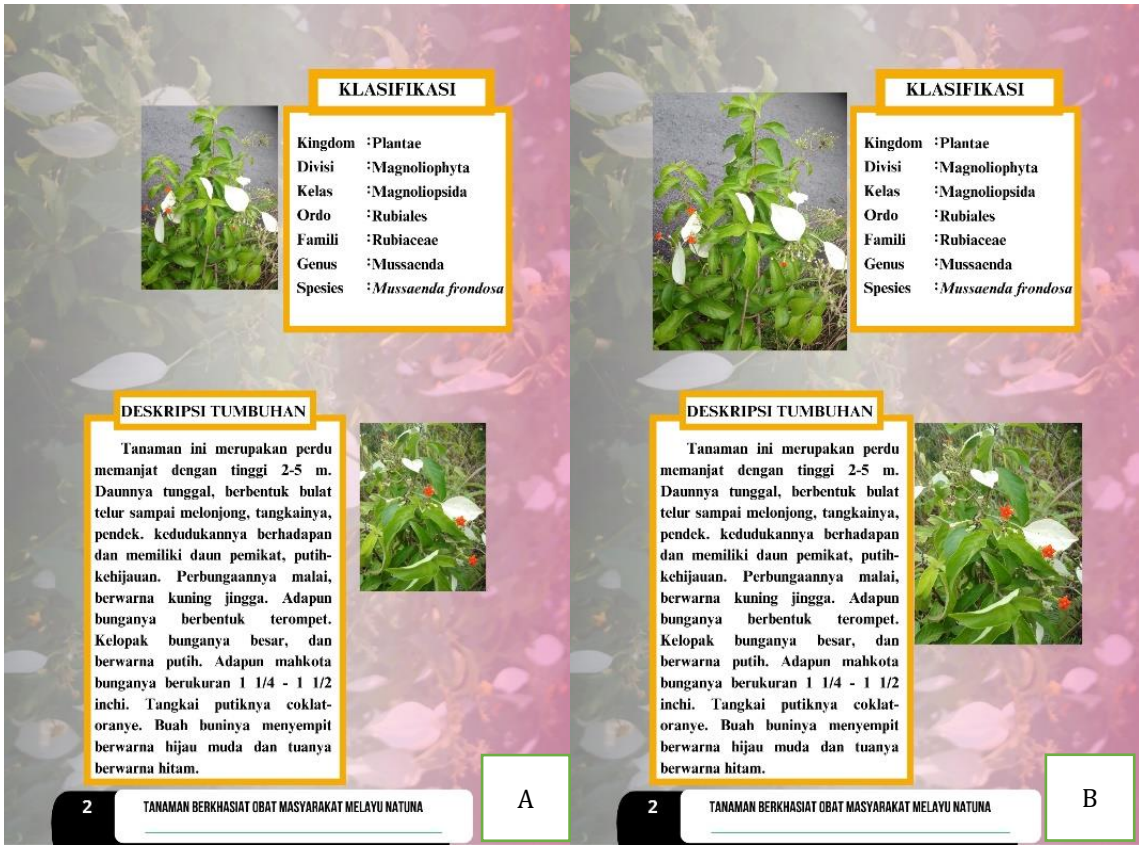

Figure 2 Encyclopedia content: (A) before revision, and (B) after revision (in Indonesian)

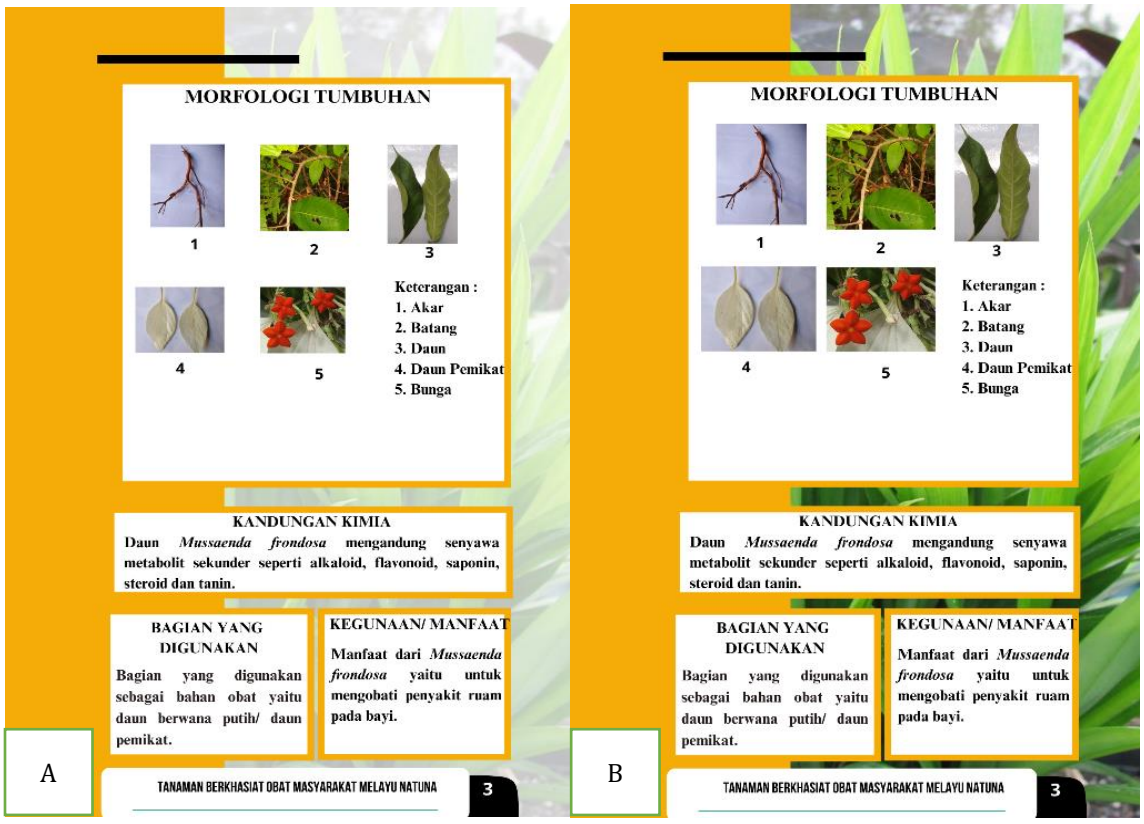

Figure 3 Encyclopedia content: (A) before revision, and (B) after revision (in Indonesian)

Figure 4 Encyclopedia content: (A) before revision, and (B) after revision (in Indonesian)

The product trial stage is carried out to measure practicality. The practicality of the media is an important aspect to show that the media is effective (Hartika et al., 2024). The product will be revised according to the comments and suggestions given by students to get a more feasible product. The product trial stage was carried out with a small-scale and large-scale trial. Students assessed the encyclopedia using a questionnaire that had been provided. Student responses in the small-scale trial used 20% of 40 students, and the large-scale trial used 50% of 40 students in X MIPA 1 and X MIPA 2 classes based on high, medium and low ability levels. The aspects assessed were material feasibility, language, implementation, and presentation appearance. Learner responses are based on 20 questions, consisting of ten positive and ten negative questions, as shown in Table 5.

Table 5 Student response questionnaire

No.	Statement
1.	For me, the information in the encyclopedia provides new knowledge
2.	The material in the encyclopedia does not increase motivation to learn about the biodiversity of medicinal plants
3.	Encyclopedia can help me understand the material well
4.	I am not happy with the local potential in the surrounding environment that is used as learning media
5.	I need reference books such as this encyclopedia as a learning medium in class.
6	I am not interested in learning by utilizing local potential.
7.	I find the language used easily understood
8.	I find the language used challenging to understand
9.	This encyclopedia can foster my curiosity
10.	This encyclopedia did not spark my curiosity to learn more about it
11.	I feel that the colours used in the encyclopedia are varied and interesting
12.	I feel that the colours used in the encyclopedia are not varied and not interesting.
13.	The type and size of the font used are clear read
14.	The type and size of the font used are not clear to read
15.	The image display is clear and not faint
16.	The image display is unclear and sketchy
17.	I am very interested in seeing the pictures presented in the encyclopedia.
18.	I am not very interested in looking at the pictures presented in the encyclopedia
19.	The overall appearance of the encyclopedia very interesting
20.	The overall appearance of the encyclopedia not very attractive

Table 6 Student response result

No	Trial scale	Percentage	Criteria
1	Small Scale	81,62%	Positive
2	Large Scale	98%	Very Positive

The small-scale and large-scale trials aimed to determine whether the encyclopedia media developed was suitable for learning. The small-scale trial was conducted on 20% of students from a total of 40 students, namely eight students of class X MIPA 1 and X MIPA 2 at SMAN 1 Bunguran Timur Laut. The large-scale trial was conducted on 50% of students from 40, with 20 students of class X MIPA 1 and X MIPA 2 at SMAN 1 Bunguran Timur Laut. The results of the small-scale trial showed a percentage value of 81.62% (positive), and the results of the large-scale trial showed a percentage value of 98% (very positive) as shown in Table 6.

Based on the analysis of student response data in Table 6, the results of student assessment of the encyclopedia of medicinal plants as a whole show that student responses are very positive. Students think the medicinal plant encyclopedia has a very good appearance, the images presented are clear, and the content and language are easy to understand. Thus, the development of the Natuna Malay community medicinal plant encyclopedia is very practical to use.

The learning media developed is quite practical because it benefits teachers and students. Some benefits are that learning media can increase students' enthusiasm for learning, make learning easier to understand, and foster an attitude toward environmental conservation. This is by research conducted by Prawati et al. (2024) that the content and presentation of encyclopedia material are very good because it is in line with the learning objectives of the curriculum and is tailored to the general abilities of high school students so that learning involving local wisdom is very appropriate to be applied to obtain effective learning.

D. Conclusion

The encyclopedia of medicinal plants of the Natuna Malay community is very valid for use in the learning process, where the level of validity based on material aspects is 98.88% (Very Valid), media aspects are 99.82% (Very Valid), and language aspects are 88.33% (Very Valid). The level of practicality of the encyclopedia obtained practical results with a student response questionnaire value in the small-scale test of 81.62% (Positive) and a large-scale test of 98% (Very Positive). It shows that the Encyclopedia of medicinal plants of the Natuna Malay community is declared very valid and positive so that it can be used as learning media in the biology learning process on biodiversity material. This encyclopedia media can also serve as a means of preserving the local wisdom of the Natuna Malay community in utilizing plants as independent medicine.

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