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Development of Learning Media for E-Booklet Human Reproductive System Materials to Improve Cognitive Learning Outcomes of High School Students

Ade Nur Eliana[1*], Oding Sunardi, Lufty Hari Susanto

[1]Pendidikan Biologi, Fakultas Keguruan dan Ilmu Pendidikan, Universitas Pakuan, Bogor, Indonesia

*Email: *adenureliana99@gmail.com*

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Abstract

Exciting learning media can be a good point for student. Human reproductive system material that presented in ebook can be easily learned by student. Thus, this study aimed to develop a learning media *ebooklet* for reproductive system materials to improve cognitive learning outcomes of Biology students for human reproductive system subject. This study was conducted from December 2020 to June 2021. The trial in this study consisted of one class using the model *one group pretest posttest design*. The method was research and design using 4D model. The results of the validation related to the feasibility of the media *ebooklet* obtained a score of 91% in the Very Valid category. The results of the *pretest* and *posttest scores* of class XI IPA1 students in improving students' cognitive learning outcomes. This is indicated by the average value of the *pretest* before using the learning media, which is 33. While the average *posttest* after using the learning media is 87 with a Biology minimum completeness criteria value of 72. The *N Gain value* has an average of 0.81 or in *N Gain*% is 81% indicating high category. It shows that the learning media *ebooklet* material for the human reproductive system can improve cognitive learning outcomes of students.

Keywords: cognitive learning outcomes; ebooklet; human reproductive system material; learning media

INTRODUCTION

Biology is one of the branches of Natural Sciences which studies real life on earth, be it humans, animals, and plants. The characteristics of biological material are in the form of facts, concepts, principles, and processes from the symptoms of life, as well as the intricacies that affect life including its interaction with the environment. According to (Almasri, 2022). Biology has unique characteristics and requires its own technique in studying it. Biology learning is a fun activity and requires students to master the ability to visualize high power, and the ability to describe the whole object. But basically someof the concepts containedin biology are abstractconcepts (cannot be seen directly both in size and in biological processes)(Oding *et al*., 2020). In learning activities, the media is one of the supporting forces in the teaching and learning process that takes place, which is designed in an attractive way to stimulate student interest, in accordance with the functionof learning media, which is to make iteasier for students to understand the material provided by the teacher. Media in the learning process can be interpreted specifically as graphic, photographic, or electronic tools to capture, process and rearrange visual or verbal information

Based on the results of interview observations, it was stated that when learning biology,

especially on the material of the human reproductive system, the learning media used by the teacher was a slide power point with an unclear image display, so that students' interest in participating in learning was low. This has an effect on students' cognitive learning outcomeson the material of the human reproductive system which falls into the low category with apercentage of 35%. The use of learning media that is less attractive can cause students to feel bored, and make students less interested in reading learning material which causes students to not understand the material that has been given by the teacher, from this the factors that cause student learning outcomes to be less than optimal. Of the 30 students, 70% of the studentswho answered the online questionnaire strongly agreed that learning biology requires interactive, interesting and not boring learning media.

In response to this, it is necessary to have interactive learning media containing pictures and easy-to-understand material that can help students understand the material of the human reproductive system both when learning with teachers and studying independently. The learning media e-booklet answers the needs of students who want interesting and practical learning media, because the e-booklet learning media is a digital-based learning media so that itcan make it easier and help students to learn anytime. Especially in the human reproductive system material, many students experience errors, with the existence of learning media e- booklet, the human reproductive system material can be presented with interesting material content with the help of videos, clear pictures, and quizzes to make it easier for students to understand the material. Digital-based learning media such as e-booklets can beaccessed using an Android smartphone. The learning media that will be used need to be prepared efficiently and effectively. Useful for stimulating the attractiveness, thinking abilities,and skills of studentsthat can encourage learning activities. One alternative solution that is relevant today is utilizing digital technology to provide information widely and communicate which is the basis for developinglearning media (Sajidan *et al*., 2020 & Wang *et al*., 2022).

Based on research (Hanifah, 2020) concluded that learning media e-booklet can overcome problems such as the lack of student interest in learning that affects students' low cognitive learning outcomes. The use of learning media e-booklet can increase curiosity, interest, motivation, expectations of needs, and can improve students' cognitive learning outcomes. Based on Rahmatih's research (2017) e-booklets play a role in improving student learning outcomes. E-booklets are designed to complete concise and systematic explanations, as well as pictures as illustrations, which facilitate students' understanding of a concept orfact inthe learning process. e-booklets Informative, attractive designs can arouse curiosity, so that students can easily understand what is conveyed in the learning process. The development of learning media e-booklet has the aim of stimulating students' interest in the learning process, increasing students' reading interest to improve students' cognitive learning outcomes.

METHOD

This research is a Research and Development (R&D) using the model Four-D which consists of four stages, namely Define, Design, Development, and Disseminate (Thiagajangan:Sugiyono, 2010). The product trial of this research was carried out in one of the senior high schools (SMA) in Bogor Regency using one class XI IPA as a sample. This research was carried out in the even semester of 2020/2021, namely from December to June 2021. The product developed is an e-booklet on the material of the reproductive system human. The stepsfor developing the model of learning media Four-Dare as follows: The results obtained are then categorized according to figure 1, as follows:

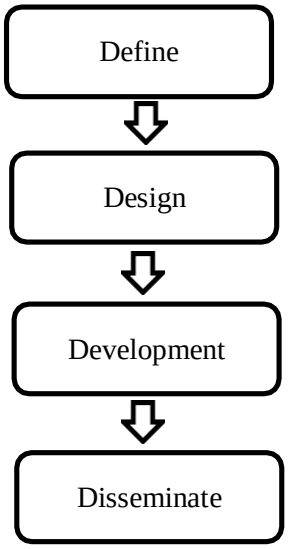

Figure 1. Model Design Chart Four-D(Thiagajangan: Sugiyono, 2010)

Define, At the define stage, a preliminary study or observation in the field is carried out by interviewing teachers and giving google forms to students aimed at knowing the initial conditions at school by covering the learning process, learning media, and student characteristics. Design, At the design stage, which is the stage of designing learning media products e- booklet that can be implemented after getting afield study analysis. Things to do at this stage are: a. Selection of learning media sources. b. Selection of format. c. initial design. Development, The development stage iscarried out after the initial design of the learning media e-booklet human reproductive system has been made, then validation of the learning media is carried out with expert lecturers and biology teachers. Furthermore, the results of the revision are used as a reference for achieving the desired learning objectives. Then this limited trial will be carried out using the One Group Pretest- Posttest Experiment design to determine the effect of the application learning media e- booklet of the human reproductive system on student biology learning outcomes. The feasibility of based learning media was e-booklet obtained from the assessment of experts (lecturers) and teachers using an online validation sheet questionnaire using google form. According to (Arikunto, 2013) the calculation of the validity of learning media data is analyzed using the percentage of Eligibility is found by dividing between real value and expected value then multiplied by 100%.

Table 1. Learning Device ValidityCriteria (Arikunto, 2013)

No	Score (%)	Qualification	Description
1	80-100	very valid	no revision
2	60-79	valid	no revision
3	40-59	less valid	revision
4	0-39	no valid	revision

By experts to measure the feasibility level of content aspects, material aspects, and display aspects. At this stage, expert advice and comments are needed to find out the shortcomings of the media design that has been made. Then for the data of students' cognitive learning outcomes using multiple choice questions using google form. After the validation results are carried out, the media that has been declared feasible and ready to be tested. Media e-booklet with the human reproductive system material to improvestudents' cognitive learning outcomes. The design of this field trial research was only carriedout in a limited trial using OneGroup Pretest- Posttest in one class as the research subjects werestudents of class XI science inone of the Bogor district schools consisting of 30 students who were given an experiment using learning media e-booklet. Research using this design, students are given a pretest before being given media treatment, and a posttest after being given treatment, thus the results of the

treatment can be known more accurately, because it can compare the conditions before and after being given treatment. The following is a design related to the research used (Sugiyono, 2015).

O1	x	O2

Figure 2. Research Design

Description:
O1: Pretest is given before using theE-Booklet
X: Treatment is using the E-Booklet
O2: Posttest is given after using the E-Booklet

In this study, students were given formative tests with the aim of measuring students' cognitive learning outcomes. The test was carried out using a multiple choice test using googleform. The data obtained in the form of quantitative data from the scores pretest posttest that have been done by students. Learning using learning media e-booklet can be seen its effectiveness on the ability of students' cognitivelearning outcomes by looking for the N-Gain value. Of learning using Media e-booklet can be known effectiveness on student learning outcomes by looking for the N-Gain value withthe following equation: Determination of the N-gain value criteria is presented in table 2.

Table 2. N-gain value criteria (Hake, 1999)

No.	N-gain value	Criterion
1	High	>0.7 (>70%)
2	Medium	0.3-0.7 (30-70%)
3	Low	<0.3 (<30%)

Disseminate, This stage is the stage for disseminating the media e-booklet system's reproduction so that it can be accepted by users, if the results of the limited trial showconsistent results and the results of expert assessments recommend positive comments. So this media e-booklet can be disseminated in a limited way.

RESULTS AND DISCUSSION

The development of learning media e- booklet on the material of the human reproductive system was carried out based on the results of interviews with biology teachers about the learning media used, namely the useof learning media, showing that teachers have limited use of technology in learning biology. The media used when learning the material for the human reproductive system is slides Power Point which tend to contain long material descriptions, limited images are displayed so that students have low learning interest in participating in learning and can affect students' cognitive learning outcomes to below. The first stage of this development starts from define (definition) from the observation results of interviews with biology teachers, students' cognitive learning outcomes are still much below the Minimum Completeness Criteria. From the average test scores of students in class XI IPA, it shows a percentage of 35% of the total 30 students who scored above the Minimum Completeness Criteria determined in biology subjects in one of the schools in Bogor district, namely 72. Less use of learning media Interesting can cause students to feel bored, and make students less interested in reading learning material which causes students to not understand the material that has been given by the teacher, from this thefactors that cause student learning outcomes to be less than optimal. Of the 30 students, 70% of the students who answered the online questionnaire strongly agreed that learning biology requires interactive, interesting and not boring learning media. Learning media that contains images are included with easy-to-understand material to assist students in understanding the material for the human reproductive

system both when learning with teachers and studying independently.

The second stage is design (design). The design of this learning media e-booklet begins with the selection of sources by taking documentation from several literatures such as the internet, the material written in the learning media is obtained from several books. The resultof this stage is the initial draft of media design. Media e-booklet This consists of the main menu, how to use the e-booklet, KD IPK and learning objectives, materials, videos, quizzes, and summaries. Researchers designed their own in making learning media e-booklet using power point software with software assistance using *ispring suite 9* and to publish the software used, namely Website 2 APK Builder Pro, this application is a compatible application when exported in apk. format. The development stage is carried out by validating learning media with E- Booklets by experts. Validation was carried out to determine the feasibility of E-Booklets so that appropriate learning media were obtained to be tested on a small group of XI science class students in one of the high schools in Bogor district. In addition, at this stage the preparation of expert validation instruments and instrumentsto measure students' cognitive learning outcomesiscarried out. The third stage of the development process is development. At this stage the learning media E-Booklet that has been designed will be validated by experts, namely media experts and material experts. This validation is reviewed from the aspect of content, material content, anddisplay content. Validation of this media e- booklet is very important with the aim of producing more effective, feasible, and quality media. The data obtained by the average percentage of the four validators can be seen in Figure 3.

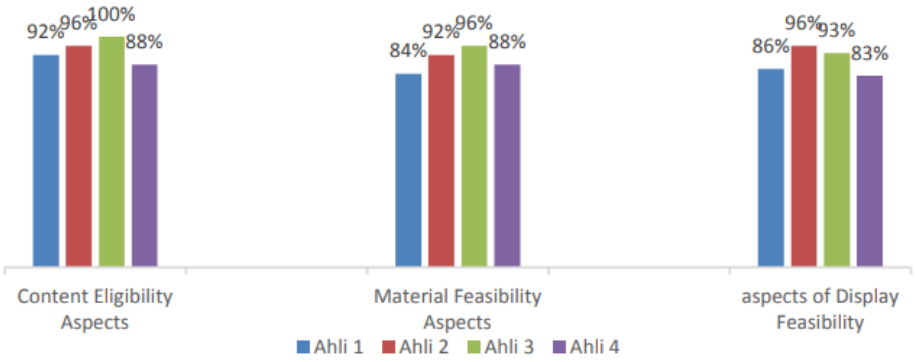

Figure 3. Percentage of validators

The results of the calculation of the feasibility of the learning media E-Booklet by expert 1 on the content aspect are 92%, material aspect 84%, and display aspect 86%. The results of the feasibility assessment of thelearning media E-Booklet by expert 2 on the content aspect are 96%, the material aspect is 92%, and the display aspect is 96%. The results of the feasibility assessment of the learning media e-booklet by expert 3 on the content aspect are 100%, the material aspect is 96%, and the display aspect is 93%. The results of the assessment of the feasibility of the learningmedia E-Booklet by expert 4, namely biology teachers in the content aspect, namely 88%, material aspect 88%, and display aspect 83%. This feasibility validation isa validation of the learning media E-Booklet from the feasibility aspect of media content, material aspects, and display aspects. If the level of achievement of the four experts is equal to or more than 61%, the learning media is categorized as valid and does not need revision. In accordance with theopinion according to (Arikunto, 2013) in the qualification table that a score >80% iscategorized as very valid with information thatdoes not need revision. This shows that the learning media is e-booklet feasible to use in learning the material of the human reproductive system. After the validation results are carried out, the media that has been declared feasible and ready to be tested. This trial phase was conducted to test the effectiveness of the learning media e-booklet with the human reproductive system material to improve students' cognitive learning outcomes. This field trial was only carried out in a limited trial. Consisting of 30 students were given an experiment using the learning media E- Booklet. Given the treatment using the experimental design One Group pretest- posttest students workon multiple choice test questions. This test aims to determine students' cognitive learning

outcomes by using the *N- Gain* value. The test results can be seen in table 3 as follows:

Table 3. The value of N-Gain in the experimental class on students' cognitivelearning outcomes

No	Criteria	Pre-test	Post-test
1	Number of students	30	30
2	Total scores	960	2524
3	Max scores	52	96
4	Average	33	87
	N-gain score		0.81 (81%)
			(g) = >0.7 (> 70%)
	criterion		high

The N-Gain score has an average value of 0.81 or in N-Gain% it is 81% in the high category. According to the criteria for the value of N-Gain (Hake, 1999) states that >0.7 (>70%)is categorized as high. This shows that the learning media e-booklet plays a role in improving students' cognitive learning outcomes. This is because, e-booklets are designed to complete concise and systematic explanations, as well as colorful images as illustrations, complemented by video and audio, which facilitate students' understanding of a concept or fact in the learning process. This is in accordance with Rahmatih's research (2017) e- booklets play a role in improving student learning outcomes. e-booklets are designed to complete concise and systematic explanations, as well as pictures as illustrations, which facilitate students' understanding of a concept or fact in the learning process. e-booklets Informative, attractive designs can arouse curiosity, so that students can easily understand what is conveyed in the learning process. The development of learning media e-booklet has the aim of stimulating students' interest in the learning process, increasing students' reading interest to improve students' cognitive learning outcomes (Senteio, 2020; & Delafontaine *et al*., 2022).

This research on the development of e- booklet learning media has limitations in the trial when filling out the question sheets pretestand posttest in this study distributed online through biology teachers to be distributed to students. The question sheet pretest posttest filled out by the respondents online in the formof a google form, therefore the researcher couldnot control the respondents directly. Then in the final stage, namely the stage Disseminate (spread). This stage is carried out in a limited manner, namely in class XI IPA in one of the high schools in Bogor district. This limited distribution is carried out with the assistance of a biology teacher providing an apk link. e-booklet for biology teachers. Then the instructional media e-booklet are distributed to the students to be installed on mobile each phones. The e-booklet learning media can be used for appropriate learning media for students, both in learning activities with teachers or learning independently (Akhter *et al.*, 2021).

CONCLUSION

Based on the results of the study, it can be concluded that the learning media e-booklet canimprove students' cognitive learning outcomes. has an average of 0.81 or in the N-Gain% is81% with a high category. The learning media is e-booklet valid and feasible to use for the learning process. based on the results of expert validation in terms of content aspects, material aspects, and display aspects, the learning media e-booklet obtained an average value of 91%witha very valid category.

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