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The development of interactive multimedia learning media on cell materials in Class XI IPA SMA Negeri 2 Kabanjahe

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ABSTRACT

This study aims to develop and produce interactive multimedia-based biology learning media using a valid, practical and effective powerpoint media that can be applied as a biology learning medium on cell material. The type of research used is development research with a 4-D development model. This model includes four stages, namely defining, designing, developing and disseminating. The results showed: (1) The validity of the media based on the assessment of media experts and material experts by getting an average percentage of 85.5% with the criteria of "very valid / very good". (2) The practicality of learning media based on student and teacher responses after using the media got an average percentage of 95.3% which included the "very practical" criteria. (3) The effectiveness of the media based on the results of student learning mastery after using interactive multimedia learning media is 86.1%. Then the calculation of the significance level is carried out with the ngain test score. From the results of manual calculations obtained n-gain score of 0.52. Based on the results of the study, the use of interactive multimedia learning media is said to be feasible with valid, practical and effective categories.

Keywords: Development, Interactive Multimedia Learning Media, Cell

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INTRODUCTION

Schools are the most important places in the education system that can improve the quality of education in which there is a teaching and learning process that involves several components, namely teachers, students, learning objectives, media used in learning, methods used, learning content and evaluation of learning outcomes. In the interaction learning process, the teacher is required to have skills that can apply media and learning models that can make learning more effective. The quality of learning outcomes can be obtained from the grades in the school and the high and low grades of students which are determined from several factors, including the media used by the teacher and the involvement of students in responding to the subject matter.

Ferdinan (2019) shows that education greatly influences the quality of people's lives, as in the preamble to the 1945 Constitution which states that one of the goals of the State of Indonesia is to educate people's lives. Therefore, the quality of education and learning must be improved in order to improve the quality of Indonesia's human resources. Improving the quality of human resources must continue to be carried out through the educational process. Science only grows in a rapidly developing civilization and culture. The development of culture is very dependent on the way people think, while the development and progress of people's thinking depends on their education. Thus, if you want the progress of science, humans must develop education as well as possible.

Suratanta (2020) reveals that science and technology is developing rapidly and calls for education to overcome the quality of education. The quality of education can be further developed by changing the attitudes that students use as a pattern to make learning progress in the media. But in reality there are still many educators / teachers who do not want to develop interesting and productive learning media, especially for learning materials. Therefore, it is important to break down articles from past test results in order to understand the appropriate media for biology learning. The word media is the plural form of the word media. Learning media is anything that can be used to convey messages (learning materials) to provoke students' thoughts, interests, reflections, and emotions in learning exercises to achieve learning objectives.

The use of learning media is related to improving the quality of education and according to Baharuddin (2015) learning media is one of the factors that support the success of the learning process in schools because it can help the process of delivering information from teachers to students or vice versa. The use of learning media in the teaching and learning process in schools can attract students' attention to pay more attention to the teacher's explanations, so that students are more aroused to pay attention, think, and have a willingness to learn. Creative use of learning media can facilitate and improve learning efficiency so that learning objectives can be achieved.

According to Handayani (2018) the problem that students often experience when studying at school is that they find it difficult to absorb the material presented by the teacher because learning media are also still limited to books whose presentation of material is dense and looks unattractive and makes students bored to study it. Another problem that occurs in the field is the number of teachers who have not been able to realize a learning by involving technology-based learning media such as computers. Most teachers are constrained by technical problems regarding the procedure for making electronic learning media, both from the realm of mastery of programming techniques, as well as visual displays or designs. A teacher should be able. use and utilize appropriate technology in their field in the learning process, especially mathematics learning.

According to Aziza (2011) cell material has the characteristics of many images (cell anatomy) that cannot be seen directly by the naked eye, has many parts and functions that must be memorized and understood by students. Cell material objects are actually real but become abstract for students if they are given a visualization of the cell structure. This makes it difficult for students to learn, especially on cell material, especially by comparing prokaryotic and eukaryotic cells as well as between animal and plant cells.

Based on the problems that arise, the efforts we make are to innovate to overcome the problems that we need to do. Based on the problems that arise, we make innovation efforts to overcome the problems that we have to do. Darmawan (2014) provides multimedia learning as an example of learning innovation through the use of technological developments in education. According to the definition of experts that multimedia is defined as text, color, graphics, animation, audio and video. Multimedia is a tool that combines text, color, graphics, animation, audio, and video to create dynamic and interactive presentations.

According to Hamidi (2017) it was revealed that interactive multimedia-based learning media no longer made the teacher the only source of learning for students and had to make students more active in learning skills. Interactive multimedia also provides opportunities for students to learn independently, so that learning can be done anytime and anywhere. This is in line with the Regulation of the Minister of Education and Culture Number 68 of 2013 concerning the 2013 Curriculum which states that teachers must provide the widest opportunity for students to learn from various different learning sources. Students can gather knowledge from various sources. The teaching materials used do not only utilize a single tool but are multimedia-based. The pattern of interaction that initially took place in one direction, from teacher to student, was changed to be interactive by utilizing various teaching materials.

RESEARCH METHOD

The opening method used in this study is the 4-D model by Thiagarajan (1974). This development model refers to the stages of defining (*define*), design (*design*), development (*development*) and dissemination (*dissemination*) and development (Trianto, 2015).

Table 1 Validity test criteria are seen in the Likert Scale Guidelines

No	Score	Information
1.	Score 5	Strongly agree/always/very positive/very decent/very good/very useful/very motivating
2.	Score 4	Agree / good / often / positive / appropriate / easy / feasible / useful / motivating enough
3.	Score 3	Doubtful/sometimes/neutral/fairly agree/fairly/fairly/appropriate/fairly easy/fairly interesting/moderately appropriate/sufficiently useful/sufficiently motivating

No	Score	Information
4.	Score 2	Disagree / almost never / negative / do not agree / do not understand / less worthy / less useful / less motivating
5.	Score 1	Strongly disagree / very unfavorable / very unsuitable / very unattractive / very unworthy / very less useful / very less motivating

$$P=\frac{\Sigma X}{\Sigma X1} \times 100\%$$

Information:
P = Percentage of validity values
X = Number of expert answers in one aspect
X1 = Maximum number of answers in one aspect
100% = Constant

Table 2 Practicality Test Criteria looked at Guttman according to Sugiyono

No.	Score	Information
1.	Score 1	Agree/yes
2.	Score 0	Disagree/no

$$P=\frac{\Sigma X}{\Sigma X1} \times 100\%$$

Information:
P = Percentage of validity values
X = Number of expert answers in one aspect
X1 = Maximum number of answers in one aspect
100% = Constant

Table 3 . Effectiveness Test Criteria (Majdi, 2018)

N-Gain score	Criteria
N-Gain $>$ **0. 7**	Tall
0.3 $\leq$N-Gain $>$ **0. 7**	Currently
N-Gain$<$ **0. 3**	Low

$$N\text{-}Gain = \frac{skor\ \ postest - skor\ Pretest}{skor\ maks - skor\ pretest}$$

RESULT AND DISCUSSION

Defining Stage (Define)

This stage is the initial stage in compiling media to define and define learning requirements. At this stage, what is done is to determine the development of learning media and materials used. The first is curriculum analysis, the second is material analysis, media analysis, student analysis and needs analysis

Stage of Design (design)

The design phase aims to design the learning media that will be developed. The steps that must be taken at this stage are the preparation of materials and components of the presentation of learning media.

Development Phase (development)

Early stage

At this stage the researcher will provide interactive multimedia learning media that have been made to several lecturers to be assessed. The lecturer's assessment is an assessment by media experts, material experts and questions along with responses from biology teachers and students.

Learning Media Development

1. Intro/ Main Menu Learning Media

   The intro display of learning media displays the media title. In the intro view there is a home button to display the contents of the title contained in the initial display and this button appears in every display of learning media, a question mark button for the help button in the form of an email address and researcher's contact number. The intro display of the developed learning media can be seen in the image below.

Figure 1 Display Intro / Main Menu Learning Media

2. Display media content

Figure 2 Profile View

Figure 3 Help View

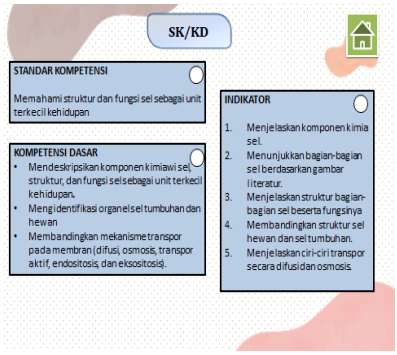

Figure 4 SK/KD display

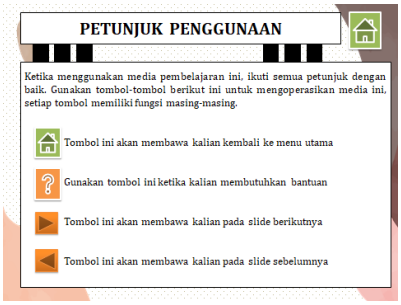

Figure 5 User Guide Display

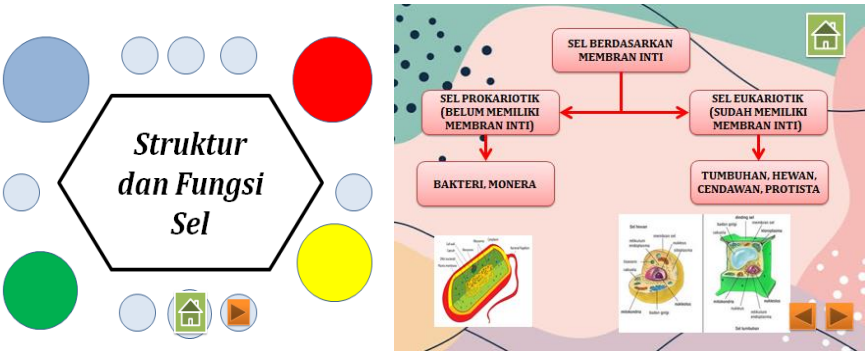

Figure 6 Display Materials

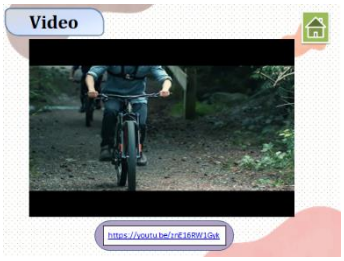

Figure 7 Video Display

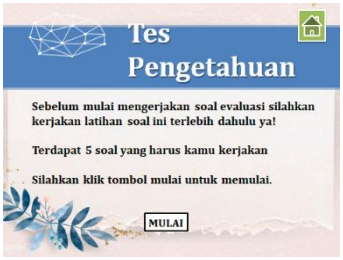

Figure 8 Exercise View

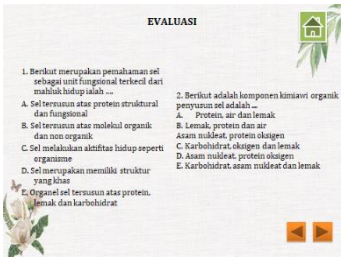

Figure 9 Evaluation Display

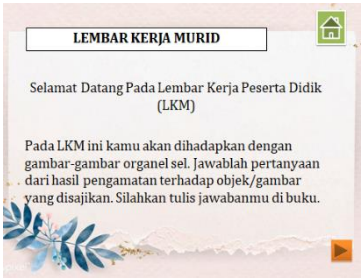

Figure 10 MFI Display (Student Worksheet)

Dissemination Stage (Desseminate)

Interactive multimedia learning media that have been assessed by media experts, material experts along with responses from biology teachers and students, the final result is obtained in the form of interactive multimedia learning media products on cell material. Furthermore, learning media products enter the dissemination stage by delivering learning materials using media that have been made so that students can see the media that have been developed.

1. Validity of Interactive Multimedia Learning Media

The validity of interactive multimedia learning media on cell material is carried out through assessment or validation by media experts and material experts. The validation carried out by media experts covers the display aspect and the programming aspect. While the validation by material experts includes the quality of the material presented in the media.

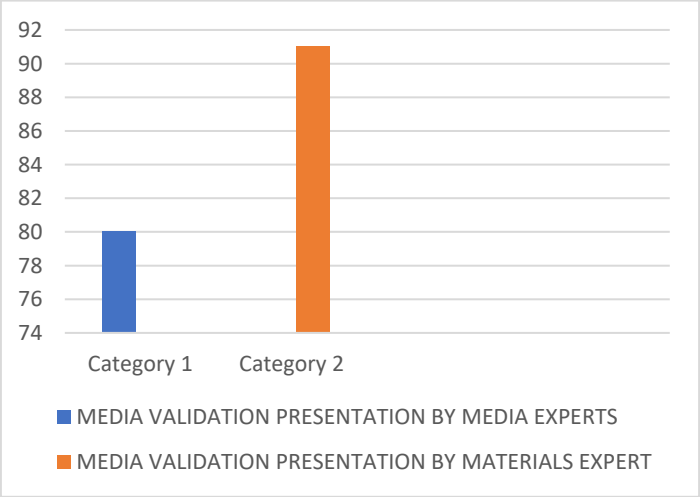

Figure 11 Bar Charts of Media Experts and Materials Experts Penilaian

The bar chart above shows that the highest percentage is in the assessment of material experts of 91% which is included in the very valid category and the second is the assessment of media experts with an average of 80% which is included in the valid category.

Practicality of Interactive Multimedia Learning Media

interactive multimedia learning media on cell material is seen based on the respondent's assessment at the development stage, namely the trial of learning media products in schools. The respondents involved in the trial of this product were 36 students and a biology teacher. The assessments given include aspects of appearance, aspects of ease of use, aspects of material presentation, and aspects of benefits.

Based on students' responses after using learning media, the results obtained are: (1) Aspects of the display of learning media with an average percentage of assessment of 98.6% which are included in very practical criteria; (2) the aspect of ease of use of learning media with an average percentage of assessment of 98.1% which is included in the very practical criteria; (3) The material presentation aspect has an average rating percentage of 96.5% which is included in the very practical criteria; and (4) the

benefit aspect has an average percentage of assessment of 98.1% which is included in the very practical criteria. The average percentage obtained from the four aspects is 97.8 % which is included in the very practical criteria. The results of the assessment of student responses after using the media are presented in the following bar chart.

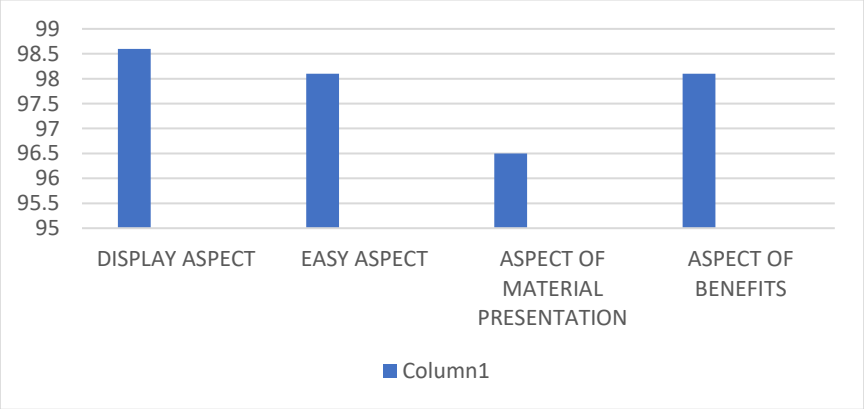

Figure 12 Student Response Result Bar Chart

Based on the teacher's response after teaching by using learning media, the results obtained are: (1) The display aspect of learning media has an average percentage of assessment of 75% which is included in practical criteria; (2) The aspect of ease of use of learning media has an average percentage of assessment of 100% which is included in the very practical criteria; (3) The material presentation aspect has an average percentage rating of 100% which is included in the very practical criteria; and (4) the benefit aspect has an average rating percentage of 100% which is included in the very practical criteria. The average percentage obtained from the four aspects is 92.8 % which is included in the very practical criteria. The results of the teacher's response assessment after using the media are presented in the following bar chart.

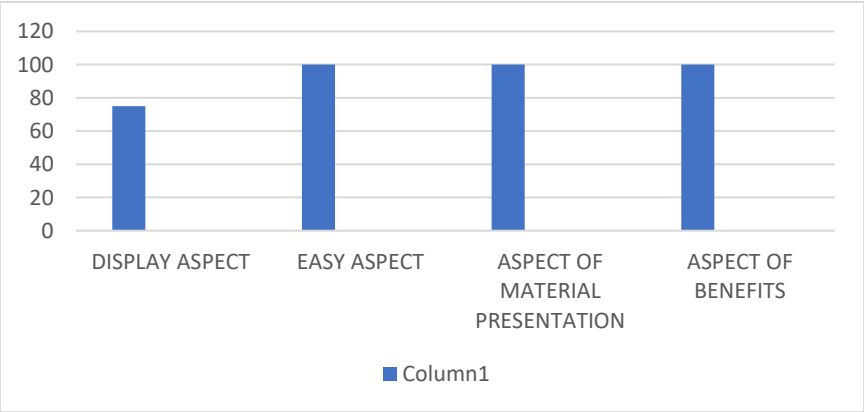

Figure 13 Teacher Response Result Bar Chart

The results of the responses from students with an average of 97.8 % which are included in the very practical criteria and the second the teacher's response to the media with an average of 92.8% which is included in the very practical criteria.

Effectiveness of Interactive Multimedia Learning Media

Based on the analysis of the learning test results in table 4.12, it is known that 31 students who passed the test got a score ≥of 70 out of a total of 36 students who had taken the test after using interactive learning media. the following is a diagram of student learning outcomes in convectional learning and after using interactive multimedia is presented in the following diagram:

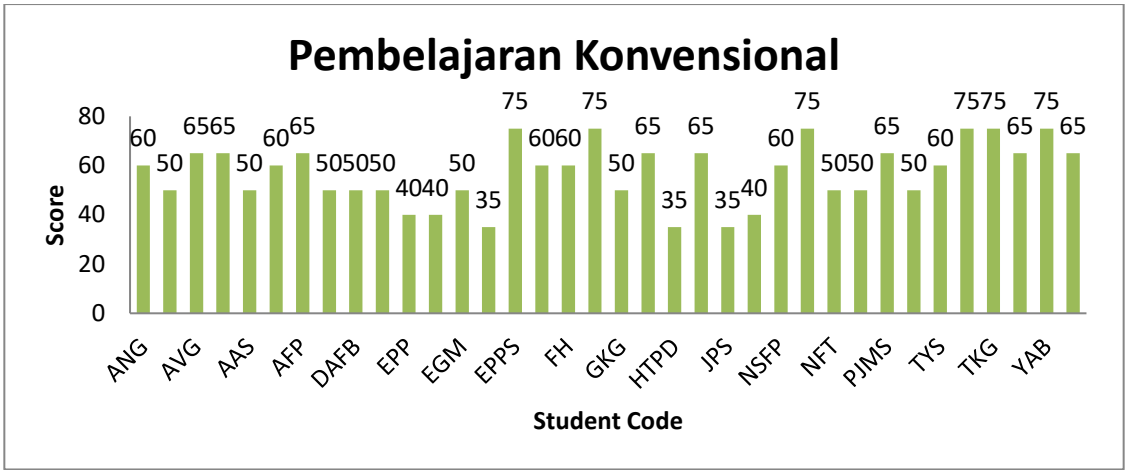

Figure 14 Bar chart Student Values After Using Media

Based on the calculations that have been done, the results of classical student learning completeness in conventional learning are 16.6 % . While the classical student learning completeness after using interactive multimedia-based mathematics learning media was 86.1 % . Then the calculation of the significance level is carried out with the *ngain test score* . From the results of manual calculations obtained *n-gain score* of 0.52 . Based on table 4.12, the *n-gain score* of 0.52 is at 0.3≤ *n-gain* ≤0.7 which includes the moderate criteria. With this, making interactive multimedia learning media can improve student learning outcomes with an average pretest of 57.08% and an average posttest result of 78.75%. Thus, interactive multimedia learning media on cell material is considered effective in learning in class XI science at SMA Negeri 2 Kabanjahe.

CONCLUSION

Development of interactive multimedia learning media on cell material for class XI science at SMA Negeri 2 Kabanjahe using a 4-D development model with 4 stages , namely the definition, design, development and dissemination stages. The learning media developed can be said to be of high quality if it meets three criteria, namely valid, practical and effective. Then it can be concluded as follows: The validity of the interactive multimedia learning media for cell material was assessed with a "very good / very valid " scale which was assessed by material experts as 85.5%. Therefore, it can be concluded that the interactive multimedia learning media on cells is valid and feasible to be used in learning biology in schools. The practicality of interactive multimedia learning media on cell material is obtained from the results of student and teacher responses after using the media. Based on the data obtained from the cumulative analysis of student and teacher responses obtained from the average practicality percentage of 95.3%. The percentage shows the overall response of students and teachers after using interactive multimedia learning media which are categorized in very practical criteria. The effectiveness of interactive multimedia learning media on cell material is obtained from the results of student learning tests. The results of student learning mastery after using interactive multimedia learning media are 86.1 % . Then the significant level with the ngain test score . From the results of manual calculations obtained n-gain score of 0.52 . Therefore, the use of interactive multimedia learning media is quite effective in learning biology at SMA Negeri 2 Kabanjahe.

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