



Development of Encyclopedia on Reproductive System Material for Class XI at Hang Tuah Belawan High School

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Abstract

This study was undertaken to address the issues identified during preliminary research, which revealed that teachers were still using packaged books and worksheets as their teaching materials. Based on these findings, the researchers became interested in developing teaching materials in the form of encyclopedias. Encyclopedias have the advantage of being both a source of information and a teaching aid. The objective of this study was to develop a valid, practical, and effective encyclopedia on the topic of the reproductive system. The research methodology employed in this study was Research and Development (R&D), utilizing the 4-D development model, which encompasses the stages of define, design, develop, and disseminate. Validity, practicality, and effectiveness instruments were used as research tools, and data analysis was conducted using a Likert scale. The results revealed that the encyclopedia met the criteria for validity (as determined by 92% of teaching material experts and 83% of content experts), practicality (as reported by 95% of teachers and 84% of students), and effectiveness (as demonstrated by an increase in pretest scores from 56.22 to a posttest score of 89, resulting in an N-Gain of 0.75, with a percentage of 75%). Therefore, it can be concluded that the reproductive system encyclopedia is valid, practical, and effective, making it suitable for use in learning activities. The development of this reproductive system encyclopedia has significant implications for the learning process, particularly in terms of adopting a more comprehensive learning approach. The encyclopedia provides extensive and in-depth information, fostering a more holistic learning experience and transforming the role of the teacher into that of a facilitator who assists students in navigating and comprehending information.

Keywords: Teaching Materials; Encyclopedia Developmen; Reproductive System

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INTRODUCTION

Education plays a crucial role in the lives of individuals. It is a key factor in producing highly competent human resources with superior intelligence, skills, and competitiveness. Moreover, education serves as a valuable tool for unleashing the innate potential within individuals. This notion holds significant relevance in the context of biology education, where teaching materials should be meticulously designed to foster the development of observation, analysis, and problem-solving skills. Such an approach not only taps into students' critical thinking abilities, but also cultivates their scientific aptitude. This viewpoint aligns with the perspective put forth by Puspita and Purnomo (2023), who assert that education serves as a means for individuals to enhance their talents and abilities through the process of learning. Successful education at the school level is inherently linked to the collaborative efforts of educators and students. Learning is a dynamic process that involves the interaction between teachers and students, various instructional methods, resources, materials, and strategies within

a conducive learning environment (Anisa et al., 2020). According to Regulation No. 65/2013 issued by the Minister of Education and Culture of the Republic of Indonesia, the learning process in educational units should be designed to be engaging, interactive, challenging, and enjoyable. This design necessitates comprehensive planning, implementation, and evaluation of the learning process to enhance efficiency and effectiveness in achieving desired competencies (Putri et al., 2022).

Teachers are expected to consistently provide and develop methods, models, educational media, and instructional materials that align with the ongoing learning process. However, one common challenge faced by teachers during learning activities is the selection and development of appropriate teaching materials, particularly in the context of biology education where scientific knowledge rapidly evolves. Therefore, teachers must exercise caution in choosing current teaching materials that reflect the latest advancements in the field. Building on this notion, it is widely accepted that teachers must cultivate creativity and innovation in developing teaching materials to cater to the ever-evolving needs of modern students (Magdalena et al., 2020). This necessity arises from the fact that educational curricula and syllabi often provide only an outline of the subject matter, relying on teachers to present comprehensive teaching materials that facilitate students' competency development (Aisyah et al., 2020).

Teaching materials comprise various resources that play a vital role in supporting teachers and students during the instructional process in the classroom. They are primarily designed to address challenges encountered throughout the learning process. These materials serve to motivate students and elucidate abstract concepts, as their influence significantly impacts the attainment of learning objectives. Consequently, ongoing innovations in teaching materials are indispensable in facilitating the learning process across all subject areas, including biology. Biology, a scientific discipline that investigates the life of organisms and their surroundings (Khoirudin, 2019), is often regarded as a subject that requires rote memorization according to Suryanti et al. (2019). The learning of biology in schools demands that students not only comprehend and apply conceptual and procedural knowledge, but also analyze and solve problems (Aqil, 2017; Aripin & Yulianti, 2018). However, this can pose challenges for students since the essence of studying biology is not solely based on memorizing every aspect of the subject matter, but rather on comprehending the underlying concepts (Yusup, 2018).

Furthermore, students face additional difficulties, as highlighted by Jeronen et al. (2017), due to textbooks which predominantly consist of numerous definitions and specifications of phenomena. Consequently, certain biology topics merely require factual retention, making it tedious and burdensome for students to appraise (Hinne, 2017). One potential solution to address these issues is by developing teaching materials that facilitate students' comprehension, such as encyclopedic resources. An exemplification of such a resource is teaching materials focusing on the reproductive system.

Within the Education Unit Level Curriculum, the human reproductive system is encompassed by Basic Competency 3.7. This competency delves into the interplay between the structure, function, and processes involved in human reproduction. These processes include the development of sex cells, ovulation, menstruation, fertilization, pregnancy, and breastfeeding. Furthermore, this competency also encompasses the study of disorders and diseases related to the reproductive system, with the aim of fostering a holistic understanding and promoting awareness of reproductive health.

Through interviews conducted with biology teachers from Hang Tuah Belawan Private High School, it was ascertained that the reproductive system topic is perceived as intricate. This complexity emanates from the multitude of organs and functions that necessitate comprehension, often provoking a mnemonic burden for students. Additionally, students often encounter difficulties when it comes to grasping topics that involve intricate processes such as oogenesis, spermatogenesis, and fertilization, which cannot be visually observed. These circumstances underscore the imperative for more innovative teaching approaches and the

incorporation of teaching materials that can facilitate visualization of these complex processes, thereby enhancing students' comprehension of the reproductive system.

Consequently, one potential strategy to tackle these challenges is the development of teaching materials, such as encyclopedic resources, that aid students in comprehending the subject matter more easily. The encyclopedia is a valuable educational resource that covers a wide range of scientific disciplines. Its name originates from the Greek term "enkyklios," meaning a circle with complete teachings. According to the Big Indonesian Dictionary (KBBI), an encyclopedia is a compilation of books arranged alphabetically, providing information and explanations on various scientific subjects (Septyasningrum, 2022). This definition is consistent with the viewpoint of Nuryanti et al. (2019), who describe an encyclopedia as a collection of writings containing detailed and easily comprehensible information about all aspects of science. Typically recorded in book series, encyclopedias organize their content within articles categorized by letters, groups, or relevant topics.

Encyclopedias, alongside dictionaries, laws and regulations, and atlases, belong to the category of non-text books and serve as a valuable reference material (Maulina et al., 2021). They possess several advantages as sources of information and teaching aids, offering clear and detailed explanations focused on specific subjects (Septyasningrum, 2022). Unlike textbooks, non-text books are not directly utilized in educational institutions.

Numerous research efforts have been dedicated to developing encyclopedias, including those focused on plant form and function (Erawati et al., 2020), Android-based mini Kingdom Plantae encyclopedias (Anggraini et al., 2022), Macroscopic Mushroom encyclopedias (Mardin et al., 2024), Biodiversity encyclopedias (Habiba et al., 2023), and local potential-based Plantae encyclopedias (Wulandari et al., 2023). However, an encyclopedia dedicated specifically to the reproductive system has yet to be reported. A specialized reproductive system encyclopedia would offer comprehensive and in-depth information on this subject, surpassing the scope of general teaching materials. By presenting information in a well-organized and easily accessible manner, the encyclopedia would facilitate students' ability to locate and establish connections between related concepts. The present study examines the findings from interviews conducted with student teachers and observations carried out at Hang Tuah Belawan High School. Specifically, the study investigates the teaching materials employed by teachers, including textbooks, LKS, LKPD, and the absence of encyclopedias as teaching resources. Based on the analysis of student needs, it was revealed that students exhibit a greater interest in colorful textbooks, accompanied by illustrations and clear explanations. Consequently, the researchers have become motivated to develop a learning medium in the form of an encyclopedia, with the objective of creating valid, practical, and effective resources for teaching the reproductive system to eleventh-grade students. This research is anticipated to provide assistance to teachers by offering a comprehensive encyclopedia as a teaching resource, ultimately enhancing the quality of instruction and facilitating student comprehension of the reproductive system. Importantly, it is expected that this instructional medium will foster increased student enthusiasm towards learning.

METHOD

This research was conducted using the R&D (Research and Development) development research method. The R&D research method is a method used to produce a product and then test the effectiveness of the product (Sugiyono, 2015). The model used is the development of the 4D model. The 4D model stands for Define, Design, Development, and Disseminate. This model is used to develop various kinds of learning media. This model was developed by Sivasailam Thiagarajan, Dorothy S. Semmel, and Melvyn I. Semmel. The 4D development model consists of 4 main stages, namely Define, Design, Develop, and Disseminate. This method and model are used to produce learning media in the form of Encyclopedia.

Opinions (Anggia et al., 2020) say that the validation of teaching materials is assessed based on four aspects, namely aspects of content feasibility, presentation aspects, linguistic

aspects, and graphic aspects. The aspects assessed in the student response questionnaire are related to the practicality of a product, namely ease of use, attractiveness, and efficiency. The data collection techniques used were validation sheets and tests. The products that have been made are then tested for validity using validity tests, practicality tests and effectiveness tests.

Research and Development Procedure

The research procedure uses the 4D development research model as shown in Figure 1 (Thiagarajan et al., 1974).

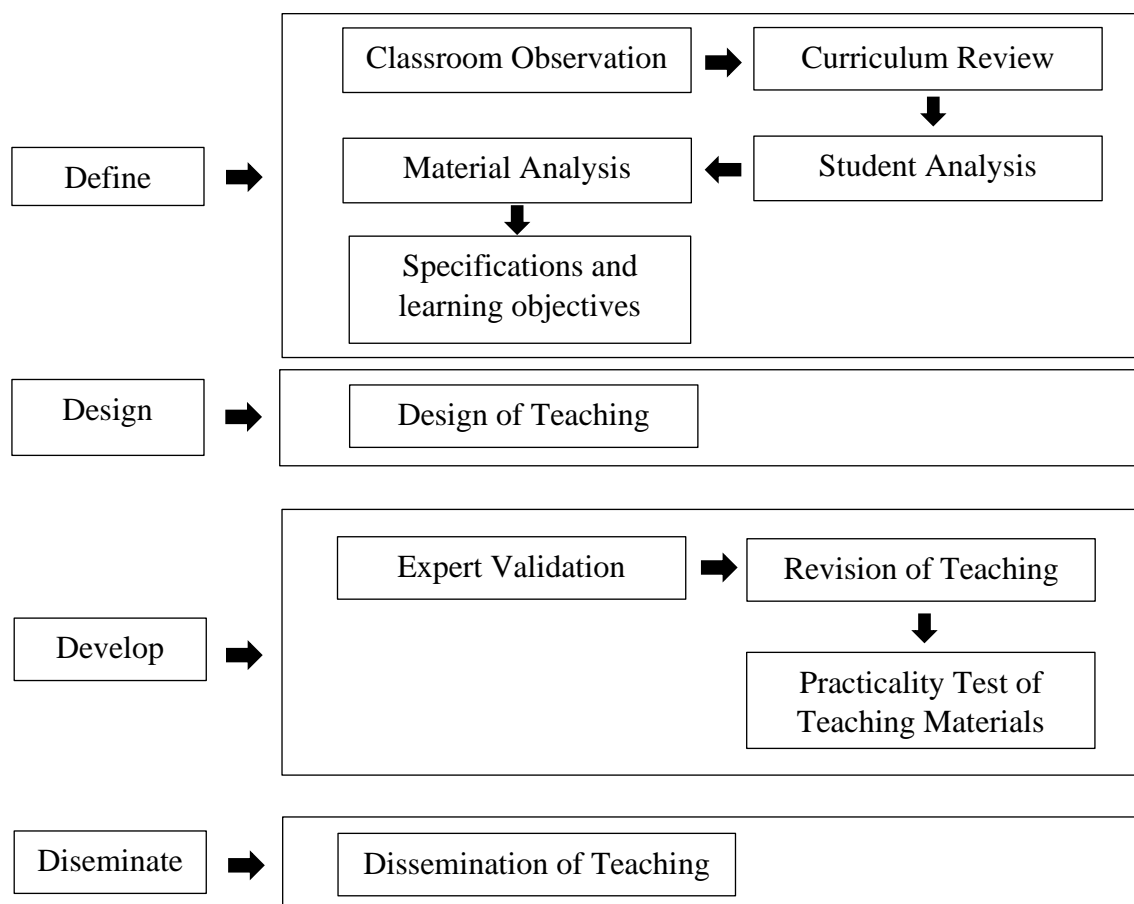


Figure 1. stages in 4d research

1. Define. At this stage, learning conditions were analyzed through direct classroom observations, interviews, and questionnaires to teachers and students, as well as reviewing existing curriculum and teaching materials. From this analysis, gaps in teaching materials were identified, particularly regarding the reproductive system which is less discussed. The specific objectives identified were to improve students' understanding of the reproductive system and increase student engagement with interactive and multimedia methods. The developed teaching materials should be comprehensive, easily accessible, and include evaluation tools to measure student understanding.
2. Design. At this stage, learning conditions are analyzed in greater depth to design effective teaching materials. The analysis is conducted by identifying the specific needs of students and teachers, and examining the most suitable teaching methods. The results of this analysis were then used to design interactive and engaging encyclopedia content. The specific objectives identified included the development of comprehensive teaching materials on the reproductive system, equipped with illustrations, diagrams, and multimedia to enhance student understanding and engagement. In addition, the teaching materials should be designed to be easily accessible to teachers and students, in both digital and print formats.

3. Develop. At this stage, the researcher gave the encyclopedia draft to material experts and teaching material experts for review. The feedback received was then explained and prioritized. Revisions were made by updating the content, improving the structure, and adjusting the teaching approach according to the experts' suggestions. The researcher also ensured that the revisions were in line with the learning objectives and in accordance with the students' level of understanding. After revision, the encyclopedia was re-examined and then subjected to a practicality test.
4. Disseminate. At this stage, researchers disseminate encyclopedia teaching materials.

Instruments and Data Analysis Techniques

Research instruments are tools used to obtain or collect data systematically, in finding solutions to research problems or achieving research objectives or to test hypotheses (Kurniawan, 2018). (Anggia et al., 2020) suggest that the validation of teaching materials is assessed based on four aspects, namely aspects of content feasibility, presentation aspects, linguistic aspects, and graphical aspects. The aspects assessed in the student response questionnaire are related to the practicality of a product, namely ease of use, attractiveness, and efficiency. The data collection techniques used were validation sheets and tests. The products that have been made are then tested for validity using validity tests, practicality tests and effectiveness tests.

Validity Test

Validity data is obtained by providing validation sheets from two experts, namely material experts and teaching material experts. The validation sheet is an instrument used by experts to assess the quality and feasibility of teaching materials. The content includes several aspects of assessment such as the accuracy of material content, graphics, and clarity of presentation. This sheet usually uses a Likert Scale (e.g. 1-4) for each criterion, accompanied by a column for comments. The data obtained from the validation questionnaire given by experts were analyzed by quantitative descriptive analysis with the Riduwan and Akdon formula (Oktafiana et al., 2020) as follows.

$$Percentage = \frac{\sum \text{Score given by validator}}{\sum \text{Maximum score}} \times 100\%$$

The criteria for the validity of the resulting product are stated as follows:

Table 1. Criteria for the validity of teaching materials

Interval (%)	Criteria
81-100	Very Valid
61-80	Valid
41-60	Valid enough
21-40	Less valid
0-20	Invalid

Source: Riduwan dan Akdon (Oktafiana et al., 2020)

The results obtained are more than 61%, so the encyclopedia of the reproductive system can be said to be valid and can be tested with the condition of revising again based on the results of the questionnaire.

This range of 81-100% "Very Valid" reflects a very high level of validity and quality, approaching or achieving perfection. 61-80% "Valid" indicates good quality but there is still room for improvement. 41-60% "Moderately Valid" needs moderator revision. 21-40% "Less Valid" requires substantial revision. 0-20% "Invalid" needs redevelopment.

Practicality Test

For the field trial, responses were obtained from users and observers, namely teachers and students. The student and teacher response questionnaires were designed to measure students' and teachers' perceptions and experiences of the teaching materials. Questions can include clarity of material, interest in learning, design and layout. The scoring criteria usually use a Likert Scale of 1-4, where 1 means strongly disagree and 4 means strongly agree. This questionnaire can also contain open-ended questions to get qualitative feedback from students. The data obtained from the practicality questionnaire, both limited and field trials will be analyzed by quantitative descriptive analysis with criteria in the table using the Riduwan and Akdon formula. (Oktafiana et al., 2020) as follows.

$$\text{Percentage} = \frac{\sum \text{Score given by Students}}{\sum \text{Maximum score}} \times 100\%$$

The criteria for the practicality of the resulting product are expressed as follows:

Table 2. Criteria for the practicality of teaching materials

Interval	Criteria
81-100	Very Practical
61-80	Practical
41-60	Practical enough
21-40	Less Practical
0-20	Not Practical

Source: Riduwan dan Akdon (Oktafiana et al., 2020)

The results obtained are more than 61%, so the encyclopedia of the reproductive system can be said to be valid and can be tested with the condition of revising again based on the results of the questionnaire.

Effectiveness Test

Effectiveness data was measured using test instruments in the form of pretests and posttests given to students before and after using the encyclopedia. Effectiveness data is obtained from the average student learning outcomes in one class. The test instrument consisted of 15 multiple choice questions. After obtaining the pretest and posttest scores, the researcher analyzed the scores obtained. The analysis used is the normality gain test. This test is used to determine the effectiveness of the treatment given. Analysis of pretest and posttest scores using the normality gain (N-gain) test was chosen because it effectively measures the increase in student understanding before and after learning and can consider differences in students' initial abilities. The following formula is used to calculate the normality of the gain:

$$N_{\text{Gain}} = \frac{\text{Skor Posttest} - \text{Skor Pretest}}{\text{Skor Ideal} - \text{Skor Pretest}}$$

To see the category of the magnitude of the increase in the N-Gain score, it can refer to the normalized Gain criteria in Table 3. As for determining the level of effectiveness of the application of the intervention, it can refer to Table 4.

Table 3. Normalized Gain Criteria

Interval	Kriteria
$0,70 \leq g \leq 100$	High
$0,30 \leq g < 0,70$	Medium
$0,00 < g < 0,30$	Low
$g = 0,00$	No increase
$-1,00 \leq g < 0,00$	There was a decrease

Source: (Sukarelawan et al., 2024)

Table 4. Criteria for the effectiveness of teaching materials

Interval	Kriteria
76-100	Sangat efektif
51-75	Efektif
26-50	Kurang Efektif
0-25	Tidak Efektif

Source: (Riduwan & Sunarto, 2013)

The results obtained are more than 51%, so the encyclopedia of the reproductive system can be said to be effective and can be used with the condition of revising again based on the test results of students.

RESULTS AND DISCUSSION

This research is a research and development development by making a product that will be used in learning activities. The product made is an encyclopedia that contains Biology class XI material, namely the Reproductive System. The research was conducted using the R&D development model developed by Thiagarajan, namely 4-D, which consists of four stages of define, design, develop, and disseminate.

Define Stage

The development of this product is based on problems found in schools when conducting observations and identifying learning needs from students or learners and collecting data through surveys, teacher interviews, or observations regarding knowledge and skills gaps, then formulating specific, measurable, achievable, relevant, and time-bound learning objectives and determining the competencies that must be achieved by students after studying teaching materials. The results of the interview found that the school had never used encyclopedias as teaching materials, it was found that most of the materials used in teaching came from the main textbooks provided by the school curriculum. Teachers said that they rarely, or even never, use encyclopedias as an additional source in teaching. They tend to rely on textbooks and standard teaching materials. Interviews with students revealed that they are rarely introduced to various learning resources other than the main textbook, so their knowledge may be limited to what is in the book. Against this background, researchers are interested in developing encyclopedias as teaching materials. After determining the teaching materials to be developed then determine the scope of the encyclopedia, including the main materials and submaterials to be covered and compile a list of materials that need to be described based on their relevance and importance.

Design Stage

The encyclopedia design stage involves drafting more concrete details of the defined plan. At this stage, the focus is on designing the structure, content and format of the encyclopedia so that it is ready for the development stage. The following are the main steps in the encyclopedia design stage:

1. Develop an encyclopedia outline that includes all the submaterials to be covered and determine the hierarchy and relationship between the reproductive system submaterials.
2. Designing a standard template for the encyclopedia, including elements such as headings, subheadings, paragraphs, images, and references, then determining the writing format, and language style.
3. Determining Visual Design such as designing the visual layout of the encyclopedia in printed form, then selecting the paper, paper size, color, font, and other design elements to be used to ensure an attractive and professional appearance.

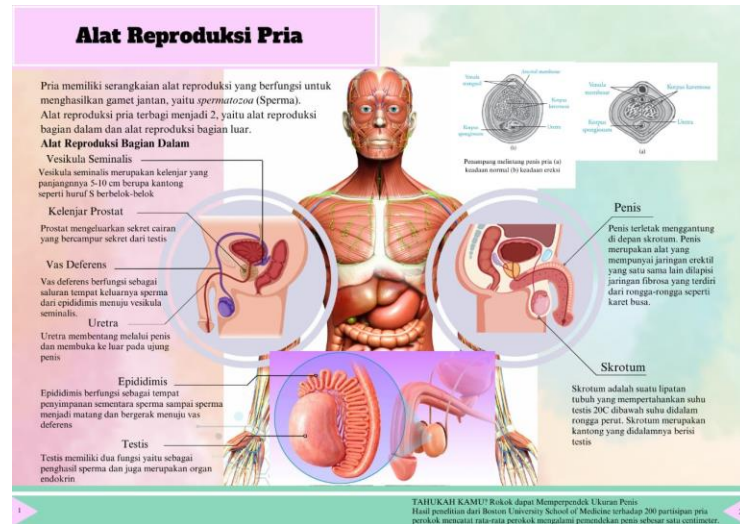
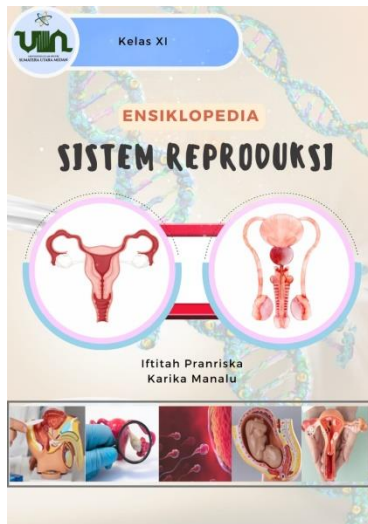


Figure 1. Encyclopedia Cover

Figure 2. The content of the material in the Encyclopedia

Development Stage

This encyclopedia product design is made using art paper paper with a softcover cover and A5 size. This encyclopedia is designed with the aim to suit the needs of students, both in terms of material, appearance and conformity with the 2013 curriculum. This encyclopedia product is composed of cover, preface, table of contents, explanations covering Reproductive System material. Not only that, there are also basic competencies and learning objectives to be achieved.

Validation of Encyclopedia on Reproductive System Material

The validation of this encyclopedia consists of two, namely teaching material expert validation and material expert validation. Seen in table 5 states "very valid" with a percentage of 92%, table 1 to find out the criteria for validation of teaching materials. Material expert validation seen in table 6 states "very valid" with a percentage of 83%, the validity criteria can be seen in table 1. However, teaching material experts and material experts noted and gave feedback that some of the images were not clear enough to convey the material and needed improvement. Improve the quality of the graphics and ensure all images have high resolution and clear captions.

Table 5. Results of Teaching Material Expert Validation Analysis of Encyclopedia Teaching Materials

Aspects	Score Obtained	Score Maximum	Percentage (%)	Criteria
Graphics	30	32	93,75%	Very Valid
Presentation	28	31	90%	Very Valid
Total Score		58		
Maximum Score		63		
Percentage Criteria		92%		Very Valid

Research conducted (Jahidin et al., 2023) shows that the encyclopedia of Protista material is said to be valid with an average percentage of the final result of 88.03%. Another study conducted by (Renita et al., 2020) produced a similar product in the form of an encyclopedia but the material taken was ferns, the encyclopedia produced was used as a Biodiversity learning resource with a percentage of validity value of 77% and categorized as valid. Further research conducted by (Wulandari et al., 2023) in his research produced a Plantae encyclopedia product

with a validity percentage of 88.75% and included in the valid category, the encyclopedia indicator can be said to be valid if it has been validated by a team of experts who are competent in their fields. Research conducted by the three researchers above shows that the development of encyclopedias meets the validation requirements, this shows that encyclopedias can be used as teaching materials and resources.

Table 6. Results of Material Expert Validation Analysis of Encyclopedia Teaching Materials

Aspects	Score Obtained	Score Maximum	Percentage (%)	Criteria
Content	36	44	82%	Very Valid
Presentation	7	8	87%	Very Valid
Total		43		
Score		52		
Maximum		83%		
Percentage		Very Valid		
Criteria				

Practicality of Reproductive System Encyclopedia

The step taken after the validation test is the practicality test of the reproductive system encyclopedia that has been developed by asking teachers and students to respond to the use of the reproductive system encyclopedia as teaching material by filling out the questionnaire that has been given.

Table 7. Percentage Analysis Results of Teacher Response to Encyclopedia Teaching Materials

Aspects	Score Obtained	Score Maximum	Percentage (%)	Criteria
Content	32	32	100%	Very Valid
Graphics	30	32	93%	Very Valid
Presentation	30	32	93%	Very Valid
Total		92		
Score		96		
Maximum		95%		
Percentage		Very Valid		
Criteria				

Biology teachers at Hang Tuah Belawan High School responded to the encyclopedia teaching materials. The biology teacher said that the encyclopedia developed was very helpful in explaining complex concepts. The format is easy to use and in accordance with the existing curriculum. Seen in table 7 displays the results of the teacher's response to the reproductive system encyclopedia with a score of 92 with a maximum score of 96 and a percentage result of 95% categorized as very practical and qualified. The next step is to give a questionnaire about the use of the encyclopedia of the reproductive system to 31 students of class XI. Table 8 shows the results that the score obtained was 941 with a maximum score of 1116 with a percentage result of 84% and included in the very practical category. Students said that the reproductive system encyclopedia is easy to read and understand because it has many pictures and the information provided is complete, but there are some parts that are too difficult to understand without teacher explanation. Based on this, the encyclopedia can be used as teaching material that can help students and teachers in the learning process.

Table 8. Results of Percentage Analysis of Student Responses to the Encyclopedia Teaching Materials Trial Test

Number of Students	Score Obtained	Score Maximum	Percentage (%)	Criteria
31 Students	941	1116	84%	Very Practical

Effectiveness of Reproductive System Encyclopedia

The Product Effectiveness Test aims to see whether the Encyclopedia developed is effective as a teaching material or learning reference source. The effectiveness of encyclopedia products is carried out by giving pretest and posttest questions to students related to reproductive system material, the questions given are 15 multiple choice questions. The pretest questions were given before learning began, the learning process was carried out using teaching materials in the form of an encyclopedia of the reproductive system. Then the posttest questions were given after the learning process was complete. The next step is to analyze the Gain Normality based on the pretest and posttest results obtained by students. Table 8 shows that the pretest results obtained an average of 56.22 and posttest 89 and the N-Gain value of 0.75 with a percentage of 75%. Based on table 3, it can be seen that the N-Gain interval of 0.75 is categorized as moderate and in table 4 it can be seen that the percentage of 75% falls into the effective category. Students said that before using the encyclopedia they found it difficult to understand the material and this reproductive system encyclopedia helped them understand concepts that were previously confusing. Teachers also said that the reproductive system encyclopedia was very helpful in preparing students for exams.

Table 9. Gain Normality Analysis Results

Pretest	Posttest	N-Gain	Percentage (%)	Criteria
56.22	89	0.75	75%	Effective

Research conducted (Habiba et al., 2023) shows that encyclopedias effectively improve test results, from 52% to 91%, this shows that encyclopedias can help students in following the learning process. Another study conducted by (Ananda et al., 2018) states that student learning completeness is categorized as very good with a percentage of 87.30%. further (Rosnawati & Kaharudin, 2020) states that encyclopedias are effectively used in learning activities due to the frequency of student learning outcomes above 80%.

The above studies positively support the development of reproductive system encyclopedia teaching materials in the learning process. The developed encyclopedia of the reproductive system is said to meet the criteria of effectiveness. The effectiveness is due to several factors, one of which is the learning resources used by students in learning. Learning using encyclopedias can improve student learning outcomes. The encyclopedia of the reproductive system that has been developed is expected to be able to improve students' understanding of learning materials. In this study, it can be said that the development of encyclopedia on reproductive system material in class XI which refers to the 4D development is successful or as expected.

The dissemination stage in encyclopedia development involves the dissemination and distribution of the encyclopedia to the target audience. At this stage, the main focus is to ensure that the encyclopedia that has been completed can be accessed by users. Dissemination is limited to students of Hang Tuah Belawan Private High School.

CONCLUSION

The study concludes that the encyclopedia of the reproductive system is highly valid, with 92% of teaching material experts and 83% of material experts agreeing. The analysis of the practicality test results indicates that the encyclopedia is highly practical, with 95% of teachers and 84% of students responding positively. The effectiveness of the reproductive

system encyclopedia is demonstrated by the increase in posttest scores from 56.22 to 89, resulting in an N-Gain score of 0.75, indicating a 75% improvement. The development research confirms that the reproductive system encyclopedia is suitable and feasible for use in learning activities. However, a critical analysis reveals the need for improvements in visual presentation, such as enhancing the quality of graphics and adjusting the table of contents. By implementing these enhancements, the encyclopedia will become more effective and practical in supporting learning.

RECOMMENDATION

It is highly recommended for educators, particularly those in the field of biology, to incorporate engaging teaching materials into their instructional practices. In this regard, it is essential that the chosen textbooks come equipped with visually stimulating illustrations that effectively complement the content being taught. A noteworthy example of such a resource can be found in the reproductive system encyclopedia. By adopting this approach, educators can enhance the overall learning experience for their students, thereby facilitating better comprehension and retention of the subject matter.

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REFERENCES

- Aisyah, S., Noviyanti, E., & Triyanto. (2020). Bahan Ajar Sebagai Bagian dalam Kajian Problematika Pembelajaran Bahasa Indonesia. *Jurnal Salaka*, 2(1), 62–65.
- Ananda, L., Tanjung, I. F., & Syahputra, I. (2018). Pengembangan Ensiklopedia Terintegrasi Potensi Lokal Sumatera Utara Tumbuhan Balakka (*Phyllanthus emblica* L) Sebagai Alternatif Bahan Ajar Biologi. *ZBIOEDUSAINS: Jurnal Pendidikan Biologi Dan Sain*, 7(1), 53–54.
- Anggia, V., Roza, Y., & Siregar, S. N. (2020). Pengembangan Bahan Ajar Materi Segiempat dan Segitiga Kelas VII SMP / MTs Berbasis Permainan. *JOM FKIP*, 7(2), 1–12.
- Anggraini, A., Syafi'i, W., & L.N., F. (2022). Pengembangan Ensiklopedia Mini Kingdom Plantae Berbasis Android Untuk Pembelajaran Biologi Sma Kelas X. *Biogenesis*, 18(2), 122. <https://doi.org/10.31258/biogenesis.18.2.122-131>
- Anisa, F. W., Fusilat, L. A., & Anggraini, I. T. (2020). Proses Pembelajaran Pada Sekolah Dasar. *Jurnal Pendidikan Dan Ilmu Sosial*, 2(1), 158–163. <https://ejournal.stitpn.ac.id/index.php/nusantara>
- Aqil, D. I. (2017). Literasi Sains Sebagai Konsep Pembelajaran Buku Ajar Biologi Di Sekolah. *Wacana Didaktika*, 5(02), 160. <https://doi.org/10.31102/wacanadidaktika.v5i02.59>
- Aripin, I., & Yulianti, D. (2018). Potensi Keunggulan Lokal Kabupaten Majalengka Dan Pemanfaatannya Pada Pembelajaran Biologi. *Jurnal Bio Educatio*, 3(1), 43–52.
- Erawati, Y., Raharjo, & Azizah, U. (2020). Pengembangan Media Ensiklopedia Bentuk dan Fungsi Tumbuhan Melatihkan Berpikir Kritis Siswa Sekolah Dasar. *Jurnal Bidang Pendidikan Dasar*, 4(2), 195–205. <https://doi.org/10.21067/jbpd.v4i2.4389>
- Habiba, R., Ngabekti, S., & Indriyanti, D. R. (2023). Pengembangan Ensiklopedia Keanekaragaman Hayati Di Kabupaten Jepara Sebagai Suplemen Bahan Ajar Untuk Meningkatkan Hasil Belajar. *Journal on Education*, 6(1), 620–635.
- Hinne, J. T. (2017). Attitude towards Practical Work and Students' Achievement in Biology: A Case of a Private Senior Secondary School in Gaborone, Botswana. *IOSR Journal of*

- Mathematics*, 13(4), 6–11. <https://doi.org/10.9790/5728-1304010611>
- Jahidin, Agriansyah, A., & Sukeisi. (2023). Pengembangan Sumber Belajar Berbentuk Ensiklopedia Untuk Mendukung Materi Protista SMA Kelas X. *AMPIBI: Jurnal Alumni Pendidikan Biologi*, 8(1), 46–53.
- Jeronen, E., Palmberg, I., & Yli-Panula, E. (2017). Teaching methods in biology education and sustainability education including outdoor education for promoting sustainability—a literature review. *Education Sciences*, 7(1), 1–19. <https://doi.org/10.3390/educsci7010001>
- Khoirudin, M. (2019). Pengembangan Modul Pembelajaran IPA Biologi Berbasis Scientific Approach Terintegrasi Nilai Keislaman Pada Materi Interaksi Antar Makhluk Hidup Dengan Lingkungan. *IJIS Edu: Indonesian Journal of Integrated Science Education*, 1(1), 33. <https://doi.org/10.29300/ijisedu.v1i1.1403>
- Kurniawan, A. (2018). *Metodologi Penelitian Pendidikan*. PT. Remaja Rosdakarya.
- Magdalena, I., Prabandani, R. O., Rini, E. S., Fitriani, M. A., & Putri, A. A. (2020). Analisis pengembangan bahan ajar. *Ejournal.Stitpn.Ac.Id*, 2(2), 170–187. <https://ejournal.stitpn.ac.id/index.php/nusantara/article/view/805>
- Mardin, H., Husain, H. I., & Mamu, Hartono, D. (2024). Pengembangan Ensiklopedia Jaur Makroskopis Sebagai Media Pembelajaran. *Jurnal Pendidikan Biologi*, 9(1), 642–647.
- Maulina, I., Kusuma, H. H., & Faqih, M. I. (2021). Pengembangan Ensiklopedia Alat Ukur Fisika sebagai Sumber Belajar untuk Siswa SMP/MTs. *Physics Education Research Journal*, 3(1), 53–64. <https://doi.org/10.21580/perj.2021.3.1.6151>
- Nuryanti, B., Artika, E. E., Wulandari, N., Asma, N., Aulia, N., & Al, S. (2019). Analisis Pemanfaatan Ensiklopedia di Perpustakaan IAIN Tulungagung. *Shout Al- Maktabah: Jurnal Perpsuatakaan, Arsip Dan Dokumentasi*, 11(1), 99–110. <https://doi.org/10.15548/shaut.v11i1.123>
- Oktafiana, E., Ratnawuri, T., & Pritandhari, M. (2020). Pengembangan Modul Ekonomi Berbasis Pendekatan Sainifik Pada Peserta Didik Kelas Xi Sma Negeri 2 Metro. *EDUNOMIA: Jurnal Ilmiah Pendidikan Ekonomi*, 1(1), 1–13. <https://doi.org/10.24127/edunomia.v1i1.368>
- Puspita, D., & Purnomo, H. (2023). Implementasi Kurikulum Merdeka di Kelas IV SD Negeri 17 Tanjung Pandan. *Jurnal Gentala Pendidikan Dasar*, 8(2), 187–195. <https://doi.org/10.22437/gentala.v8i2.27012>
- Putri, R. H., Rini, C. P., & Perdiansyah, F. (2022). Pengembangan Media Pembelajaran Ensiklopedia IPA Berbasis Pendekatan Contextual Teaching & Learning (CTL) pada Materi Energi dan Perubahannya untuk Siswa Kelas III Sekolah Dasar. *Fondatia*, 6(3), 751–766. <https://doi.org/10.36088/fondatia.v6i3.2087>
- Renita, A., Setyowati, E., Fuziah, A., & Purwanto, N. (2020). Pengembangan Ensiklopedia Tumbuhan Paku Sebagai Sumber Belajar Keanekaragaman Hayati. *Jurnal Biologi Dan Pembelajarannya (JB&P)*, 7(1), 1–6. <https://doi.org/10.29407/jbp.v7i1.14797>
- Riduwan, & Sunarto. (2013). *Pengantar Statistika untuk Penelitian Pendidikan, Sosial, ekonomi, Komunikasi, dan Bisnis*. Alfabeta.
- Rosnawati, V., & Kaharudin, L. ode. (2020). Pengembangan Ensiklopedia Berbasis Potensi Lokal Yang Terdapat Di Wakatobi Pada Materi Pokok Animalia Invertebrata (Mollusca Dan Echinodermata). *JIKAP PGSD: Jurnal Ilmiah Ilmu Kependidikan*, 4(1), 84. <https://doi.org/10.26858/jkp.v4i1.12055>
- Septyasningrum, E. M. (2022). Pengembangan Ensiklopedia Alat Ukur Berbasis Problem-Based Learning Dengan Teknologi Augmented Reality (Ar). In *Eprints.Walisongo.Ac.Id*. https://eprints.walisongo.ac.id/20236/1/1908066010_Erlita Mirdza S_Skripsi Full - Erlita Mirdza S.pdf
- Sugiyono. (2015). *Metode Penelitian & Pengembangan Research And Development*. Alfabeta.
- Sukarelawan, M. I., Indratno, T. K., & Ayu, S. M. (2024). *N-Gain vs Stacking: Analisis Perubahan Abilitas Peserta Didik dalam Desain One Group Pretest-Posttest* (1st ed.).

Suryacahaya.

- Suryanti, E., Fitriani, A., Redjeki, S., & Riandi, R. (2019). Identifikasi Kesulitan Mahasiswa Dalam Pembelajaran Biologi Molekuler Berstrategi Modified Free Inquiry. *Perspektif Pendidikan Dan Keguruan*, 10(2), 37–47. [https://doi.org/10.25299/perspektif.2019.vol10\(2\).3990](https://doi.org/10.25299/perspektif.2019.vol10(2).3990)
- Thiagarajan, S., Semmel, D. S., & Semmel, M. I. (1974). *Instructional Development for Training Teachers of Exceptional Children*. National Center for Improvement of Educational System.
- Wulandari, M., Suratno, & Sofyan. (2023). Pengembangan Ensiklopedia Plantae pada Mata Pelajaran Biologi SMA Berbasis Potensi Lokal Kabupaten Musi Banyuasin. *Jurnal Ilmiah Universitas Batanghari Jambi*, 23(1), 767. <https://doi.org/10.33087/jiubj.v23i1.3290>
- Yusup, I. R. (2018). KESULITAN GURU PADA PEMBELARAN BIOLOGI TINGKAT MADRASAH/SEKOLAH DI PROVINSI JAWA BARAT (Studi Kasus wilayah Priangan Timur). *Jurnal BIOEDUIN: Program Studi Pendidikan Biologi*, 8(2), 34–42. <https://doi.org/10.15575/bioeduin.v8i2.3187>