Development of an Electronic Encyclopedia of Spermatophyta Sub Materials Based on Flipbook Maker for Class X High School Students

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ARTICLE INFO

A B S T R A C T

The type of this research is research and development using the ADDIE Instructional Model which consists of the design phase, doing product design, validation sheets and limited test responses. Development, conducting product development and testing product validity from material experts, media experts and biology teachers. Implementation, conducted a limited trial of phase I on 10 students and phase II on 31 students of class XI MIPA. Evaluation, Conducting an evaluation of each stage carried out. The results of the analysis phase of the curriculum used in the learning process in schools is the 2013 curriculum. The basic competencies that are appropriate in the development of this Electronic Encyclopedia are KD (3.7) Plantae. The results of the analysis of the characteristics of students are known, students prefer to learn by discussion, students prefer to learn in an environment outside the classroom and are more interested in learning with books that have lots of pictures, so that the Flipbook Maker-based Encyclopedia of Spermatophyta learning resources was developed. Based on the results of the validity test and limited trial, the overall value of the category is very good so that it produces a quality Flipbook Maker-based Electronic Encyclopedia of Spermatophyta, which can be used as a learning resource.

1. Introduction

Knowledge as the main foundation that must be possessed in 21st century learning, is expected to be able to integrate literacy skills, knowledge skills, skills and attitudes, as well as mastery of information and communication technology (ICT) coupled with the spread of the COVID-19 virus that hit Indonesia, which had an impact on education World. The most felt impact is online learning, where teachers are required to be more innovative and creative in providing learning

materials, one way is to create electronic-based learning resources. Online learning can take advantage of platforms in the form of applications, websites, social networks and learning management systems (Herliandry et al., 2020). The use of technology and the involvement of electronic devices in developing teaching materials into an electronic learning media can improve the quality of learning itself (Afrila & Yarmayani., 2018). Knowledge and teaching experience during online learning, educators can create a variety of interesting media, so that students are motivated in participating in learning (Amalia et al., 2022).

Learning with online methods requires the readiness of the competence of students and teachers in carrying out learning using technology. In Indonesia, the use of multimedia as a learning tool is still limited. This is caused by the limited application of teaching materials commonly used by teachers and students in teaching and learning activities (Situmorang et al., 2020). In designing learning strategies, teachers are required to want to learn and be able to master technology. The realization of learning strategies cannot be separated from the help of learning resources with technology (Pane and Dasopang., 2017). Learning resources can be used in a variety of learning, one of which is learning Biology. Based on the results of interviews with Biology teachers at SMA Negeri 3 Pekanbaru, it is known that, students' knowledge is still relatively low on Plant World material, especially on the concept of Spermatophyta material, Textbooks and LKS are still the main guidelines for teachers in the learning process until now, In developing learning tools teachers rarely take advantage of digital multi-media so that the teaching materials produced are less varied, especially in online learning. The results of research conducted by Hadiati et al., (2022) Teachers generally use textbooks, student worksheets, power points in the media, and school libraries as sources of student learning. Students tend to memorize material and the learning process is less active so that students do not master the material well and the learning results are less than optimal because most students do not reach the minimum completeness criteria (KKM).

The low knowledge of students on spermatophyta material can be caused by monotonous learning which is dominated by the lecture method and the lack of variation in learning resources applied by the teacher. According to Sanjaya., (2011) The development of learning resources that are not good in class will result in limited student knowledge. So it is necessary to find a solution so that learning biology, especially Spermatophyta material can be understood by students using learning resources that are appropriate and relevant to current learning conditions. One way that can be done is by creating and developing an Electronic-based Encyclopedia. Where is an electronic-based learning strategy with electronic learning resources as well. The developed electronic encyclopedia is arranged alphabetically or based on certain categories of objects in a broad and complete manner. Can be integrated with the internet, does not need to be printed so it does not require paper and ink, and does not require a large space to store it (Puspitasari., 2019). advances in science and technology, especially information technology, greatly affect the preparation and implementation of learning strategies (Putri et al., 2021)

The development of this Electronic Encyclopedia uses Flip Book Maker Software in Online view or without the need to download the application on the desktop. Flip Book Makers is an electronic book application that is equipped with pictures, sound and video. This feature is expected to increase the desire, interest or learning motivation of students to read it anywhere through their devices. This is in accordance with Arshina et al., (2014) which, if there are additional images/animations or videos in teaching materials, can help students understand the concept in real terms with audiovisual performances.

Based on the problems above, a research entitled "Development of an Electronic Encyclopedia of Spermatophyta Submaterials Based on Flipbook Maker was conducted for high school students in class X".

2.   Methodology

This research was a development research (Research and Development) using the ADDIE development model by Dick Walter & Lou Carey., (2005) which consists of the stages of Analysis, Design, Development, Implementation and Evaluation. In this study, it was limited to the development stage, namely the validity stage due to the limited time of the study. The research was conducted at the Masters Program in Biology Education, Faculty of Teacher Training and Education (FKIP) and SMA Negeri 3 Pekanbaru. Sources of data obtained consist of primary data and secondary data. Primary data in the form of data obtained in research, while secondary data in the form of data obtained through previous studies that are used to support primary data. The parameter in this study is the validity which is measured by using a Validation Questionnaire. The research subject is an experienced and competent expert or expert in the field of biological material, the field of learning media and pedagogy who will validate and assess the feasibility of the developed Spermatophyta Electronic Encyclopedia. The stages of research carried out in this development research can be seen in Figure 1.

Analysis

At this stage the researcher will analyze the needs, feasibility and requirements for development. The needs analysis carried out includes an analysis of educational content and Spermatophyta material content. The educational content includes (1). Analysis of the curriculum (syllabus) required in the development of the Electronic Encyclopedia and (2) Analysis of learning resources in the form of identifying the availability of teaching materials that are relevant to the existing curriculum.

Design Stage

At this design stage, several designs related to research were carried out. The development design of the Spermatopyta Electronic Encyclopedia is as follows:
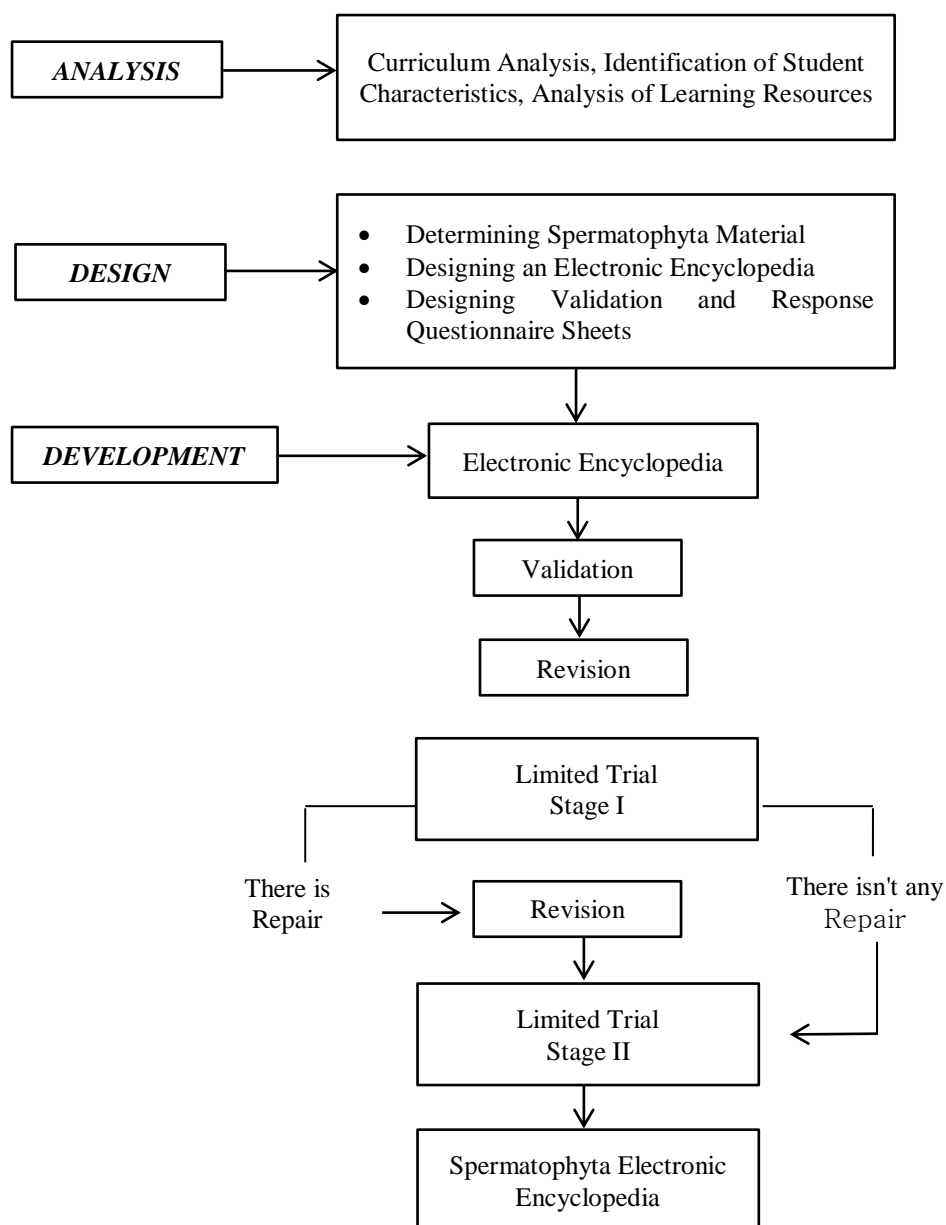
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┌──────────────┐      ┌─────────────────────────────────────────┐
│   ANALYSIS   │─────▶│ Curriculum Analysis, Identification of   │
└──────────────┘      │ Student Characteristics, Analysis of     │
                      │ Learning Resources                       │
                      └─────────────────────────────────────────┘

┌──────────────┐      ┌─────────────────────────────────────────┐
│   DESIGN     │─────▶│ • Determining Spermatophyta Material     │
└──────────────┘      │ • Designing an Electronic Encyclopedia   │
                      │ • Designing Validation and Response      │
                      │   Questionnaire Sheets                   │
                      └─────────────────────────────────────────┘
                                         │
                                         ▼
┌──────────────┐      ┌─────────────────────────────────────────┐
│ DEVELOPMENT  │─────▶│ Electronic Encyclopedia                 │
└──────────────┘      └─────────────────────────────────────────┘
                                         │
                                         ▼
                              ┌─────────────────┐
                              │   Validation    │
                              └─────────────────┘
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                              │    Revision     │
                              └─────────────────┘

                         ┌─────────────────────┐
                         │   Limited Trial     │
                         │     Stage I         │
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  There is          ┌─────────────────┐        There isn't any
  Repair    ──────▶ │    Revision     │        Repair
                    └─────────────────┘
                             │
                             ▼
                    ┌─────────────────┐
                    │  Limited Trial  │◀──
                    │    Stage II     │
                    └─────────────────┘
                             │
                             ▼
                    ┌─────────────────┐
                    │ Spermatophyta   │
                    │ Electronic      │
                    │ Encyclopedia    │
                    └─────────────────┘
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Figure 1. ADDIE Model Media Development

Development Stage

The development stage is the stage in realizing the results of the previous Electronic Encyclopedia design into a product that is ready to be tested for quality through validation. The Electronic Encyclopedia of Spermatophyta was validated by 3 validators consisting of material experts, media experts, and Biology teachers. This validation activity is carried out by filling out a validation questionnaire sheet. The results of the validation will then be revised by the researcher. includes qualitative descriptive data and quantitative descriptive data. Qualitative data were obtained from input, responses, comments and suggestions for improvement obtained from experts, while quantitative descriptive data in the form of validation data obtained from the validation results of experts. The

categorization of the assessment scores of the validation questionnaire sheet provided by the validator can be seen in Table 1.

Rancangan Desain Ensiklopedia Elektronik Spermatophyta

1. Cover

2. Kata pengantar

3. Daftar isi

4. Latar Belakang/Pendahuluan

5. Bagian Isi/Pembahasan

   A. Divisi Gymnospermae (Tumbuhan Biji Terbuka)

   B. Divisi Angiospermae (Tumbuhan Biji Tertutup)

   - Kelas Tumbuhan Dikotil (Dicotyledoneae)

   - Kelas Tumbuhan Monokotil (Monocotyledoneae)

6. Daftar Pustaka

7. Glosarium

Table 1. Scoring Guidelines for Validator Assessment Sheets

Category	Score
Very good	5
Well	4
Pretty good	3
Not good	2
Not good	1

(Source: Sugiyono, 2018)

After obtaining the score from the expert validation questionnaire sheet, then the percentage of each question item on the validation sheet is calculated using the formula below:

$$P = \frac{\text{Total Score obtained on 1 item}}{\text{Maximum Score}} \times 100\%$$

Table 2. Quality Intervals and Categories of Spermatophyta Electronic Encyclopedia

Interval	Category
$80 \leq x < 100$	Very good
$60 \leq x < 79$	Well
$40 \leq x < 59$	Pretty good
$20 \leq x < 39$	Not good
≤ 20	Very less

(Arikunto, 2014)

Analyzing the validity of the Electronic Encyclopedia of Spermatophyta, determined by calculating the average aspect value for each validator. The

average value of the validator is then matched with the table of criteria for the validity of the development product by finding the percentage in Table 2.

3.   Results and Discussion

The development of the Electronic Encyclopedia of Spermatophyta sub-material uses the ADDIE development model consisting of the Analysis, Design, Development, Implementation and Evaluation stages. Research is limited only to the development stage. The development was carried out on the Biology class X (KD) 3.7 material, namely the Spermatophyta sub material. Overall it can be seen as follows:

Analysis

Analysis of the curriculum used in the learning process in schools is the 2013 curriculum, as recommended by the government through the Ministry of Education and Culture of the Republic of Indonesia to implement the 2013 curriculum as a refinement of the previous curriculum. The 2013 curriculum emphasizes the application of a scientific approach where teachers must be able to design learning that can make students active in the learning process (Sultoni., 2016). Basic Competencies that are appropriate in the development of this Electronic Encyclopedia are KD (3.7) namely "Applying the classification principle to classify plants into divisions based on observations of plant morphology and metagenesis and linking their role in the survival of life on earth".

Analysis of students is seen in accordance with the wishes and learning styles of students. Each student has his own way and style that is different in receiving and absorbing the information and knowledge taught by the teacher. Teachers should know and understand how the characteristics of each student's learning style are in absorbing and understanding the subject matter. According to Sari., (2014) states that if the characteristics of students' learning styles are adjusted, it will be easier to motivate themselves in learning. Students in each class certainly have different ways and learning styles, so the ability to receive and absorb information is different. which contains examples of material from the surrounding environment, in addition to textbooks and worksheets.

Design

Designing an Electronic Encyclopedia of Spermatophyta sub based on the 2013 curriculum syllabus and the X grade Biology book for Seed Plants. Making this Electronic Encyclopedia using the Canva.com Application, Convert PDF To Word, and Microsoft Word. The fonts used are Times New Roman, Friendly School, Comic San MS, Tahoma, Royal Mission, High Tower Text, Verdana, and Arial. The material used in this Electronic Encyclopedia is taken based on the textbook used by students at school, plus the 2010 Gembong Tjirosoepomo book,

then developed by the researcher in a concise, clear, and organized manner based on the division.

Making an electronic encyclopedia book is done using Microsoft word by making a cover first and then proceeding with the layout, layout of images and other designs. . Overall the results of the encyclopedia design can be seen in Figure 3.
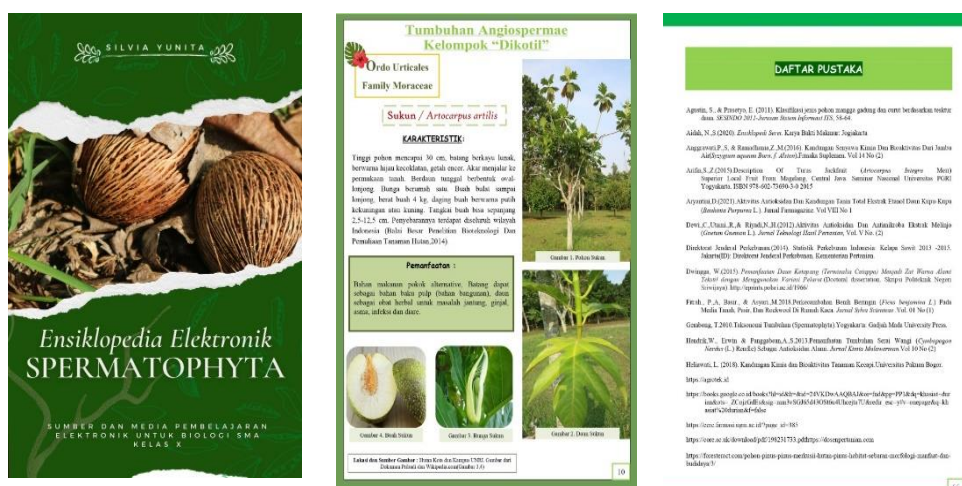

Figure 3. Spermatophyta Encyclopedia Design Display a. Cover (Front) b. Content Display c. Backyard View

Encyclopedias are equipped with pictures that match the sample material, which are easily found in the surrounding environment or in the description of the picture so that it is easily understood by students. The presence of colors displayed on each page can add to the attractiveness and interest of readers. Overall the color in the Encyclopedia is green. The choice of green color is in accordance with Hartini's opinion, (2013), which states that green can cause physical effects that can calm the nervous system, various health problems related to heart organs and abnormal blood pressure. Electronic media can increase pedagogical accessibility, explain abstraction of information, and increase students' mastery of knowledge (Zulfarina, 2020).

Development

The results of the development are in the form of an Electronic Encyclopedia that has been validated by experts and teachers. Validation of the Spermatophyta Electronic Encyclopedia uses a validation sheet consisting of 3 validators, namely material experts, media experts and education experts (biology teachers). Validation was carried out on the developed Spermatophyta Electronic Encyclopedia. This validation is carried out to obtain suggestions from the validator that will be used by the author to improve the Spermatophyta Electronic Encyclopedia that is made.

Validation Results of the Spermatophyta Electronic Encyclopedia of Material Experts

The Electronic Encyclopedia of Spermatophyta was validated by material experts to see the feasibility of the material contained in the Electronic Encyclopedia of Spermatophyta. The assessment aspect of the material expert consists of 3 assessment components, namely the Content Component, the Graphical Component and the Language Component. The results of material expert validation can be seen in table 3.

Table 3. Results of Expert Validation of Spermatophyta Electronic Encyclopedia Materials

No	Component	Average	Category
1	Contents	68.00	Good
2	Chart	70.00	Good
3	Language	75.00	Good
	Total Average	71.19	Good

Based on table 3, it can be seen that the content component got an average of 68.00 in the Good category, the Graphic component 70.00 in the Good category, the Language component in the 75.00 category in the Good category. The results of all assessment components of material expert validation show that a total average value of 71.19 is obtained in the Good category. Plantae (Spermatophyta) material is one of the materials that has many classes and examples of species that must be distinguished based on the diversity of plants that can be used as medicine, classification, description where it requires visualization of objects that are clear, real, and interesting. This can be accommodated by encyclopedia media based on local potential, because this media can display local images that students often encounter in the surrounding environment and are juxtaposed with material that supports the existence of the object (Mulia & Syamsiah., 2019). encyclopedias can improve student learning outcomes. Rizky & Maryam., (2017) encyclopedias can improve students' understanding of the material, find facts about abstract material and make it easier for students to remember long-term material so that learning outcomes can improve. Thus, teachers need to provide quality learning resources, according to student needs. Learning about environmental sustainability can be done through advice and moral values (Istiqomah et al., 2020).

The Electronic Encyclopedia of Spermatophyta is suitable for use in learning with revisions, according to the validator's suggestion so that the quality of the Electronic Encyclopedia of Spermatophyta is even better. The statement of suggestions and input from the validator is "Pay attention to the Encyclopedia Design, explore the concept map of the material, the composition of the division of spermatophyta" with the conclusion that it can be used with improvements. Improvements were made to get a more attractive appearance and produce better products. This is in accordance with Sugiyono., (2018) the improvements made are aimed at producing better products.

Validation Results of the Spermatophyta Electronic Encyclopedia of Media Experts

The assessment from media experts is used to see the feasibility in terms of appearance, media experts assess three components, namely Presentation Techniques, Presentation Feasibility and graphic components. The results of the media experts as a whole can be seen in Table 4.

Table 4. Results of Validation of Spermatophyta Elektronik Electronic Encyclopedia Media Experts

No	Component	Average	Category
1	Presentation Technique	86.67	Very good
2	Serving Eligibility	80.00	Very good
3	Graphics Component	84.00	Very good
	Total Average	83.56	Very good

Based on table 4, it can be seen that the Presentation Technique component gets an average of 86.67 in the Very Good category, the Presentation Feasibility component is 80.00 in the Very Good category, and the Graphic Component is 84.00 in the Very Good category. The results of all assessment components of media expert validation showed that the total average score was 83.56 in the Very Good category. The encyclopedia looks interesting because it is packaged more modernly with backgrounds and pictures of local potential plants, color variations that are not monotonous. Views like this can provide visual stimulation, can attract students' interest in learning, and help streamline the learning process. Cimer., (2012) states that the use of biology learning media that is able to display objects visually can make biology learning take place more efficiently. interesting, effective, and the knowledge gained can be stored longer.

Overall the Spermatophyta Electronic Encyclopedia is feasible to use in terms of media in learning with revisions according to the validator's suggestions. The input of suggestions from the validator regarding media can be seen from the statement from the validator. The statement from the validator is "Can be used as a medium because it is in accordance with the suggestions given by the validator". Some input things that must be corrected from the validator's statement are cover, the table of contents is adjusted to the content, add a youtube link for videos or like a science window.

Table 5. Validation Results of Biology Teachers' Electronic Encyclopedia of Spermatophyta

No	Component	Average	Category
1	Contents	90.00	Sangat Baik
2	Presentation	80.00	Sangat Baik
3	Language	80.00	Sangat Baik
4	Chart	88.00	Sangat Baik
	Total Average	85.00	Sangat Baik

Spermatophyta Electronic Encyclopedia Validation Results for Biology Teachers

To see the quality of the Spermatophyta Electronic Encyclopedia, the results of the Biology Teacher validation as a whole, can be seen in table 5. Table 5 shows that the content component gets an average of 90.00 in the Very Good category, the Presentation component 80.00 in the Very Good category, the Language Component 80.00 in the Very Good category, and the Graphic Component 85.00 in the Very Good category. The results of all Biology Teacher Validation assessment components show that the total average score is 85.00 in the Very Good category. This is because the teacher can understand well a series of Spermatophyta material presented in the Electronic Encyclopedia, in other words the material is in accordance with the accumulated competency standards or basic competencies contained in the curriculum, easy to understand, easy to read and attractive (Arsanti., 2018). Thus this Spermatophyta Electronic Encyclopedia can be used. According to Akbar., (2013) Validation of the field of study teacher, aims to determine the advantages or disadvantages of the material, language and graphics with student-centered learning, based on this assessment the user can provide input for improving the teaching materials developed. Overall, the results from material experts, media and biology teachers stated that the encyclopedia was valid and could be used at a later stage.

Overall, the recapitulation of the validation results of the Experts or Validators can be seen in table 6.

Table 6. Recapitulation of Quality Validation Assessment Results of the Spermatophyta Electronic Encyclopedia from the Experts

Validator	Average	Category
Material Expert	71.19	Well
Media Expert	83.56	Very good
Biology Teacher	85.00	Very good

The results of the validation of the Spermatophyta Electronic Encyclopedia overall got an average value of 78.98% with a good category. This is in accordance with the assessment criteria used by Sugiyono., (2018), that the value of a large number of 70% is stated in the Good category. So that the Spermatophyta Electronic Encyclopedia can be used in learning activities Based on research conducted by Hidayat et al., (2015), the use of encyclopedias in the learning process can improve student learning outcomes, the use of encyclopedias can also avoid misconceptions from the material presented by the teacher because the encyclopedia presents images that can support information from the material. delivered (Hidayat et.al., 2015).

4. Conclusion

The results of the validation of the Electronic Encyclopedia of Spermatophyta, obtained the results of assessments from material experts, media experts and Biology teachers are categorized as Good. The research was carried out by providing encyclopedia links to students through whatsaap groups, this is an easy

thing for students because it can be accessed anywhere so that learning is not only at school or at home, the encyclopedia also contains very informative pictures and information so it is easy to understand. Besides that, the encyclopedia also has a knowledge window that can stimulate students' knowledge well. The disadvantage of this encyclopedia is that it requires internet access, so students must have internet quota in order to access the electronic encyclopedia.

Acknowledgement

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How to cite this article:

Yunita, S., Wulandari, S., & Suzanti, F. (2022). Development of an Electronic Encyclopedia of Spermatophyta Sub Materials Based on Flipbook Maker for Class X High School Students. *Journal of Educational Sciences*, *6(3)*, 341-352.