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Development of an encyclopedia of flora and fauna motifs in Singkawang hand-written batik as a biology learning resource

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Abstract

Singkawang City has biodiversity that inspires motifs in Singkawang batik. In order to introduce batik tulis in the city of Singkawang, an encyclopedia media was developed on biodiversity material. This study aims to develop an encyclopedia of flora and fauna motifs of Singkawang hand-written batik by measuring the level of validity and student response to the encyclopedia. This research uses the R&D method with the 4D development model, which consists of defining, designing, developing, and disseminating. Data collection using interviews, observations, questionnaires, and documentation, analyzed with descriptive techniques. The results showed the average validation score in the very valid category, in the media aspect (98.81%), material aspect (98.25%) and language aspect (84.72%). The media was considered practical with very strong criteria based on student responses with an average of 88.78% in the small-scale trial and 96.57% in the large-scale trial. It is concluded that the encyclopedia media of flora and fauna motifs of Singkawang hand-written batik is very valid and very strong from students. The existence of this encyclopedia media is expected to increase public knowledge, especially the younger generation in Singkawang City about the flora and fauna motifs of Singkawang hand-written batik, so that they are able to maintain and preserve hand-written batik in Singkawang city.

Abstrak. *Kota Singkawang memiliki keanekaragaman hayati yang menginspirasi motif pada batik tulis Singkawang. Demi memperkenalkan batik tulis yang ada di kota Singkawang maka di kembangkan media ensiklopedia pada materi keanekaramanan hayati. Penelitian ini bertujuan untuk mengembangkan ensiklopedia corak motif flora dan fauna batik tulis Singkawang dengan mengukur tingkat kevalidan dan respon siswa terhadap ensiklopedia. Penelitian ini menggunakan metode R&D dengan model pengembangan 4D, yang terdiri dari pendefinisian, perancangan, pengembangan, dan penyebaran. Pengumpulan data menggunakan wawancara, observasi, angket, dan dokumentasi, dianalisis dengan teknik deskriptif. Hasil penelitian menunjukkan rata-rata nilai validasi pada kategori sangat valid, pada aspek media (98,81%), aspek materi (98,25%) dan aspek bahasa (84,72%). Media tersebut dinilai praktis dengan kriteria sangat kuat berdasarkan respon siswa dengan rata-rata 88,78% pada uji coba skala kecil dan 96,57% pada uji coba skala besar. Disimpulkan bahwa media ensiklopedia corak motif flora dan fauna batik tulis Singkawang sangat valid dan sangat kuat dari siswa. Adanya media ensiklopedia ini diharapkan menambah pengetahuan masyarakat khususnya generasi muda di Kota Singkawang mengenai corak motif flora dan fauna batik tulis Singkawang, sehingga mampu menjaga dan melestarikan batik tulis yang ada di kota Singkawang.*

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A. Introduction

Education is a basic human need. One can learn everything unknown through education. The role of teachers in the educational process cannot be ignored. Teachers are expected to have the ability and competence to present information to students (Nurfatimah et al., 2022). The success of teachers and students in achieving learning objectives is inseparable from the teaching materials used (Rizki et al., 2020). Learning materials can improve student self-regulation in science subjects (Baist et al., 2019). Learning will take place effectively and efficiently if quality teaching materials are available (Selaturrohmi & Haikal, 2024). Teaching materials, if used by students, will have benefits and advantages, such as being able to prepare and make a significant contribution to carrying out tasks in a well-organized manner (Aldya et al., 2022).

Learning media is a tool or means of conveying material or content that can stimulate students' minds so that the teaching and learning process can run effectively and the learning objectives can be achieved perfectly (Zahwa & Syafi'i, 2022). Learning media facilitates the learning process and improves student learning outcomes (Zaharah et al., 2024).

Based on the results of interviews with science teachers at SMP Negeri 1 Monterado, it is known that science learning uses learning media such as student worksheets, package books, whiteboards, and occasionally PowerPoint. Based on the results of interviews with students at SMP Negeri 1 Monterado, the use of science learning media is currently in the form of books that tend to contain long descriptions, few pictures, and few colors. According to Khotimah et al. (2020), one of the most effective ways to manage classes that need more concentration is by providing media that is interesting to children, namely picture media. Astuti et al. (2023) reinforced the idea that image media can improve students' listening skills. So, it is necessary to develop learning media that contain many pictures and descriptions.

One learning media that can be used is an encyclopedia. Encyclopedia teaching materials are information about subject matter in the form of text and equipped with illustrative images used by educators in the learning process as additional information related to material that is broad in scope so that students can get more detailed information about the material to be studied (Rima et al., 2022). An encyclopedia is a book or series of papers bound together that contains an explanation or discussion of a particular branch of science or field of science (Cahyawulan & Rachmawati, 2018). The advantages of the encyclopedia are that it contains exciting pictures and that the material presented is based on knowledge and phenomena that occur (Lukitasari et al., 2021).

Every region in Indonesia has local wisdom that characterizes the region, one of which is Singkawang City, which is located in West Kalimantan province. Singkawang City was designated as the most tolerant city in Indonesia by the Setara Institute in 2021, with a score of 6,483 (Permana, 2022). The diversity that exists in Singkawang City remains harmonious and inspires batik artists in their work, one of which is Priska Yeni R., a woman and founder of the Batik Kote Singkawang community. The harmony of the people of Singkawang City resulted in the acculturation of cultural aesthetics (Santoso, 2016). The "Kote Singkawang" batik motif produced by Priska is a form of concern for natural preservation, such as the Singkawang orchid motif, which is endemic to Singkawang City and is almost extinct. There are motifs of bamboo betung, kangkong flowers, meihua flowers, sacred lotus, starfish, ivory hornbills, goldfish, gold snails, green turtles, gonggong snails, and white-footed shrimp, which are exciting local wisdom displays of Singkawang residents so that they can be used as learning resources.

This study aims to measure the level of validity of the encyclopedia of flora and fauna motifs of Singkawang hand-written batik as a biology learning resource and analyze student responses to it. It is hoped that this research can provide information and a basis for the world of education in the learning process, especially in Singkawang, by utilizing the flora and fauna motifs of Singkawang batik as a source of biology learning, such as the development of this encyclopedia learning media.

B. Material and method

This research uses the R&D (Research and Development) method with the 4-D development model recommended by Thiagarajan. The development model consists of four stages: define, design, develop, and disseminate. However, in this research, the development stage is only limited to the develop stage.

Trials were carried out in the 2023/2024 school year at SMP Negeri 1 Monterado, Jalan Raya Monterado, Monterado District, Bengkayang Regency, West Kalimantan, Indonesia.

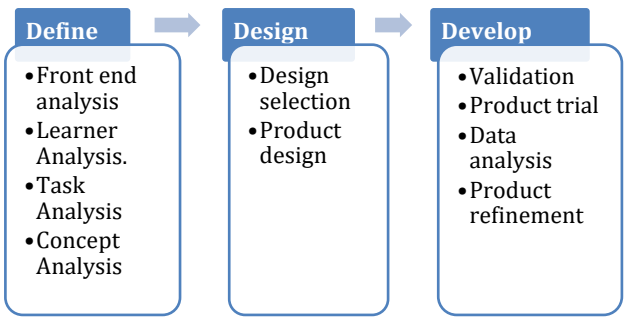

Figure 1 Research procedure

The define stage is the first stage in development research. At this stage, it is carried out to

determine and define development requirements. The first front-end analysis stage aims to bring up and determine the fundamental problems faced in learning biology so that the development of teaching materials is needed. At the learner analysis stage, researchers analyze student characteristics in terms of student abilities. In relation to the development of teaching materials, student characteristics need to be known in order to develop teaching materials that are suitable for student abilities. The task analysis stage is carried out by identifying the competency standards and basic competencies required in learning and then analyzing them into a more specific indicator framework. The concept analysis stage covers biodiversity material in class VII SMP Negeri 1 Monterado related to flora and fauna. The formulation of learning objectives is adjusted from the results of task analysis and concept analysis. Namely, students are expected to be able to carry out learning activities and understand the concept of biological material from the formulation of learning objectives carried out. This will guide the development of encyclopedia learning media. The last stage is the formulation of learning objectives, adjusted from the results of task analysis and concept analysis; namely, students are expected to be able to carry out learning activities as well as be able to understand the concept of biological material from the formulation of learning objectives carried out. This will be a guideline for the development of encyclopedia learning 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 or core part, and the closing part. At this stage, researchers also designed encyclopedia media by paying attention to the design aspect, the material aspect, and the language used.

The development stage aims to produce encyclopedia media as learning media that have been revised based on assessments from material experts, linguists, and media experts. The development stage is the third stage in the research and development of an encyclopedia of flora and fauna motifs of singkawang batik as a biology learning resource that will be developed in this study. It contains material that is easy to understand and pictures that support the material.

Thiagrajan divides the development stage into two activities: Expert appraisal and developmental testing with activities as follows:

1) Expert appraisal stage: namely, the assessment of material experts, media experts, and language experts. At this stage, the media is revised based on input and suggestions provided by each of the three validators. The results are suggestions, comments, and input, which can be used as a basis for revising the media being developed.
2) At the developmental testing stage, class VII students of SMP Negeri 1 Monterado. The number of class VII students is 63. Small-scale trials were carried out on 20% of students. Then, a large-scale trial was carried out, which was tested on 50% of students by distributing questionnaires to determine students' assessments of the product being developed.

Learning media analysis using assessment sheets from validators is used to measure the validity level of encyclopedia learning media. According to Wicaksono et al. (2014), Formula 1 is used to calculate the validity level of learning media. The percentage of validity scores was then matched with the validity criteria (Sugandi & Rasyid, 2019). The validity criteria can be seen in Table 1.

$$P = \frac{\sum x}{\sum x1} X\ 100\% \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{Formula 1}$$

Description:
P = Percentage of validity value
Σx = Number of answers from all respondents in one aspect
Σx1 = Ideal number of answers in one aspect
100% = Constant

Table 1 Criteria for learning media validity

Rating scale	Criteria	Description
81%-100%	Very Valid	No Revision
61%-80%	Valid	No Revision
41%-60%	Fairly Valid	Revision
21%-40%	Less Valid	Revision
0%-20%	Invalid	Revision

(Source: Sugandi & Rasyid, 2019)

The questionnaire in this study was developed as a data collection tool containing 18 questions to be answered by respondents. The questionnaire was used to obtain data on student responses to encyclopedia learning media using a Likert scale. Analysis of student response questionnaires will be carried out using small-scale and large-scale trials. Therefore, students are given a questionnaire sheet, which is useful for filling out the assessment after using and operating the product. The student response scores for each answer are then summed up for each question item and percented according to Formula 2. Then, interpret the percentage of respondents' responses follows Table 2.

$$\%\ \text{NRS} = \frac{\Sigma\ \text{NRS}}{\Sigma\ \text{NRS Maximum}} \text{X}\ 100\% \ldots\ldots \text{Formula 2}$$

Description:
% NRS = Percentage of student response scores
Σ NRS = The total student response score

Table 2 Percentage of student response score

No.	Score (%)	Feasibility criteria
1.	0 % < NRS ≤ 20 %	Very Weak
2.	21 % < NRS ≤ 40 %	Weak
3.	41 % < NRS ≤ 60 %	Strong
4.	61 % < NRS ≤ 80 %	Strong enough
5.	81 % < NRS ≤ 100 %	Very Strong

(Source: Sugandi & Rasyid, 2019)

C. Results and discussion

The results of this research are an encyclopedia of flora and fauna motifs in Singkawang-written batik. This research uses a 4D development model. The stages carried out by researchers consisted of Define, Design, and Develop. This stage is carried out by identifying problems in the learning process so that they can be used as research background (Sari et al., 2023).

Define

The define stage consists of five main stages: front-end analysis, student analysis, concept analysis, formulation of learning objectives, and analysis of Singkawang batik flora and fauna motifs.

In the first stage, based on the results of interviews with science teachers, it is known that science learning still needs to be more attractive to students because the learning media available at school are very minimal. Teachers still use learning media such as student worksheets, textbooks, and blackboards and occasionally use PowerPoint. The limited number of infocus makes it easier for teachers to display exciting images through media other than books. According to Sanimah et al. (2024), learning activities require learning media that are in accordance with the teaching material so that students get a memorable learning experience.

In the second stage, based on the results of interviews with students, it can be concluded that students are more interested in books that contain many pictures. Engaging media can support the learning process. According to Nurrita (2018), the benefits of learning media can increase student motivation and interest in learning so that students can think and analyze the subject matter provided by the teacher well in a pleasant learning situation and understand the subject matter easily.

The third stage is the selection of material based on the problems that exist at school, namely that students need more media to understand biodiversity material, which results in student scores needing to be in accordance with the teacher's criteria. According to Putra et al. (2019), learning media is a tool that can help students contain the learning materials used so that they can understand the concepts and operate them themselves. In line with Gosal et al. (2023), the encyclopedia is a development of the dictionary. The difference between an encyclopedia and a dictionary lies in the content. Whereas the dictionary generally only contains the definition of each word and only contains synonymous words, the encyclopedia contains a more thorough explanation. It summarizes it in such a way as to make it easier to understand. An encyclopedia is usually equipped with pictures as an explanation.

The fourth stage is done by looking at the flow of Learning Objectives and modules. Learning outcomes on the material of Indonesian ecology and biodiversity, as well as sub-material differences in biodiversity between Indonesia and other parts of the world, namely students, identify interactions between living things and their environment. The learning objective to be achieved is to explain the differences in biodiversity between Indonesia and other parts of the world.

The final stage is after observations and interviews with informants, namely Priska (originator of the batik community “Kote Singkawang"), and the results are obtained in Table 3 and Table 4.

Table 3 Observation results of the flora of Singkawang hand-written batik

No	Regional Name	Latin Name	Family
1	Anggrek Singkawang	*Dendrobium singkawangense*	Orchidaceae
2	Bambu Betung	*Dendrocalamus asper*	Poaceae
3	Bunga Kangkung	*Ipomea aquatica*	Convovulceae
4	Bunga Meihua	*Prunus mume blossoms*	Rosaceae
5	Teratai Suci	*Nelumbo nucifera*	Nelumbonaceae

Table 4 Observation results of the fauna of Singkawang hand-written batik

No	Regional Name	Latin Name	Family
1	Bintang Laut	*Archaster typicus*	Archasterdae
2	Enggang Gading	*Rhinoplax vigil*	Bucerotidae
3	Ikan Mas	*Cyprinus carpio*	Cyprinidae
4	Keong Semak	*Bradybaena similaris*	Hygromiidae
5	Penyu Hijau	*Chelonia mydas*	Chelonidae
6	Siput Gonggong	*Laevistrombus canarium*	Strombidae
7	Udang Kaki Putih	*Litopenaeus vannamei*	Penaeidae

Design

Design stage aims to design learning media. The design stage aims to design learning media. According to Rasagama (2020), Some of the benefits of learning media in the student learning process include student learning motivation, which will grow with more interesting learning, thus enabling students to better understand the meaning and master learning material and be able to achieve learning goals. The design of encyclopedia by Renita et al. (2020) is divided into

several parts, namely the beginning, contents, and closing. At the design stage, the tasks that the researcher must complete are determining the topic of learning media for class VII biodiversity encyclopedia material, determining the size of the encyclopedia with dimensions of 15.5 cm x 23 cm using art paper, designing the media encyclopedia by designing the front cover and back cover and choosing colors interesting contrast for students. The preparation of this encyclopedia material consists of the results of research that has been carried out on the flora and fauna motifs of Singkawang written batik. The material is prepared 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 flora and fauna motifs in Singkawang's handwritten batik. The cover design has a flora and fauna theme. The contents section contains a foreword page, table of contents, instructions for use, introduction, pictures of flora and fauna, classification, and description of each picture. The content section is the central part of the encyclopedia, which describes the knowledge that students must learn (Aini et al., 2024). The closing section of this encyclopedia consists of a glossary, bibliography, and author profile. In accordance with the opinion of (Paramita et al., 2019), the presentation of explicit images in the media is necessary so that learning messages are conveyed effectively and attract more students' attention.

Development

The develop stage aims to produce encyclopedia media as feasible media based on expert input (validators). The development of the encyclopedia that has been produced can be said to be feasible if it meets the validity aspects. The validity aspect is obtained based on the assessment of experts (validators). The results of expert validation of the encyclopedia in Table 5 show that all aspects of validation obtained very valid criteria, so that this encyclopedia can be used without revision. The results of the validation that have been carried out show that the criteria are very valid. The language validation results show a percentage value of 84.72% (very valid), material validation results of 98.25% (very valid), and material validation results of 98.81% (very valid). Revisions are still carried out according to suggestions from validators to make it better. Thus, the encyclopedia developed is feasible to test in the field with slight improvement. In line with Prayitno's (2017) statement, media is said to be valid if it is in the range > 61%; thus, the encyclopedia developed is included in the criteria of being very valid and worthy of being tested in the field. According to Rohman (2019), validation is carried out to ensure that the analysis method is accurate, specific, reproducible, and resistant to the range of analytes to be analyzed. Hidayat & Mulyawati (2022) state that validation is an assessment of media to prove that the media is suitable for use.

Table 5 Results of expert validation assessment

No	Validation	Percentage	Criteria
1	Language	84,72%	Very Valid
2	Material	98,25%	Very Valid
3	Media	98,81%	Very Valid

Some of the revisions made to the encyclopedia are presented in the following figures. The following pictures are a comparison between before and after the revision. Figure 2 shows the revisions to the cover, changing the layout and adding images of flora and fauna.

Figure 2 Front cover of the encyclopedia: (A) before revision, and (A) after revision (in Indonesian)

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

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

Figure 3 shows the revision to the instructions for use, which is to select the background color contrast. Then, figure 4 shows the revision of the encyclopedia content, namely organizing the layout and clarifying the images. The encyclopedia that has gone through the revision stage is continued with the student response test. Student responses are based on 18 questions in Table 6.

Table 6 Student response questionnaire

No.	Question
1.	Do you enjoy learning using the encyclopedia of flora and fauna motifs of Singkawang batik?
2.	Do the appearance and images in the encyclopedia of flora and fauna motifs of Singkawang batik draw your attention to participate in learning?
3.	Is the design of the encyclopedia of flora and fauna motifs of Singkawang batik unattractive?
4.	Were you able to understand the material with the help of the encyclopedia of flora and fauna motifs of Singkawang batik?
5.	Do you need help understanding the example questions given?
6.	Is the language and material in the encyclopedia of flora and fauna motifs from Singkawang batik quite boring?
7.	Is the language and material in the biology magazine and the flora and fauna motifs of Singkawang batik easy to understand?

No.	Question
8.	Do you need help understanding the content of the material in the encyclopedia of flora and fauna motifs from Singkawang batik, especially on the sub-matter of the benefits of biodiversity?
9.	Are you less interested in learning using the encyclopedia of flora and fauna motifs from Singkawang batik?
10.	Is the material explained in the encyclopedia clear, coherent, and easy to understand?
11.	Is the design of the encyclopedia attractive with clear illustrations?
12.	Is the shape of the encyclopedia and the font size used simple and easy to read?
13.	Is the encyclopedia media very complicated and not useful?
14.	Is the encyclopedia very boring to you?
15.	Is the layout of the encyclopedia parts difficult to understand?
16.	Does the encyclopedia media of flora and fauna motifs from Singkawang batik motivate you to learn the sub-matter on the benefits of biodiversity?
17.	Does the encyclopedia not make you interested in learning?
18.	Does learning using the encyclopedia make you more active?

The student response test was carried out by giving 18 questions, where there were 18 questions consisting of 10 positive questions and 8 negative questions. Observation of student responses was conducted in small and large groups with the aim of obtaining representative results in terms of use and acceptance by students. This assessment aims to obtain objective data from student responses to the encyclopedia developed, which will later become the basis for improving the encyclopedia.

Table 7 Student response assessment criteria

No	Experiment	Percentage	Feasibility criteria
1	Small Scale	88,78%	Very Strong
2	Large scale	96,57%	Very Strong

The small-scale trial aims to determine whether the developed encyclopedia media is suitable for use in learning. The small-scale trial was conducted on 20% of students from a total of 63 students. 13 students were found in class VII of SMP Negeri 1 Monterado. Based on Table 7, the results of the percentage of student responses through the small-scale trial were 88.78%. The large-scale trial aims to determine whether the developed encyclopedia media is suitable for use in learning. The large-scale trial was conducted on 60% of students from a total of 63 students, with 32 students in class VII of SMP Negeri 1 Monterado. Based on Table 7, the results of the percentage of student responses through the large-scale trial were 96.57%.

According to Bare & Sari (2021), if the student response value is in the range of 80% to 100%, it is classified as very strong. This means that students' responses to the encyclopedia media provide a practical response. Aini et al. (2024) developed a local plant encyclopedia as a biology learning media, obtaining good criteria for student responses with a percentage of 78.83% for the small-scale test, and 84.47% for the large-scale test. In addition, with different criteria, Pranriska & Manalu (2024) developed an encyclopedia of reproductive system material with student response test results obtaining 84% with very practical criteria.

Based on the comparison of several previous studies, it is concluded that the encyclopedia developed and obtained very strong feasibility criteria can be interpreted as getting very good student responses. In addition, this encyclopedia can be concluded to be very practical. Media practicality is an important aspect to show that media is used effectively (Hartika et al., 2024; Fajeriadi et al., 2024). The involvement of students in the development of learning media is in line with the need to present interactive learning media, in accordance with student interests, which in turn can improve their understanding and learning outcomes.

D. Conclusion

Based on the results of the study, it can be concluded that learning media in the form of an encyclopedia of flora and fauna motifs of Singkawang hand-written batik has been developed using Thiagarajan's 4D research model, as one of the learning media at SMP Negeri 1 Monterado, which has been tested in class VII. The results of the media validity test from the media expert aspect reached 98.81% with very valid criteria, the material expert aspect amounted to 98.25% with very valid criteria, and the linguist aspect reached 84.72% with very valid criteria. This media was declared practical, with the average value of the small-scale student response test of 88.78% which included very strong criteria, and the large-scale student response test of 96.57% which also included very strong criteria. Thus, the encyclopedia of flora and fauna motifs of Singkawang hand-written batik is declared practical for use by students in learning. It is hoped that the existence of this encyclopedia media can increase public knowledge, especially the younger generation in Singkawang City, about the flora and fauna motif patterns of Singkawang batik, so that they are able to maintain and preserve hand-written batik batik in Singkawang City.

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