



The Effectiveness of Multimedia-Based Biology Learning on the Main Material of the Structure and Function of Tissue-Making Cells in Plants and Animals Class XI IPA at SMA Negeri 1 Onan Ganjang T.P. 2021/2022

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ABSTRACT

This study aims to determine the effectiveness of multimedia-based biology learning on the structure and function of tissue constituent cells in plants and animals at SMA Negeri 1 Onan Ganjang T.P 2021/2022. The research sample was obtained by random sampling technique. The sample consisted of 2 classes, namely class XI MIA 1 and XI MIA 2. The research design used was a pretest-posttest nonequivalent control group design. The results showed that the posttest average value of the experimental class was 91.26 higher than the control class's posttest average score of 82.6, the average value of the multimedia effectiveness questionnaire in the experimental class was 95.7 higher than the control class's average value. 60.7, and the average value of the teacher's questionnaire regarding the effectiveness of multimedia as a teaching material is 90. The effectiveness value obtained by comparing the n-gain of the experimental class and the control class is 1.65 which shows that multimedia is more effective than student worksheets. So it can be concluded that multimedia as a teaching material is effectively used in the structure and function of cells making up plant and animal tissues in class XI MIA at SMA Negeri 1 Onan Ganjang T.P 2021/2022.



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INTRODUCTION

Education has a very strong influence on the development of a nation because education has always been a major concern in order to advance the lives of the next generation of a nation itself. Education is also a long-term resource investment that has strategic value for the sustainability of a nation's civilization. Therefore, almost all countries place education as a top priority. The current era of globalization demands high-quality human resources. For this reason, in creating quality human resources, one of the foremost ways is through good education and maximizing the potential of students to become competent human resources (Astuti, 2017).

The development of education in Indonesia has entered a new phase in which various technologies have been developed to improve the quality and results of education. The technology used is a modification of existing technology or is the latest or most recent invention. This effort is a breakthrough that is expected to improve student learning outcomes. The efforts that have been made so far only use an educator as the main player, relying on printed book teaching materials as a tool to improve student learning outcomes. Various kinds of efforts have shown good results, but this has not provided maximum results. Therefore, various methods are used, starting with curriculum changes, learning methods, and learning technology. It is estimated that in 2019, the number of users of online-based learning videos will increase by 77% compared to 2014, when it was only 59%. By using learning videos, it is hoped that each educator can be more creative in making an attractive display of the learning process because it is supported by the appearance and attractiveness of the video, which is more easily accepted or understood by students (Khairani et al. 2019).

According to Mega (2016), several factors contribute to students' learning difficulties in the material structure and function of plant tissues, including the realm of understanding plant tissue structure, function, and the relationship between plant tissue structure and function. With varying levels

of difficulty in the realms of understanding the function of plant tissue, understanding the structure of plant tissue, and understanding the relationship between the structure and function of plant tissue, there are more students who score below KKM for the same learning outcomes as those who score at or above KKM.

Based on the observations I have made, Onan Ganjang 1 Public High School is a school that is domiciled in Humbang Hasundutan district, Onan Ganjang sub-district, and Onan Ganjang village. This school was founded in 1985 and has received A accreditation since 2017. According to my interview with a biology subject teacher, namely Mrs. Fronica Damanik, S.P.D., on Saturday, July 27, 2021, at night at the mother's residence, it was revealed that during this pandemic the learning process was less effective because students were required to study on their own without direct guidance from the teacher as usual when offline. He also revealed that media limitations are also a deficiency in the smoothness and success of learning; some of the media or teaching materials used by him are still lacking in increasing interest and learning outcomes. Examples of teaching materials used are pictures taken from books and sent to students to study and worksheets used to guide students in independent learning. He also said that the average test score of students also did not reach the value expected by the school. Based on this background, the authors raised a research title entitled "Effectiveness of Multimedia-Based Biology Learning on the Subject Material of Structure and Function of Tissue-Constructing Cells in Plants and Animals at SMA Negeri 1 Onan Ganjang T.P. 2021/2022."

RESEARCH METHODS

This research was conducted at Onan Ganjang 1 Public High School, which is located at Jalan Pakkat-DolokSangul, Onan Ganjang District, Humbang Hasundutan Regency, North Sumatra. This research is quasi-experimental and aims to determine the effect of something imposed on the subject, namely students. The intended influence is the effectiveness of multimedia-based biology learning on the structure and function of plant tissues. The population in this study were all students of Class X MIPA SMA Negeri 1 Onan Ganjang, which consisted of three classes majoring in MIPA with a total of 91 students from the three classes. Samples taken by random sampling, namely taking sample members from a population that is carried out randomly without regard to the existing strata in the population. The students who were sampled were students in classes XI IPA 1 and XI IPA 2, totaling 60 students.

The research procedure uses the technique of analyzing the data that has been collected by reviewing the research proposal to check the plan for presenting the data and carrying out the statistical analysis that has been determined previously. The pretest-posttest nonequivalent control group design is used in this study. In this research design, observations of quasi-experimental subjects were carried out before the implementation of the experimental manipulation, which is called the pre-test. After the learning was carried out, observations were made again on the experimental subject, which was called the post-test. Data collection techniques in this study were in the form of learning outcomes tests and questionnaires. The data needed in this study consisted of two learning outcomes tests in the form of multiple choice questions and a questionnaire to determine the effectiveness of multimedia as teaching materials. The purpose of doing a learning achievement test is to measure student learning outcomes based on the material structure and function of plant tissues. The test results will be used as a reference for analyzing the effectiveness of multimedia as a teaching material on the structure and function of plant tissue material, and the questionnaire will be used as a reference for determining the effectiveness of multimedia as a teaching material on the structure and function of plant tissue material.

Tests are arranged based on the level of difficulty of cognitive abilities, starting with C-1 (remember), C-2 (understand), C-3 (apply), C-4 (analyze), C-5 (evaluate), and C-6 (create). The number of tests is 25 questions in the form of multiple choice questions, which are arranged according to indicators from the syllabus of the biology teacher in class XI IPA at SMA Negeri 1 Onan Ganjang. Before the test questions are used to retrieve research data, the questionnaire is first validated with the validator, and, then validation is carried out for class XII to find out how many questions are appropriate and not in accordance with the provisions. Then, for the questionnaire, the correct answer was given a score of 1 (one), and the wrong answer was given a score of 0 (zero). Multimedia is said to be used effectively in the learning process if the N-Gain value for the experimental class or the N-Gain for the control class is equal to 1 or more than 1. Then the value of the questionnaire has a

percentage value of more than 50 for students and 40–1000 for teachers. Effectiveness response questionnaire.

RESULTS AND DISCUSSION

Research Result

The data obtained during the research process were pretest-posttest scores and response scores from the questionnaire given to teachers and students. The formula analysis technique will then be used to analyze the data. Based on the research that has been carried out, the results of the research are obtained in the form of the pretest of the experimental class and the control class and the posttest values of the experimental class and the control class. Then this value is entered into the N-Gain formula to find out the increase between the pretest and posttest values in the experimental class and the control class.

Based on the values in table 1, it can be concluded that the average value of the pretest experimental class and control class did not differ significantly from the average value of the experimental class (37.3) and control (37.3). However, the posttest scores for the experimental class and the control class differ significantly from the experimental class (82.3) and the control class (65.1).

Table 1 Data pretest and posttest experimental class and control class.

Data	Pretest		Posttest	
	Experiment	Control	Experiment	Control
Total students	30	30	30	30
The highest score	52,1	60,8	91,3	82,6
Lowest Value	17,3	17,3	60,8	39,3
Average	37,4	37,7	82,3	65,1

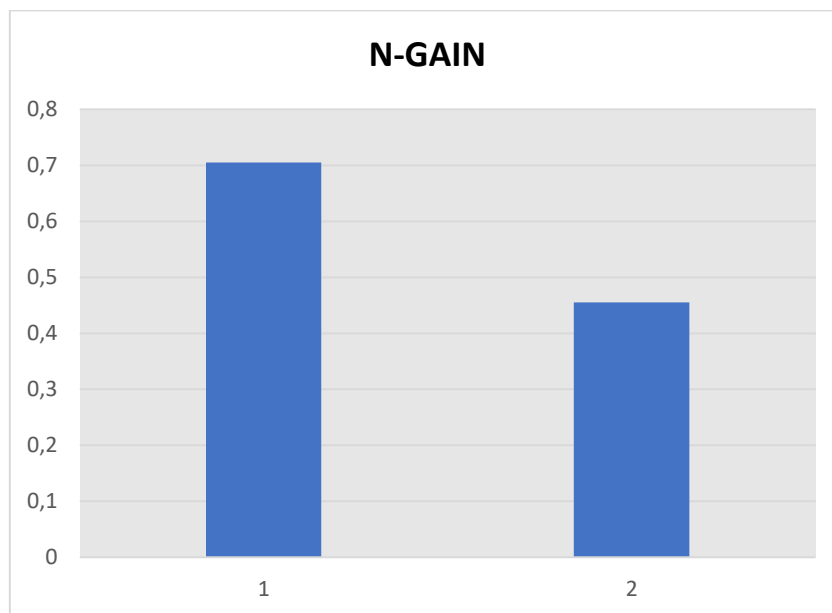


Figure 1 N-Gain value of Experiment class and Control class

The diagram above shows that the experimental class and the control class have different increases in student learning outcomes. The experimental class that used multimedia as learning material experienced an increase of 0.71 (high), while the control class used student worksheets as learning material, which increased by 0.43 (moderate). From the data, it can be seen that the experimental class that used multimedia as learning material experienced a higher increase in student learning outcomes compared to the control class that used student worksheets as learning material.

Table 2 Student multimedia effectiveness questionnaire assessment data

Data	Experiment Class	Control Class
Total students	30	30
The highest score	100	80
Lowest Value	60	47
Average	95,7	60,7

Data in table 2 shows that the average value of the effectiveness of students' multimedia learning in the experimental class is 95.7, with the highest score of 15 and the lowest score of 9. The average value of the effectiveness of using student worksheets in the control class is 60.7, with the highest score of 12 and the lowest score of 7. The average value of learning effectiveness in the experimental class using multimedia is higher than the control class using student worksheets.

Table 3 Teacher questionnaire data

Data	
Number of Respondents	2
The highest score	93
Lowest Value	87
Average	90

Data in table 3 shows that the average value of the effectiveness of multimedia as student teaching material is 90, with the highest score of 93 and the lowest score of 87.

Discussion

Based on the data obtained, the differences in student responses to teaching materials in the experimental class and control class can be seen in Figure 2 below.

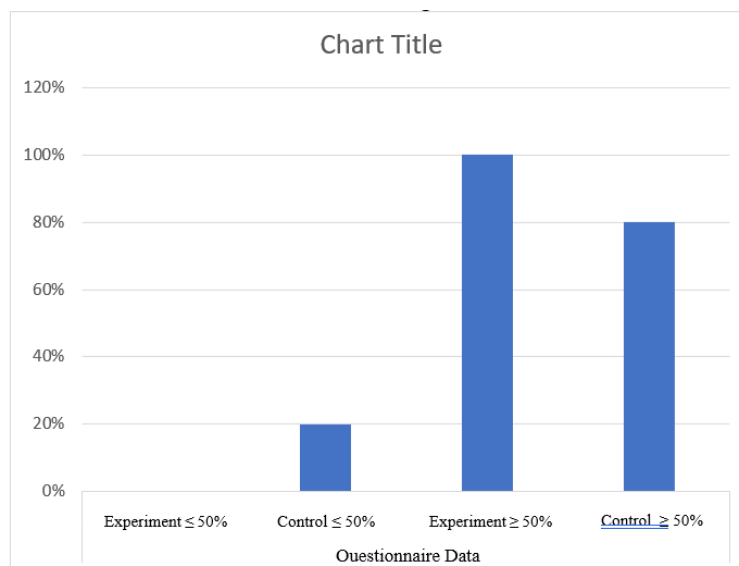


Figure 2 Diagram of Student Responses to Learning Materials Given in Class

Control and Experiment Classes

The diagram above shows that the experimental class and the control class have different student responses. In the experimental class using multimedia as teaching materials, it can be seen that all students (30 students) consider multimedia teaching materials as teaching materials to be used effectively. While in the control class, it can be seen that 20% of students consider LKS teaching materials to be ineffective teaching materials, while as many as 80% of students consider LKS to be effective teaching materials. From the existing data, it can be seen that the experimental class that uses

multimedia as teaching materials has a better response compared to the control class that uses LKS as teaching materials.

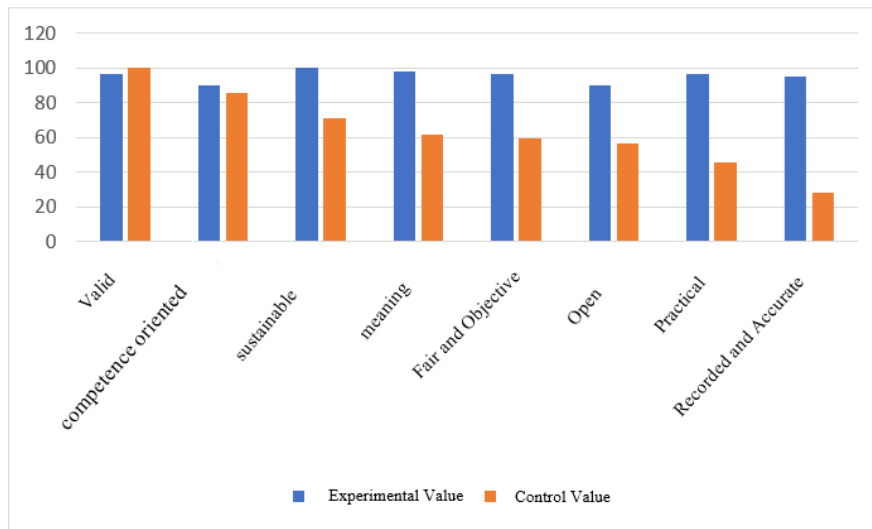


Figure 3 Questionnaire effectiveness diagram per indicator

According to figure 3, the effectiveness of teaching materials per indicator in the experimental class was 96.6% for valid indicators, 89.95% for competency-oriented indicators, 100% for sustainable indicators, 98.3% for meaningful indicators, 90% for open indicators, 96.6% for practical indicators, and 95% for indicators recorded and accurate.

The effectiveness of teaching materials per indicator in the experimental class was not effective, with a percentage value of 100% for a valid indicator, 86% for competency-oriented indicators, 71.5% for sustainable indicators, 61.6% for meaningful indicators, 59.9% for fair and objective indicators, 56.6% for open indicators (not effective), and 28.3% for indicators recorded and accurate.

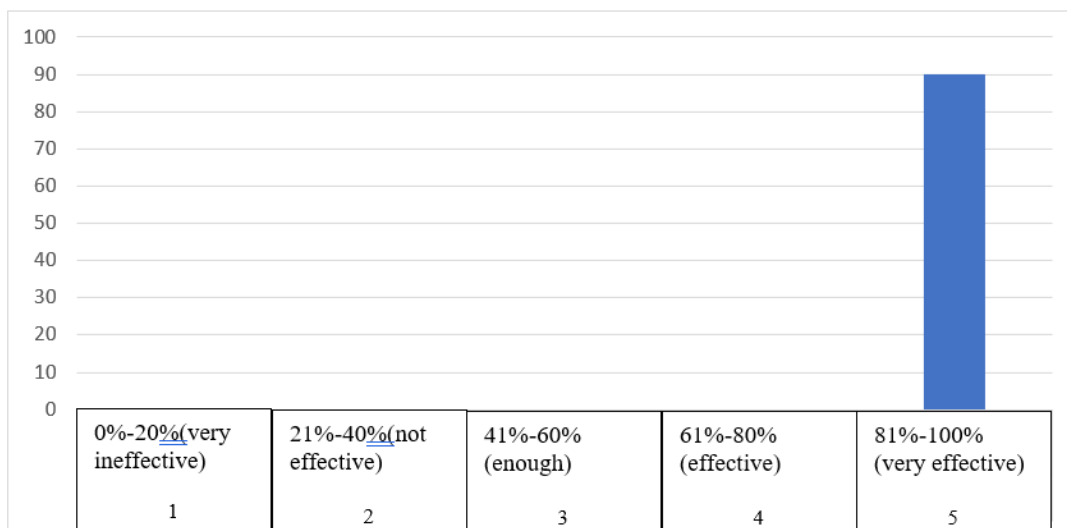


Figure 4 Diagram of the Teacher's Response to Multimedia as Teaching Material

From the diagram above, it can be seen that all biology teachers at SMA Negeri 1 Onan Ganjang (2 respondents) consider multimedia as a very effective teaching material.

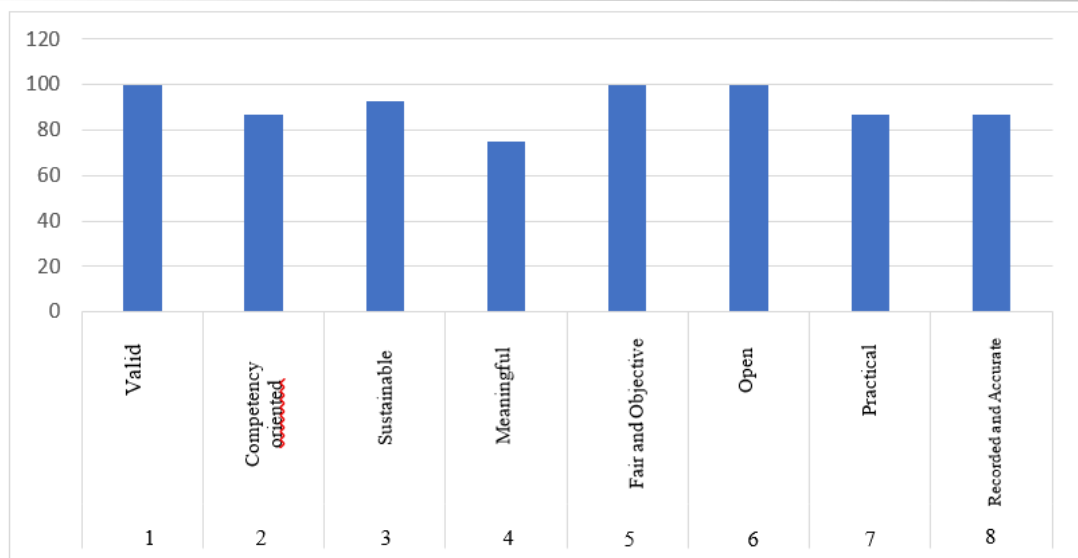


Figure 5 Multimedia Effectiveness Diagram as Teaching Material per Indicator

According to figure 5, the effectiveness of multimedia as a teaching material per indicator was 100% for valid indicators (very effective), 87% for competency-oriented indicators (effective), 93% for sustainable indicators (effective), 75% for significant indicators (effective), 100% for fair and objective indicators (effective), 100% for open indicators (effective), 87% for practical indicators (effective), and 87% for indicators. Then, based on the effectiveness formula:

$$\frac{N - \text{Eksperimental Class Gain}}{N - \text{Control Class Gain}}$$

Then the value is obtained: Effectiveness = $\frac{0,71}{0,43} = 1,65$

Based on the results of the n-gain test, the experimental class using multimedia as teaching material experienced an increase of 0.71 (high), while the control class experienced an increase of 0.43 (moderate). This shows that multimedia as a teaching material is more effectively used than student worksheets. This statement is supported by an effectiveness score of 1.38, which means that multimedia is effectively used as biology teaching material.

CONCLUSION

Based on the results and discussion of the research that has been done, it can be concluded: 1. Multimedia as an effective teaching material is used in the learning process of class XI IPA students at SMA Negeri 1 Onan Ganjang. Based on the percentage of student responses in the experimental class using multimedia as teaching materials, it is included in the effective category (100%). And based on the percentage of teacher responses to multimedia as an evaluation tool, it is included in the effective category (100%). 2. Multimedia as teaching material influences student learning outcomes on the structure and function of plant tissue material for class XI IPA at SMA Negeri 1 Onan Ganjang. Based on the N-Gain value, the experimental class student learning outcomes increased by 0.71 (high).

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