VOLUME 9 Issue 1
JULY 2024

E-ISSN: 2622-3384
P-ISSN: 2527-9939

JURNAL MEdu Mangifera Edu

Development of encyclopedia in biology "Growth and Development" enriched with an information of stunting

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ABSTRACT

Print media such as encyclopedia still holds advantages in learning. As learning media, encyclopedias can be employed to convey current issues occurring in society that are broad and highly important. The high prevalence of toddlers with stunting indicates is crucial to be presented comprehensively. Encyclopedia can act as enrichment by discussing material that can broaden students' perspectives and understanding. However, limited encyclopedias have been developed. This research aims to develop an encyclopedia as a learning medium for Growth and Development material in highschool. Enrichment with stunting information is aimed not only at increasing students' understanding, but also at supporting government programs related to efforts to reduce national stunting rates. The research and development method applied uses the ADDIE model which is limited to the first three stages (analysis, design, and development). The initial product is tested for suitability in six aspects, namely presentation, graphics, layout, content, language and use by 5 validators. The validity calculation uses the Aiken's V formula and the final value is 0.93. Referring to the minimum validity value for five validators, the encyclopedia that has been developed meets the valid category in all aspects and indicators. It is hoped that further research can be carried out to implement encyclopedias in learning.

ARTICLE INFO

Keywords
ADDIE Model, Encyclopedia, Growth and Development Material, Learning Media, Stunting.

Received
March 2, 2024

Revised
June 23, 2024

Accepted
July 2, 2024

Published
July 31, 2024

How to cite
Pasaribu, E.C., Candramila, W., & Mardiyyaningsih, A., N. 2024. Development of encyclopedia in biology "growth and development" enriched with an information of stunting. *Jurnal Mangifera Edu*, *9*(1), 1-12. https://doi.org/10.31943/mangiferaedu.v9i1.189.

INTRODUCTION

Learning media plays an important role to channels of communication that carry messages with an instruction purpose (Ritakumari, 2019). As a communication tool, learning media, whether in print or electronic form, channels information from its source systematically, which can assist students in the learning process, making learning activities more efficient and effective (Haleem et al., 2022). The presence of media in learning not only aids teachers in delivering materials but also adds value to the learning process (Shabiralyani et al., 2015). Although the digital world is advancing, the development of print technology also allows for more attractive print media because it contains elements of richer color, patterns, and textures. Print media still holds advantages in learning as it can present messages or information in significant amounts; information can be learned by students according to their interests and pace; it can be learned anytime and anywhere due to its portability, and revisions or improvements can be easily made (Mayembe & Nsabata, 2020).

Among the print media utilized as learning media, encyclopedias can also serve as reading materials for students, providing information on illustrations and images, thereby enhancing students' cognitive abilities in understanding learning materials (Mansyur, 2018). However, the collection of encyclopedias as print media in learning is still rarely used in the learning process due to the lack of awareness among library users about the benefits of encyclopedias (Nuryanti et al., 2019). Meanwhile, several previous studies have found many benefits of encyclopedias, such as increasing students' learning motivation, fostering reading interest, and expanding insights and knowledge in the learning process (Nurhatmi, et al., 2015; Zulkarnain et al., 2019; Sufiya & Faizah, 2019). As a collection of writings containing comprehensive and easily understood explanations of information regarding various branches of knowledge organized into alphabetical articles on a topic, encyclopedias actually have great potential to be more widely used in learning (Hanif, 2015). The creation of encyclopedias generally aims to provide various types of information about a topic or field of knowledge that has extensive coverage and consists of various branches of knowledge, both social and natural sciences (Nasridin & Alisher, 2016). Therefore, as a learning medium, encyclopedias can act as enrichment by discussing material that can broaden students' perspectives and understanding. Thus, the use of encyclopedic learning media can facilitate students in obtaining a wealth of knowledge, experience, and complete learning processes (Verananda, 2021). The use of encyclopedias as learning media can also be employed to convey current issues occurring in society that are broad and highly important. For instance, the topic of child growth and development disorders caused by stunting malnutrition can be utilized for enrichment in the Growth and Development material in the twelfth-grade class. Stunting is a problem in the growth process experienced by infants under five years old due to nutritional deficiencies starting from the prenatal stage until the first 1000 days of life (Tim Nasional Percepatan Penanggulangan Kemiskinan, 2017). The adverse effects of stunting on brain and intelligence disorders, physical growth, body metabolism, can lead to a decline in cognitive abilities and learning achievements (Woldehanna et al., 2017), and the high prevalence of toddlers with stunting indicates that this topic is crucial to be presented comprehensively. In West Kalimantan Province alone, the stunting rate is still high at 29.8% according to data from the Indonesia Nutrition Status Study in 2021 (Dinas Kesehatan Kalimantan Barat, 2021), while the national target reduction in 2024 is 14% (Kementerian Kesehatan RI, 2020). This indicates that reducing the stunting rate is a collective responsibility, both for the government or health ministries and all components of society, including in the teaching field.

Information about stunting that can be inserted as encyclopedia content can be obtained from various sources, including direct surveys in areas that report high incidence rates. In 2019, stunting became a focus in Jungkat Village, where 22 out of 77 cases in Mempawah Regency originated from there. The use of direct survey results in the field can enhance the contextualization of learning content for students, especially if the developed media can be used in schools near the survey location. The concept of contextual learning helps teachers introduce learning materials to students and relate them to real-life situations, thus attracting students' interest in applying them in their lives (Suryawati & Osman, 2018). Near Jungkat Village, interviews with Biology teachers at SMA Negeri 1 Sungai Raya, SMA Negeri 2 Sungai Raya, and SMA Negeri 1 Siantan revealed that both information on stunting and the use of encyclopedias have never been utilized. This indicates that innovations

such as the development of encyclopedia learning media that address stunting cases and related stunting information are still very feasible.

The purpose of this study is to develop and test the feasibility of a product in the form of an encyclopedia addressing stunting cases in Jungkat Village and containing enrichment materials related to other growth and development aspects as learning media in the twelfth-grade Growth and Development material. The resulting product is expected to enhance the collection of more varied learning media and provide inspiration and motivation for teachers to develop their own media according to their needs. This research is also conducted to invite all components in the education world to participate in handling national issues according to their competencies.

METHOD

This study uses the research and development model to produce a learning media product in the form of an encyclopedia on the Growth and Development material in the twelfth-grade of high school. The development model used is ADDIE (Analysis, Design, Development, Implementation, Evaluation), but the procedure used is limited to development. The steps taken in the three stages of the ADDIE model are explained as follows:

Analysis

This stage involves needs analysis and curriculum analysis. The needs analysis is motivated by the existence of problems related to the need for stunting management by all elements of society and the reported malnutrition cases from Jungkat Village. The needs analysis from the school side was obtained from interviews with twelfth-grade Biology teachers at SMA Negeri 1 Siantan, SMA Negeri 1 Sungai Raya, and SMA Negeri 2 Sungai Raya. The Growth and Development material in the three schools does not use additional learning media besides those provided by the school, making classroom learning quite boring and not innovative. The development of an encyclopedia is needed to address these issues because the use of images and colors in the encyclopedia can be a solution to reduce the boredom effect arising from previously used print media, and comprehensive information can broaden students' perspectives.

Curriculum analysis is carried out by observing the characteristics of the type of curriculum used in twelfth-grade learning at SMA Negeri 1 Siantan, SMA Negeri 1 Sungai Raya, and SMA Negeri 2 Sungai Raya. The development of the encyclopedia is done by adjusting to the competencies covered in the curriculum. After that, basic competency (KD) analysis is carried out to formulate competency achievement indicators in accordance with the biology syllabus for twelfth-grade Growth and Development material. From the interviews, it was found that the curriculum applied is the 2013 Curriculum revised in 2018 with KD 3.1 Describing the influence of internal and external factors on the growth and development of living things. Therefore, the development of the encyclopedia is aimed at supporting learning in the curriculum and KD with the main concept of explaining the internal and external factors of the growth and development of living things.

Design

At this stage, the planning of the encyclopedia product is carried out by first arranging the materials to be included in the media. After that, the creation of the encyclopedia framework is done through storyboarding, which includes designing the encyclopedia layout, determining the contents

of the encyclopedia, and determining the sequence of the encyclopedia contents. The framework of the encyclopedia includes themes, materials, images that can support growth and development material, and the arrangement of the alphabet on each page of the encyclopedia. Next, the encyclopedia is compiled according to the layout design and sequence of encyclopedia content specified in the storyboard. The development of encyclopedia learning media refers to (Maharani & Rahmah, 2018) which consists of literature review, collecting obtained information, editing processes, and making encyclopedia products starting from the cover making, foreword, introduction, table of contents, usage instructions, main content of the book, book index, to book printing.

Development

The development stage is the actualization of the previously made design. The encyclopedia is created using Canva and Microsoft Power Point applications. The use of both applications is to make it more familiar to teachers so they can perform the same steps to create their learning media. In the Canva application, the layout of images to be inserted into the encyclopedia is arranged. Then, in Microsoft PowerPoint, the arrangement and layout of images and text content are made. The completed encyclopedia containing all its components is saved in pdf format for printing. The book size chosen is A5 with ArtPaper type of paper and printed in color.

Next, the initial product that has been printed is validated by experts who understand the media and Growth and Development material. Validation of the initial encyclopedia product is conducted by 2 lecturers in the Biology Education Study Program and 3 Biology teachers at SMAN 1 and 2 Sungai Raya, and SMAS Kemala Bhayangkari, Kubu Raya. The aspects validated include presentation, graphics, layout, content, language, and usage consisting of 17 indicators. Each indicator assessment uses a Likert scale with 4 criteria: very good (SB) with a score of 4 points, good (B) 3, less good (KB) 2, and not good (TB) 1. On the validation sheet, validators are also asked to provide suggestions or comments regarding the encyclopedia learning media that has been made so that it can be used.

The analysis of the validation data of the encyclopedia uses content validity by calculating Aiken's V coefficient (Aiken, 1985) using the following formula:

$$V = \frac{\Sigma s\ (r-lo)}{[n(c-1)]} \text{ x } 100\% \qquad (1)$$

Where V is the overall average validation, ∑s is the total substraction of the lowest value from the raters' scores, r is the score given by the assessor, lo is the lowest validity rating score, c is the highest validity rating score, and n is the number of assessors/validators

Next, the validity of the product is determined if it meets the minimum value criteria for validity according to Aiken (1985). For five validators, the minimum value that must be obtained is 0.8. After obtaining the validation criteria for the media, the next step is to make improvements to the media developed according to the suggestions and feedback from the validators.

RESULTS AND DISCUSSION

The encyclopedia media developed in this study is titled Biological Encyclopedia "Growth and Development of Children". The encyclopedia is in the form of a book with A5 size and uses Art Paper with dimensions of 14.8 cm x 21 cm, and Montserrat font type. Ensiklopedia Biologi is developed in

accordance with the material on Growth and Development for the XII-grade students. Alphabetically, the topics included in the encyclopedia are child, anthropometry, breastfeeding (ASI), low birth weight (BBLR), genetics, growth spurt, hormones, pregnancy, development, KPSP (Kuesioner Pra-Skrining Perkembangan or Pre-Screening Development Questionnaire), malnutrition, nutrition, obesity, overweight, integrated health service post (posyandu), puberty, stunting, growth, underweight, vitamins, and wasting. Some examples of the print media of the Biological Encyclopedia developed in this study can be seen in Figure 1. This biological encyclopedia media is a specialized encyclopedia where its coverage is limited to specific issues or subjects (Handayani, 2020).

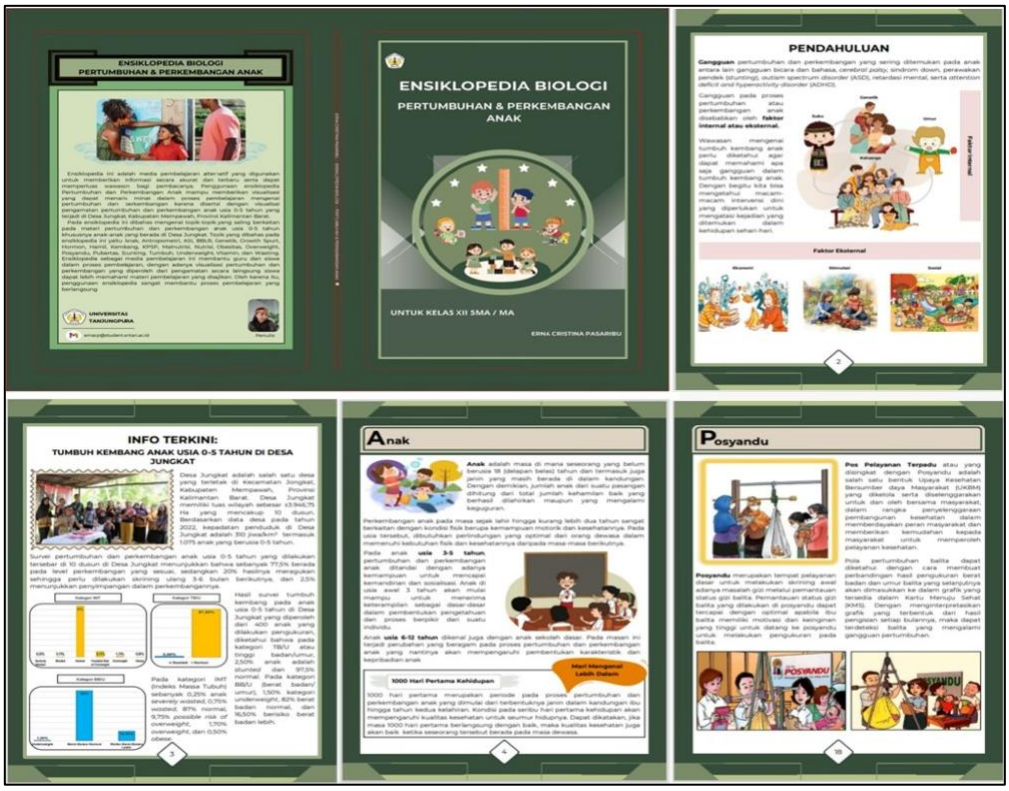


Figure 1. Excerpt from the Biology Encyclopedia "Child Growth and Development" developed in this study for the Growth and Development material in twelfth-grade high school.

The validation results of the encyclopedia media by five validators can be seen in Table 1. The coefficient V values varied from valid to very valid categories. The lowest validity criterion (V=80) was obtained for the aspect of the completeness of example incidents in each child growth and development material. For other indicators and aspects, media validity reached >80. The average validity of the encyclopedia media according to the Aiken coefficient was 0.93. Explanations for each aspect and indicator based on the validators' assessments are presented as follows.

Table 1. Validation results of the "Child Growth and Development" biology encyclopedia media by five validators.

Aspect	Indicator	V	Description
Presentation	The presentation of information on the cover is attractive with suitable and informative images and colors about the type of media, media content, and target readers	1,00	Strongly valid

	The book's identity presentation consists of the title and author's name and is displayed on the front cover, spine, and back cover	1,00	Strongly valid
	The presentation of the encyclopedia media arrangement is equipped with a table of contents, usage instructions, bibliography, and the material is presented alphabetically	0,93	Strongly valid
Graphics	The clarity of the displayed images is clear and attractive with high resolution and coloring that matches the original.	0,87	Strongly valid
	The suitability of the images used corresponds to the material and is presented attractively.	1,00	Strongly valid
	The attractiveness of the colors used on each page is attractive and harmonious.	0,93	Strongly valid
Layout	The compatibility of font type and size with other components is consistent on each page	0,93	Strongly valid
	The composition and layout of each writing component, image, and background are harmonious, contrasting, and clear, making it attractive and easy to understand on each page.	0,87	Strongly valid
Content	The accuracy of material concepts, facts, and data regarding child growth and development is scientifically accurate in Biology.	0,87	Strongly valid
	The completeness of examples in each material is supplemented by examples of incidents in child growth and development.	0,80	Valid
	The timeliness of the material and examples presented is in accordance with conditions occurring in everyday life.	0,87	Strongly valid
	The suitability of the interpretation results of the KPSP (Kuesioner Pra-Skrining Perkembangan) research presented according to the explanation needs about Child Growth and Development Material.	1,00	Strongly valid
Language	The suitability of sentence structure and word arrangement with Improved Spelling (EYD), but there are some sentences that contain multiple meanings, making them somewhat difficult to understand.	0,93	Strongly valid
	The language used in writing the encyclopedia is clear, communicative, and uses easily understandable vocabulary.	1,00	Strongly valid
	The effectiveness of the sentences used in the encyclopedia media is concise, concise, and clear, making it easy to understand.	0,93	Strongly valid
Usage	The basic material used for the encyclopedia media is made of cover paper from waterproof and tear-resistant materials, and the content part is made of paper that can provide good printing results, making it reusable.	1,00	Strongly valid
	The quality of the cover and content printing is clear and does not easily fade.	0,93	Strongly valid
	Average	0,93	Sangat valid

The first aspect is presentation, consisting of three indicators. In this aspect, it is considered valid with an average V value of 0.97, exceeding the minimum value of Aiken's V. According to the five validators, the presentation of information on the cover, presentation of book identity, and arrangement of encyclopedia media are appropriate. The presentation aspect is developed and modified from (Hidayat et al., 2015), which includes (a) on the cover, there is the title of the encyclopedia, university logo, author's name, and target readers; (b) supplemented with preface, table

of contents, usage instructions, and introduction; (c) content containing material alphabetically arranged regarding child growth and development; and (d) at the end, there is a bibliography and back cover page. The complete presentation components are useful for making message presentation clearer and more easily conveyed by teachers, thus making it easier for students to receive it, resulting in improved student learning outcomes (Hasan et al., 2021).

The graphic design aspect consists of three indicators and is considered valid with an average V value of 0.93. The three indicators assessed are the clarity of images, suitability of images, and attractiveness of color usage. These three indicators strongly support student learning motivation; for example, students with visual learning styles will be more interested if there are image components and color usage during the learning process or when communicating with others (Raiyn, 2016). Visual media is an alternative that can help students understand abstract material (Baidawi, 2016). The use of color in the encyclopedia has been adjusted to the images and text. Therefore, the color used on the background of the text is white, which can increase the contrast of both the text and images. The use of contrasting colors in instructional media can aid in information delivery (Nordin et al., 2021) . The availability of images in instructional media can provide a real experience for students when combined with text. Images can enhance student appeal, making it easier to understand the information presented

The assessment of two indicators in the layout aspect is also considered valid with an average V value of 0.9. The indicators of the compatibility of font type and size and the composition and layout of each text and image in each image have been deemed appropriate. One thing to note in creating instructional media is the selection of fonts that consider readability and legibility, as well as the layout of each text or image component in instructional media so that the information or material presented is easily digestible and understood by students (Tarasov et al., 2015). A valid layout aspect will significantly support the ease of use for users to benefit from the developed media as intended initially.

The content aspect, consisting of four indicators, is considered valid with an average V value of 0.88. In this aspect, validators assessed that the indicators comprising material accuracy, completeness of examples in each material, timeliness of material, and suitability of research results to the needs of material explanations were valid. The function of instructional media is to increase students' learning motivation. In the learning process, media will become a more effective and afficient support tool in achieving the learning material (Kouser & Majid, 2021). With complete information on child growth and development, it is hoped that students can understand the concepts, influencing factors, and disorders that occur in child growth and development. The use of instructional media helps to present information in a form that is fun, interesting, easy to understand, and clear (Kustyarini et al., 2020).

The assessment of the language aspect used is considered valid with an average V value of 0.95. Based on the five validators, indicators of EYD compliance, clear and communicative language used, and effectiveness of sentences have been deemed appropriate. The material is systematically arranged using good and correct Indonesian language. Communicative writing is conveyed through systematically arranged languages, easily digestible, not verbose, and not ambiguous (Rahmi & S., 2022) . To ensure that the encyclopedia media can be well understood, the language used should be formal, with good language style and without convolution in development (Julianti et al., 2021).

The final aspect of assessment in this biology encyclopedia is usage, consisting of two indicators. The two indicators assessed by the five validators are considered valid because they have an average V value of 0.95. The use of basic encyclopedia materials with art paper and A5 book size (14.8 x 21 cm) is adjusted to the International Organization for Standardization (ISO) standards. A5-sized printed media certainly makes it easier to carry, store, and use, so students can read it anytime and anywhere. This is in line with Sadiman's (2014) expert opinion stating that the criteria for choosing and determining instructional media are as follows: (1) access, which means instructional media is available and usable; (2) cost, which is an easily affordable cost aspect; (3) technology, which means instructional media is in line with the latest technology, making it easy to use; (4) novelty, which means the media used has novelty, making it attractive so that students are more eager to learn.

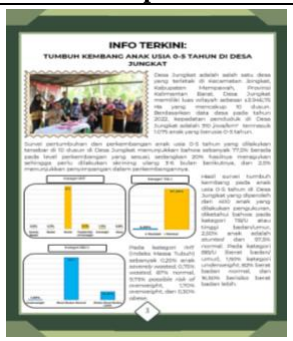
Although all indicators from the six aspects have met the valid criteria for the content feasibility according to Aiken (1985), there are suggestions from some validators in an effort to improve the quality of the "Growth and Development of Children" biology encyclopedia (Table 2). In terms of layout, one validator suggests that the text and colors used can be varied to make it more appealing, and illustrations depicting all age ranges of children can be included on the cover. Next, a validator from SMA Negeri 2 Sungai Raya suggests in the aspect of graphics that clearer images should be used to illustrate the provided material. Additionally, regarding the accuracy of the material, a validator from SMA Kemala Bhayangkari suggests adding characteristics of child growth and development based on literature studies. Improvements based on these three suggestions from validators have been made and can serve as further material for subsequent research, especially in the implementation and evaluation stages of the encyclopedia media developed in this study.

Table 2. Validation results of the "Child Growth and Development" biology encyclopedia media by five validators.

Aspect	Suggestions	Validator Identities
Graphics	There is the use of unclear images, and it would be better if the images used could clearly depict the material.	Mely Bamba, S.P. SMA Negeri 2 Sungai Raya, Kubu Raya
Layout	Varied text and colors would be more appealing to students. It would be better to include illustrations on the cover that reflect child development.	Dra. Syamswisna, M.Si. Dosen Program Studi Pendidikan Biologi FKIP Untan
Content	The accuracy of the material needs to include more characteristics of child growth and development so that readers can learn more about the characteristics of their children's growth and development.	Yeni Yulistina, S.P. SMA Kemala Bhayangkari, Kubu Raya

Table 3. Encyclopedia media before and after improvement

Aspect	Before Improvement	After Improvement
Graphics		

Aspect	Before Improvement	After Improvement
Layout		
		
Content		

The biology encyclopedia provides detailed information, including illustrations, and the information on stunting in Jungkat Village is accurate and up-to-date, beneficial for both students and the reading community. In schools implementing the 2013 Curriculum, the material in the biology encyclopedia "Growth and Development" can be used for growth and development learning materials where students are required to explain the influence of internal and external factors on growth and development. Furthermore, for schools using the Merdeka Curriculum, teachers can use this biology encyclopedia as a medium to fulfill learning objectives on the same material with the requirement to apply growth and development in everyday life. The presence of media in learning not only helps teachers convey the material but also adds value to the learning process (Kristanto, 2016).

The feasibility test results of the biology encyclopedia titled "Child Growth and Development" show that the developed media has been successful and is suitable to proceed to the next development stage. Limited trials and broad coverage in the implementation stage will provide a clearer picture of the feasibility of the developed encyclopedia learning media. In further research, it is hoped, especially if the need for the application of this encyclopedia media is aimed at addressing important issues in society where all efforts from all elements of society are truly needed.

CONCLUSION

The Biology Encyclopedia "Child Growth and Development" has been successfully developed with an average validity test result of V value of 0.93, making it suitable for testing as a learning media. For future researchers, it is hoped that they can proceed to the next stage of development, which is the implementation and evaluation phase. Further research is needed on the implementation and evaluation of the encyclopedia product that has been successfully conducted in this study to determine its effectiveness in the learning process directly.

ACKNOWLEDGMENT

The researchers would like to express their gratitude to all validators who provided assessments of this e-module teaching material product. The content of the e-module developed in this study is the result of direct studies in Desa Jungkat in 2023, which was also supported by many parties, including nutrition experts, Mrs. Titin Hartini, S.Gz. at the Jungkat Inpatient Health Center, Jongkat Koramil, the Head of Desa Jungkat, and ten village heads in Desa Jungkat, as well as the cadres.

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