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Development of Encyclopedia of Sub-Materials the Role of Biodiversity in Life for Class X Based on the Results of Inventory of Medicinal Plants for Reproductive Health

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Abstract. Learning media is one component in the learning system which functions as a means of non-verbal communication. The use of learning media aims to help educators convey information so that it is easy to understand, learning becomes effective and efficient, increasing student activity and student motivation to learn. Media creation can also be developed based on the research results. The aim of this research is to determine the feasibility of a sub-material encyclopedia on the role of the biodiversity for life in class X based on the results of inventory of medicinal plants for male and female reproductive health in Balai Harapan Village, Tempunak District, Sintang Regency as a learning medium. This research uses development research methods. This development procedure consists of determining potential and problems, gathering information, designing the product, validating the design, and revising the design. The validity of the encyclopedia is obtained through content validation carried out by five validators. Encyclopedia validation is viewed from three aspects, namely presentation, content and language. Validation analysis uses Lawshe's (1975) content validity ratio (CVR) and content validity index (CVI) approaches. The research results show an average CVR of 1.00, resulting in a CVI value of 1.00 in the "valid" category. Based on the research results, it can be concluded that the encyclopedia is suitable for use as a learning media.
Keywords: Encyclopedia, feasibility, learning media

Introduction

Studying and learning is a main activity in the educational process. The learning process can occur due to interactions carried out by a person with their environment (Yunita & Supriatna, 2021; Raibowo et al., 2019; Karlina & Setiyadi, 2019). The main role in the learning process, namely the teacher (educator) as someone who conveys information and students as someone who receives information (Dolong, 2016; Kirom, 2017; Napitupulu, 2019). In the learning process, an educator is not only a motivator and facilitator but must be able to provide information using various strategies (Fatimah & Sari, 2018) and media that have been declared suitable for use in learning (Paramita et al., 2018; Sukadi & Nurhayati, 2019; Panjaitan et al., 2020; Panjaitan et al., 2021).

Selection of appropriate media by educators aims to produce quality learning in accordance with the objectives that have been set (Rahma, 2019; Istiqlal, 2018; Nurrita, 2018). This is because learning media is one component in the learning system which

functions as a means of non-verbal communication (Magdalena et al., 2021; Umardiyah & Amaliah, 2021). The use of learning media aims to help educators convey information so that it is easily understood by students (Nurrita, 2018), learning becomes effective and efficient (Budiyono, 2020; Hada et al., 2021; Audie, 2019), increase student activity (Wulandari et al., 2020), and student motivation to learn (Puspitarini & Hanif, 2019). Learning media can also give students direct experience with real world situations so that ongoing learning can be more interesting, meaningful and varied (Novelza & Handican, 2023). The forms of media that can be used in the learning process can be electronic media or print media (Wahidi, 2018). Print media is media used in the learning process which is presented in printed form (Ubaidillah, 2017; Hidayat et al., 2015).

Encyclopedia is one of the media that can be used in the learning process. Encyclopedias contain various kinds of complete information arranged alphabetically as a characteristic (Nuraida & Nisa, 2017; Pristalika et al., 2022; Retawidyaningrum & Triatmanto, 2022). The encyclopedia is equipped with interesting pictures and illustrations according to the topic of discussion (Ubaidillah, 2017; Pristalika et al., 2022; Cahyawulan & Rachmawati, 2018). Using interesting pictures or illustrations in the encyclopedia can reduce boredom in the learning process (Pristalika et al., 2022). Encyclopedia media in learning can increase students' learning motivation (Mulyani & Armiati, 2021) and improve student learning outcomes (Renita et al., 2020).

Media creation can also be developed based on research results (Panjaitan et al., 2019; Panjaitan et al., 2021; Panjaitan & Tenriawaru, 2022). Several examples of media developed based on research results include documentary films as an additive sub-material learning medium carried out by Panjaitan et al. (2019), development of an encyclopedia of medicinal plants for the Kerinci community as a learning resource for biodiversity material for high school students carried out by Julianti et al. (2021), feasibility of an inventory booklet of medicinal plants as a learning medium carried out by Panjaitan et al. (2021), feasibility of an encyclopedia on the sub-material of utilizing biodiversity from the results of ethnobotany of medicinal plants carried out by Nurmasari et al. (2022), feasibility of the media booklet sawi dayak (Elephantopus mollis Kunth) for student biology learning carried out by Panjaitan & Tenriawaru (2022), and development of an encyclopedia of medicinal plants based on local potential in Subulussalam City as a learning resource for plantae material carried out by Solin et al. (2023).

Balai Harapan Village is one of 26 villages in Tempunak District, with a total population of 1.481 people/467 families and an area of 3.384 km2. The majority of the population is ethnic Javanese and Seberuang Dayak. The people of Balai Harapan Village still maintain their local wisdom, namely the use of medicinal plants as an alternative treatment, especially for reproductive health.

The subject of biodiversity is one of the materials studied in biology learning. One of the sub-materials studied is the role of biodiversity for life. This sub-material in the learning objectives flow of the merdeka curriculum is included in phase e learning outcomes, namely that at the end of phase E, students have the ability to create solutions to problems based on local, national or global issues related to understanding the diversity of living things and their role, viruses and their role, biological technological innovation, ecosystem components and interactions between components and environmental changes. In the sub-material on the role of the diversity of living things for life, students are expected to be able to find information about the types of plants that are used in everyday life, such as the use of plants as medicines (Ariani et al., 2019). So far, several media have been declared suitable for use in the learning process of the role of the diversity of living things in life, especially plants as medicine, including documentary films (Afifah et al., 2016), flipbook (Yani et al., 2016), booklet (Panjaitan et al., 2021), and magazines (Lestari et al., 2021).

The information related to biodiversity for life is presented in the form of an encyclopedia. Therefore, it is hoped that this encyclopedia can become an alternative learning medium in the sub-material on the role of biodiversity in Grade X biology and increase students' knowledge of local wisdom in the use of plants as traditional medicine. The purpose of this study was to determine the feasibility of an encyclopedia on the role of biodiversity in life for class X based on the results of an inventory of medicinal plants for male and female reproductive health in Balai Harapan Village, Tempunak District, Sintang Regency.

Methods

This research constitutes research and development (Sugiyono, 2015). However, the research only reached the design revision stage. The stages carried out in this research include determining potential and problems, gathering information, designing the product, validating the design, and revising the design. The first stage, determining potential and problems was carried out by interviews with biology teachers with the aim of finding out information that would be used as a reference for developing more varied media. The second stage, collecting information related to the sub-material role of the diversity of living things for life and an inventory of types of plants with medicinal properties, especially for reproductive health. The third stage, designing the product, is designing an encyclopedia of the role of the diversity of living things in life based on the results of an inventory of medicinal plants in Balai Harapan Village. Media design starts from determining the title of the encyclopedia, learning objectives, creating a summary of the material, arranging the components of the encyclopedia, determining text, images, colors and margins. The fourth stage, validation of the encyclopedia design was carried out by five validators consisting of two biology education lecturers and three biology teachers. The instrument used in the validation process contains three assessment aspects, namely format, content and language aspects. This stage aims to determine the feasibility of the encyclopedia that has been developed. Analysis of validation results and validity calculations refers to Lawshe (1975) using content validity ratio (CVR). The fifth stage, revising the encyclopedia design which has been validated according to the validator's suggestions.

Results and Discussion

This research is development research, namely research and development (R&D). The encyclopedia developed in this research is a sub-material on the role of diversity of living things for life which is enriched with the results of an inventory of medicinal plants to support male and female reproductive health in Balai Harapan Village, Tempunak District, Sintang Regency, West Kalimantan. This encyclopedia consists of three parts, namely introduction, contents and conclusion. The first part is the introduction which contains a foreword containing thanks to various parties who have helped in compiling the encyclopedia, a table of contents containing titles, subtitles and page numbers, and instructions for use which contain a general explanation of the contents of the encyclopedia. The encyclopedia is also equipped with competency standards which contain learning achievements and learning objectives according to the phases used in the independent curriculum. The second part is the content which contains a brief explanation of the diversity of living creatures, the role of the diversity of living creatures for life, and a brief explanation of male and female reproductive health accompanied by various supporting pictures/illustrations. This encyclopedia is also equipped with the results of an inventory of medicinal plants that support male and female reproductive health in Balai Harapan Village. Information about medicinal plants that support reproductive health is equipped with local

names, classification, pictures, descriptions, benefits, parts used, processing methods and rules of use. The final section, namely section 3, contains a list of bibliography or reference sources used, an index containing important terms in the encyclopedia and arranged alphabetically, as well as a glossary containing foreign language terms to help readers understand the meaning of these terms. Media that has been created and will be used in the learning process must be validated first to determine its suitability as learning media (Panjaitan et al., 2021; Wulandari et al., 2020; Muslina et al., 2017). The results of the sub-material encyclopedia media validation of the role of the diversity of living things for life based on an inventory of medicinal plants that support male and female reproductive health can be seen in Table 1.

Table 1. Results of validation and analysis of encyclopedia media data

Aspect	Criteria	Validator sequence number					CVR	Information
		1	2	3	4	5		
Presentation	1. Encyclopedia cover display	4	4	4	3	4	1.00	Valid
	2. Suitability and attractiveness of the size and type of letters used	4	4	4	3	4	1.00	Valid
	3. Clarity and suitability of image/illustration quality	3	4	4	4	4	1.00	Valid
	4. Completeness and systematic and alphabetical presentation of encyclopedia components	4	4	3	4	4	1.00	Valid
	5. The effectiveness of encyclopedias as media	4	3	3	3	4	1.00	Valid
Content	1. Suitability of material with learning outcomes (CP) and learning objectives (TP)	4	4	3	3	4	1.00	Valid
	2. Conformity of research data with the content of the material	4	3	3	3	4	1.00	Valid
	3. Orderliness in information delivery	4	3	4	3	4	1.00	Valid
Language	1. Use sentences that are easy to understand	4	4	3	4	4	1.00	Valid
	2. Conformity of Indonesian with the Pedoman Umum Ejaan Bahasa Indonesia (PUEBI)	4	4	3	4	4	1.00	Valid
Overall Average/CVI							1.00	Valid

The analysis results obtained based on three aspects and ten criteria obtained a validation value of 1.00 with the valid category. The overall average of the criteria CVI obtained a value of 1.00 with the category valid.

Presentation Aspects

The presentation aspect received a score of 1.00 in the valid category. The presentation aspect in the encyclopedia consists of five criteria. The first criterion is the appearance of the encyclopedia cover. Based on the validation results obtained a CVR value of 1.00 with a valid category. The encyclopedia cover has attractive colors, a cover title that is easy for students to understand, and a proportional layout (Figure 1). The cover title that is easy for students to understand is important because it can help them quickly comprehend and retain the learning material. The use of a proportional layout also ensures a balanced visual composition, making the presented information easier to read and more comfortable to observe for students. As research presented by Hukubun (2023), who stated that a title that is easy to understand and read can assist in both understanding and remembering. According to Nurdini et al. (2018); Sulistri et al. (2020) proportional placement of images and choosing the right and appropriate colors can attract students' interest in reading them. The colors used on the cover of this encyclopedia are white and grayish blue.

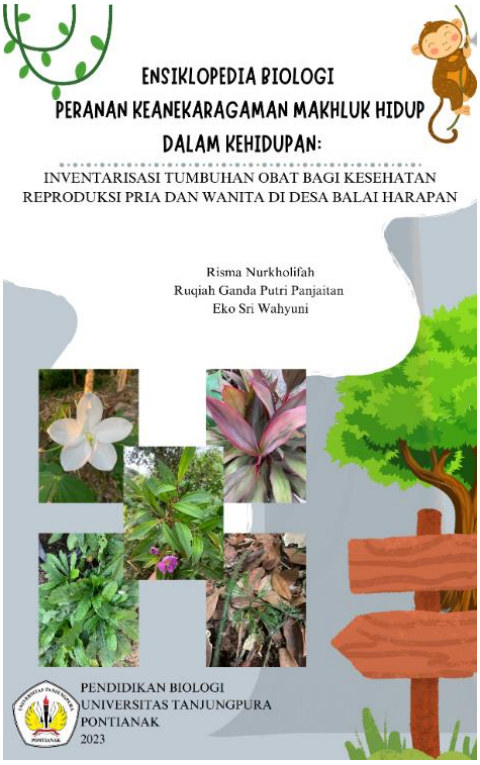
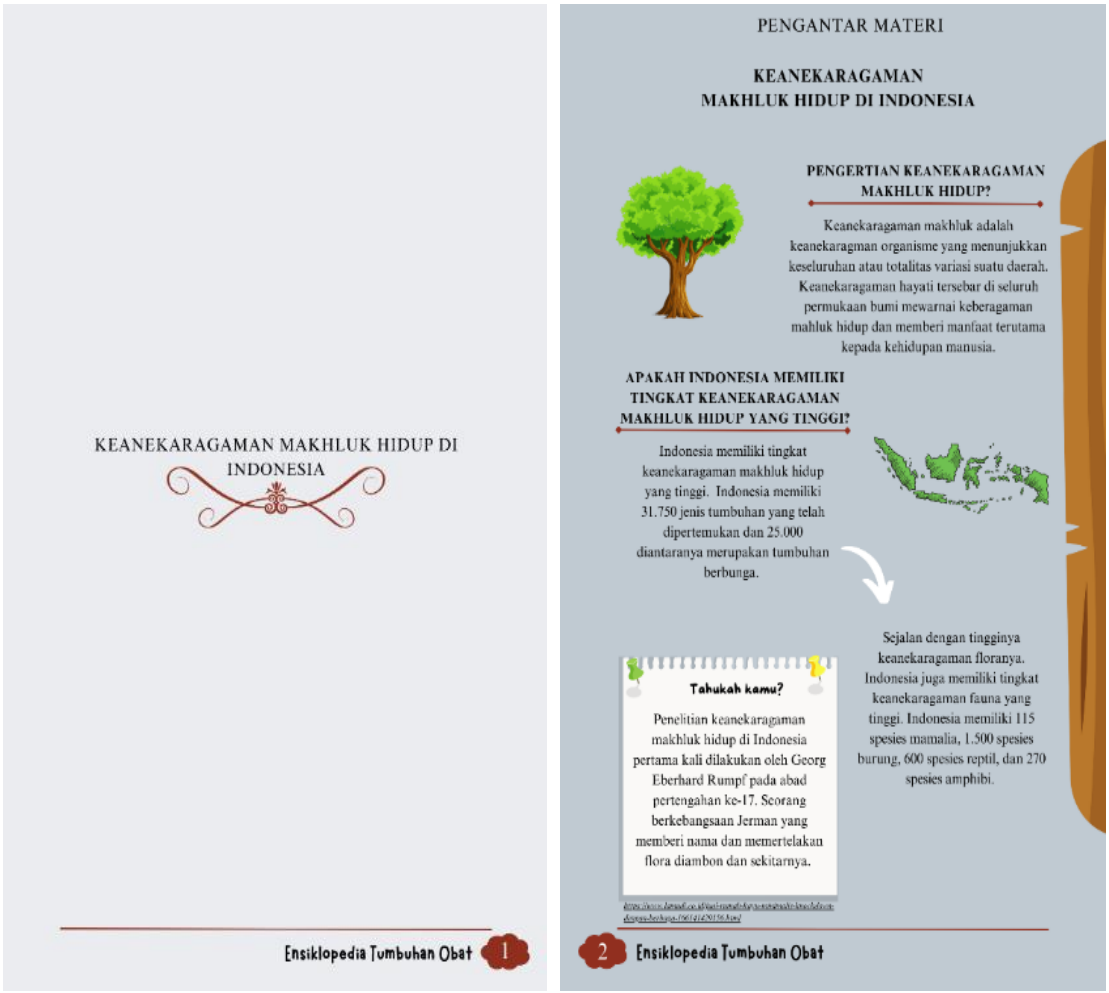


Figure 1. Encyclopedia cover presentation (in *Bahasa*)

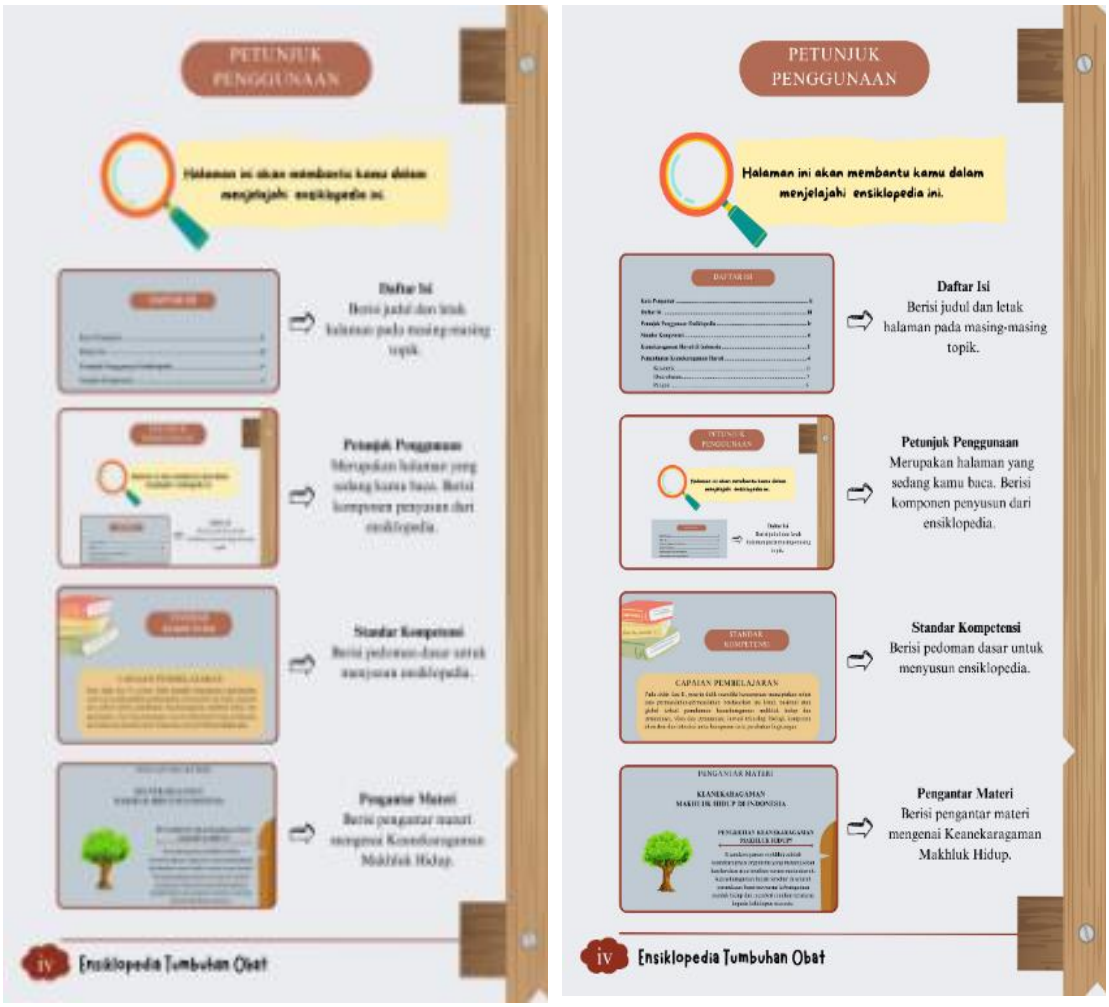
The second criterion is the suitability and attractiveness of the size and type of letters used. Based on the validation results obtained a CVR value of 1.00 with a valid category, where the size and type of font used in the encyclopedia are consistent and can be seen clearly, namely using times new roman font with a subtitle size of 30 pt and content of 25 pt (Figure 2). The choice of the right font size and type not only affects the visual aspect but also has a direct impact on the readability of the encyclopedia. According to Panjaitan & Tenriawaru (2022); (Barus et al., 2025) using the right and appropriate type and size of letters can affect reader readability.



(a) (b)

Figure 2. Use of font type and size: (a) subtitle (b) content (in *Bahasa*)

The third criterion is clarity and suitability of image/illustration quality. Based on the validation results obtained a CVR value of 1.00 with a valid category, there are comments from the validator regarding the images/illustrations on the user instructions page, namely images that are not clear and blurry, suggestions from the validator to use images with high resolution HD (high definition). The pictures/illustrations in the encyclopedia match the information presented (Figure 3). As in the opinion of Ubaidillah (2017); Pristalika et al. (2022); Cahyawulan & Rachmawati (2018) stated that the encyclopedia is equipped with interesting pictures and illustrations according to the topic of discussion. This shows that the quality of images/illustrations plays a very important role in improving the readability and appeal of encyclopedias. Therefore, revision based on suggestions from validators regarding images/illustrations need to be made so that the appearance of encyclopedias better meets the quality standards for learning media.



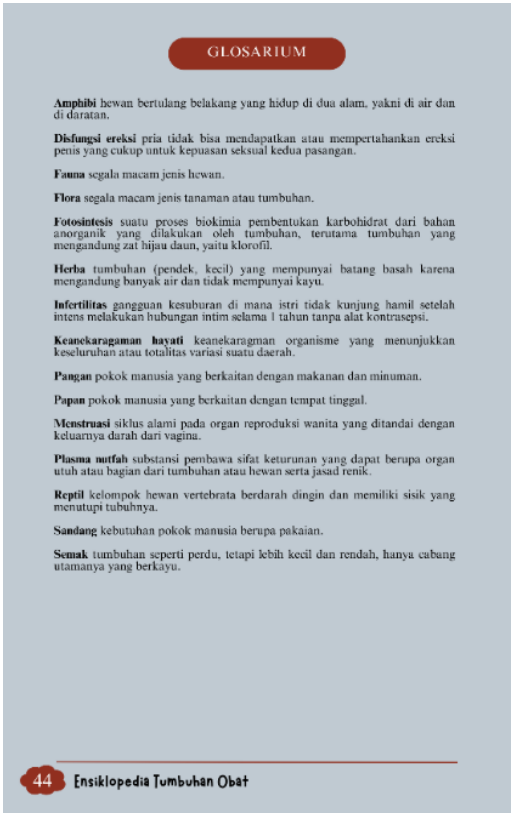
Before revision After revision

Figure 3. Image correction instructions (in *Bahasa*)

The fourth criterion is the completeness and systematic and alphabetical presentation of the encyclopedia components. Based on the validation results obtained a CVR value of 1.00 with a valid category. The presentation of the components in the encyclopedia is systematic, consisting of three parts, namely introduction, content and conclusion. The introductory section contains the cover, foreword, table of contents, instructions for use and competency standards; the contents section contains sub-material on the role of the diversity of living things in life and the results of an inventory of medicinal plants for male and female reproductive health; The closing section contains a bibliography, glossary, index and back cover. The presentation of information on the role of the diversity of living creatures for life and research results has been arranged alphabetically (Figure 4). As argued by Paramita et al. (2018) in developing learning media it must be arranged systematically to support the learning process and enables students to learn independently (Sangi et al., 2024). According to Nuraida & Nisa (2017); Pristalika et al. (2022); Retawidyaningrum & Triatmanto (2022) encyclopedias have a distinctive characteristic in their preparation, namely they are grouped alphabetically which can help students find information.

(a)

(b)



(c)

Figure 4. Display image instructions: (a) backgrounds, (b) contents, (c) cover (in *Bahasa*)

The fifth criterion is the effectiveness of the encyclopedia as a learning medium. Based on the validation results obtained a CVR value of 1.00 with a valid category. The encyclopedia presents complete information regarding the role of the diversity of living things for life, is clear, easy to understand, and has lots of pictures/illustrations (Figure 5). This shows that the encyclopedia is comprehensively designed so that students can understand the material more easily and obtain complete information through supporting visualizations. In line with this, encyclopedia media in learning can increase students' learning motivation (Mulyani & Armiati, 2021) and improve students' learning outcomes (Renita et al., 2020). Furthermore, according to Pristalika et al. (2022) using appropriate and interesting images/illustrations in encyclopedias can reduce boredom in the learning process.

(a) (b)

Figure 5. Use of illustrations in encyclopedia: (a) the material to the needs of students, (b) completeness of additional information in the encyclopedia (in *Bahasa*)

Content Aspects

The content aspect received a score of 1.00 in the valid category. The content aspect of an encyclopedia consists of three criteria. The first criterion is the suitability of the material to the learning outcomes and learning objectives. Based on the validation results obtained a CVR value of 1.00 with a valid category. The encyclopedia is in accordance with the learning achievements and learning objectives (Figure 6). In the opinion of Riswakhyuningsih (2022), the things that need to be considered in preparing learning plans

are understanding the learning outcomes that have been determined by the Ministry of Education and Culture, formulating learning objectives, preparing the learning objectives flow, and designing learning (teaching modules). The material used is focused on important material that is appropriate to students' developmental stages and still refers to learning outcomes and learning objectives (Nurcahyono & Putra, 2022).

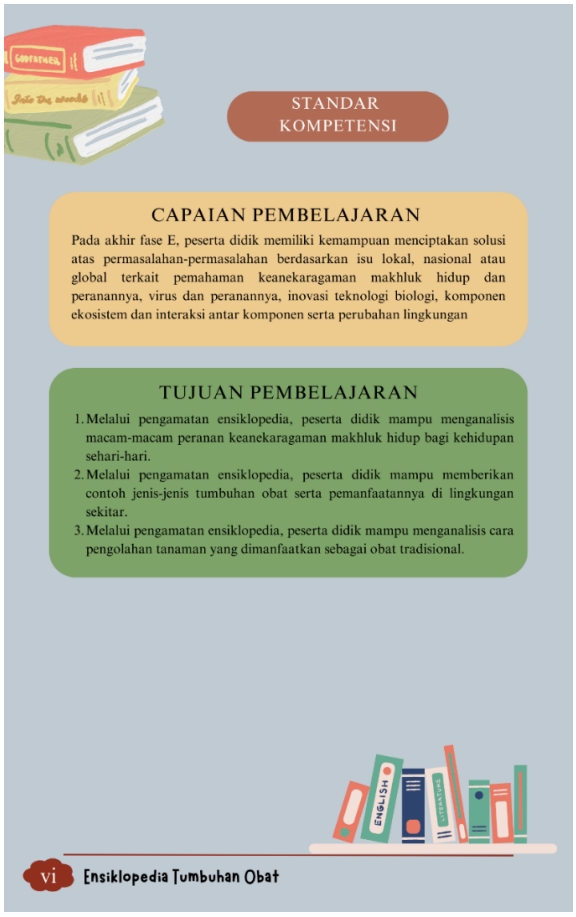


Figure 6. Presentation of learning achievements and learning objectives (in *Bahasa*)

The second criterion is the suitability of research data with the content of the material. Based on the validation results obtained a CVR value of 1.00 with a valid category. The presentation of information is accurate because it contains a number of factual information from research results on inventories of medicinal plants for men's and women's reproductive health (Figure 7). The material presented is tailored to research that has been conducted in relation to the surrounding environment, making it more relevant and easier to understand, as well as fostering contextual learning interest. According to Panjaitan et al. (2019); Panjaitan et al. (2021); Panjaitan & Tenriawaru (2022) media can also be developed based on research results. The presentation of learning media that is developed should be presented in an interesting and creative manner to foster students' interest and curiosity in a concept as a support for successful learning (Wulandari et al., 2020).

Figure 7. Presentation of information on reproductive health medicinal plant inventory results (in *Bahasa*)

The third criterion is the consistency of information delivery. Based on the validation results obtained a CVR value of 1.00 with a valid category. The delivery of information in the encyclopedia is coherent because it begins with an introduction to material related to the diversity of living things which includes understanding, examples and roles, then continues with the diversity of living things as a source of medicines as well as main information about medicinal plants for reproductive health. According to Ritonga et al. (2022) material that is arranged in a coherent manner can make it easier for students in the learning process or searching for information to achieve learning success and the information obtained can be implemented by students in everyday life. Furthermore, structured material makes it easier for teachers to deliver the material and for students to understand the material being presented (Nasrulloh & Amal, 2024).

Language Aspects

The language aspect received a value of 1.00 in the valid category. The language aspect in the encyclopedia consists of two criteria. The first criterion is the use of sentences that are easy to understand. Based on the validation results obtained a CVR value of 1.00 with a valid category. The sentences in the encyclopedia are short, concise and clear so they are easy to understand. The encyclopedia is equipped with a glossary that presents terms that students do not understand. This enables students to understand key concepts more effectively, thereby reducing confusion when encountering new terms. This is in line with the opinion of Paramita et al. (2018); Lestari et al. (2021) which states that learning

media that contains information which is then published in written form can be conveyed to readers in logical sentences, and is easily accepted by students. The second criterion is language conformity with PUEBI. Based on the validation results obtained a CVR value of 1.00 with a valid category. The language used in the encyclopedia is in accordance with the *pedoman umum ejaan bahasa Indonesia* (PUEBI). The use of language in the encyclopedia is in accordance with PUEBI, because it uses capital letters at the beginning of paragraphs and the writing of scientific names is italicized in accordance with the writing of binomial nomenclature (Figure 8).

Figure 8. Use of language in encyclopedia material (in *Bahasa*)

This is in line with the opinion of Panjaitan et al. (2021) that the use of language that is in accordance with the PUEBI can help students to learn and understand the meaning of words from the information presented and does not give rise to double interpretations. The use of consistent and easy-to-understand language makes the encyclopedia more comfortable to read and follow for students.

Conclusion

Based on the results of research conducted by researchers, the validation results from experts related to encyclopedia media show values that fall into the valid category in terms of presentation, content, and language. Thus, it can be concluded that the encyclopedia sub-material on the role of biodiversity in life, based on the results of an inventory of medicinal plants for male and female reproductive health, is suitable for use as a learning media.

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