

Effectiveness Of Interactive Multimedia Utilization In Mathematics Class VIII SMPN 25 Padang
(Keberkesanan Penggunaan Multimedia Interaktif Dalam Matematik Kelas VIII SMPN 25 Padang)

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ABSTRACT

Based on observations made at SMP Negeri 25 Padang in Mathematics, some problems impact the learning outcomes of class VIII students. Researchers found that teachers have not optimised the use of learning media and teaching materials due to limitations in technology or applications. Usually, many students have not reached the minimum completeness criteria set at 75. To overcome these problems, research was conducted using interactive multimedia based on articulate storyline in the learning process. This study aimed to determine the effectiveness of interactive multimedia utilisation on student learning outcomes in Mathematics class VIII SMP Negeri 25 Padang. The research method used in this study was a quantitative quasi-experiment. The population in the study were all grade VIII students in the 2022/2023 academic year. Data was collected from a multiple-choice questionnaire. The results showed that the average value of the experimental class that utilised articulate storyline-based interactive multimedia was 76.17, higher than that of the control class that used textbooks and teaching materials, which was 70.52. It can be concluded that using interactive multimedia based on an articulate storyline effectively affects the learning outcomes of VIII grade students in Mathematics subjects at SMP Negeri 25 Padang.

Keywords - Effectiveness, Learning Multimedia, Learning Outcomes, Mathematics.

ABSTRAK

Berdasarkan pemerhatian yang dibuat di SMP Negeri 25 Padang dalam mata pelajaran Matematik, beberapa masalah memberi kesan kepada hasil pembelajaran murid kelas VIII. Pengkaji mendapati guru belum mengoptimumkan penggunaan media pembelajaran dan bahan pengajaran kerana keterbatasan teknologi atau aplikasi. Kebiasaannya, ramai pelajar yang belum mencapai kriteria kesempurnaan minimum yang ditetapkan iaitu 75. Bagi mengatasi masalah tersebut, kajian telah dijalankan menggunakan multimedia interaktif berdasarkan jalan cerita yang tersusun dalam proses pembelajaran. Kajian ini bertujuan untuk mengetahui keberkesanan penggunaan multimedia interaktif terhadap hasil pembelajaran murid Matematik kelas VIII SMP Negeri 25 Padang. Kaedah kajian yang digunakan dalam kajian ini ialah kuasi eksperimen kuantitatif. Populasi kajian adalah semua pelajar gred VIII pada tahun akademik 2022/2023. Data dikumpul daripada soal selidik aneka pilihan. Hasil kajian menunjukkan bahawa nilai purata kelas eksperimen yang menggunakan multimedia interaktif berasaskan jalan cerita artikulasi adalah 76.17, lebih tinggi daripada kelas kawalan yang menggunakan buku teks dan bahan pengajaran iaitu 70.52. Dapat disimpulkan bahawa penggunaan multimedia interaktif berasaskan jalan cerita yang jelas memberi kesan kepada hasil pembelajaran murid darjah VIII dalam mata pelajaran Matematik di SMP Negeri 25 Padang.

Kata Kunci - Keberkesanan, Multimedia Pembelajaran, Hasil Pembelajaran, Matematik.

INTRODUCTION

Education is an effort of a person or group to change the attitudes and behaviour of mature humans through teaching efforts. Shawmi (2017) states, "Education is a tool used to stimulate humans so that they can develop their potential by expectations". Through education, students can determine how to develop their potential and train themselves to develop their abilities. From the above, it can be said that education is an indispensable need for humans who are born not knowing anything to know, and through the learning process, students can actively develop their abilities to have knowledge, self-control, intelligence, and personality.

Learning is the process of student interaction with education and learning resources in a learning environment. According to Ahmadi and Uhbiyati (2007), learning is the same as practice, so learning results will appear in specific skills. Quality learning is highly dependent on the motivation of the teacher's creativity; learning that has high motivation and is supported by teaching that can facilitate it will lead to the achievement of learning targets. In the 2013 curriculum, the role of teachers is not only to deliver learning materials, but teachers must also play various roles that aim to develop student potential to the fullest. The 2013 curriculum emphasised student character building, which requires teachers to be able to design effective and meaningful learning. In addition, teachers are also required to be able to organise learning effectively to generate student motivation for learning.

The 2013 curriculum was designed to develop students' potential, enabling them to live as individuals and citizens who are faithful, productive, creative, innovative, and effective and who can contribute to society, the nation, the state, and global civilisation. The curriculum is a mandatory learning planning tool, one of which is mathematics. Mathematics lessons are given to all levels of secondary education. However, it cannot be denied that mathematics is a subject that is less interesting to both primary and secondary education students. One reason is that mathematics lessons have many abstract concepts that are difficult to imagine. Therefore, many students work directly with mathematical formulas without trying to learn the underlying philosophical background. Technology also plays a role in improving education, especially in the development of technology in mathematics learning, which certainly impacts the development of current mathematics learning.

Education is increasingly challenged due to the rapid development of technology. The development of science has brought changes in all aspects of life, both

in the fields of economy, art, culture, and education. Adjustments are necessary to ensure that the education sector keeps pace with technological advancements. The development of the world of knowledge and technology also increasingly encourages efforts to renew and utilise technological results in the learning process. The utilisation of learning media is seen as important in the learning process at school because it is able to help achieve learning objectives. The use of interactive learning media will help students effectively absorb learning materials and message content. Many studies explain that the use of learning media can convey the content of learning messages quickly and be understood by students. Media is a component created in the learning strategy and has an essential role in improving the quality of learning. The *Association for Education and Communication Technology* (AECT) defines media as a form used to distribute information. Learning media can be used to channel messages (learning materials) to stimulate students' attention, interests, thoughts and feelings in learning activities to achieve certain learning goals.

Field observations conducted at SMPN 25 Padang on February 25, 2023, revealed that teachers have not fully utilised learning media, increasing student boredom and inattention. Consequently, some students were less active in asking questions about material they did not understand. Teachers use media in the form of textbooks. According to the author, it is impractical and less effective for teachers to use props that directly follow students' learning material. So that the learning process will be tedious, and students will become passive because they will not have the opportunity to discover the concepts taught to them. Teachers have not used technology-based learning media due to limited knowledge of *software* technology or applications that can be utilised as learning media. Therefore, the author introduces an interactive learning medium based on *Articulate Storyline* to assist teachers in delivering material to students. This affects the learning outcomes of mathematics that students learn.

From the results of students' daily tests in mathematics subjects in the school year 2022/2023, even semester, it can be stated that students' mathematics learning outcomes have not reached the KKM (Minimum Completeness Criteria) set by the teacher, namely 75. Due to the low learning outcomes of these students, the author feels the need for innovation in learning so that students can better understand the teaching carried out by the teacher in the form of interactive multimedia. Interactive multimedia is a technology innovation that can be tailored to student learning needs. Arham and Dwiningsih (2016) revealed that interactive multimedia

is an innovation that is needed as a learning medium following technological and information advances.

Learning media is very helpful for teachers in the learning process. According to Daryanto (2016), the learning process becomes more interesting and interactive, which can reduce the amount of teaching time, improve the quality of student learning, enable the teaching and learning process to occur anywhere and at any time, and enhance student learning attitudes. Learning media will make it easier for teachers to stimulate students' thinking. Learning media also provides a clearer picture to students about the material being studied. The utilisation of learning media allows learning to occur by fostering students' independence so that they will experience a more meaningful learning process and learning becomes more effective and efficient. So, in this case, using media in the learning process will be beneficial, and several learning media can be utilised, one of which is interactive multimedia based on an *Articulate storyline*.

Articulate storyline is software that functions as a communication or presentation medium. Learning media using this *software* is no less interesting than other interactive media because an *Articulate storyline* presents information with a specific purpose according to user needs. *Articulate Storyline* is equipped with supporting features such as *the templates provided*, and it can even create *templates* tailored to the desired character. Another advantage of an *Articulate storyline* is that it can create content such as images, text, audio, animation and evaluation tests. In addition, the *Articulate storyline* also has complete features to facilitate use so that it can be utilised as a learning media.

RESEARCH SIGNIFICANCE

This research focuses on testing the effectiveness of interactive multimedia, specifically *Articulate Storyline*, in improving student learning outcomes in mathematics. The study was conducted in class VIII at SMPN 25 Padang and used experimental research methodology. The researchers aimed to determine whether *Articulate Storyline*-based interactive multimedia on flat-sided space-building material could enhance student learning outcomes in this subject. Experimental research involves studying the impact of a specific factor on the subjects investigated. In this case, the researchers aimed to determine the effectiveness of interactive multimedia in enhancing student learning outcomes. The study is a part of quantitative research aiming to assess the effectiveness of interactive multimedia in mathematics

education in the specific context of SMPN 25 Padang.

MATERIALS AND METHODS

The research method used in this research is a quantitative *quasi-experiment*. The sample was taken using a *purposive sampling* technique consisting of class VIII 6, with as many as 30 students as the experimental class and class VIII 7, with as many as 29 students as the control class. The technique used in data collection is learning outcomes in mathematics subjects in the form of multiple-choice questions with 20 questions. This research was carried out in 4 meetings over two weeks, every Monday and Thursday, where in the experimental class, in addition to the usual learning process, the experimental class was treated using *storyline-based interactive multimedia* under the teacher's supervision. Meanwhile, in the control class, teachers were treated as usual with the help of textbooks and adapted teaching aids. The aim is to see how effective interactive multimedia is in the learning process in classes with classes that do not use interactive multimedia.

In the experimental class, media related to the theme being discussed is broadcast using a projector. Subsequently, the teacher explains the material to help students understand it more easily. This interactive multimedia has images, videos, animations, text, and sound, so the appearance is more attractive and not monotonous, and students can be more active and enthusiastic in receiving the material.

After conducting research for two weeks, at the end of the meeting, a final test was carried out in both classes to see the results of the students' learning using multiple-choice questions with four answer options. Data is obtained from the learning results, which will be processed using Excel according to the formula. Then, to see the differences between the learning outcomes of the two classes, an average test will be carried out to test the hypothesis using the t-test. To carry out a t-test (t-test), a normality test and a homogeneity test are first carried out.

As for the steps that must be carried out to obtain appropriate results, the following test is used:

Normality Test

The normality test in Syafril (2019, p.177) aims to determine whether the data to be processed comes from normally distributed data. To test for normality, the Liliefors test is applied, as demonstrated in Syafril's 2019 study, following these steps:

- i. Sort the data from smallest to largest.
- ii. Calculate Zi for each data using the following formula:

$$Z_i = \frac{X_i - \bar{X}}{S}$$

Notes:

X = data searched Z_i

\bar{X} = Mean value of the sample

S = Standard deviation

- iii. Calculate $F(Z_i)$ for each data by guiding the normal distribution data in the following way:
 - If Z_i has a number with a negative sign, look at the number that lies parallel to the number Z_i on the list, then count 0 - that number.
 - If Z_i is positive, then $F(Z_i)$ is 0.5 plus the list number corresponding to the value of Z_i
- iv. Calculate $S(Z_i)$ for each data by dividing the sequence number by the number of data or samples. Note that if two pieces of data have

the same value, then $S(Z_i)$ for both data is the last sequence number of the same data divided by the number of samples (n).

- v. Calculate the value of $F(Z_i) - S(Z_i)$ for each data. Note: the value of $F(Z_i) - S(Z_i)$ has an absolute price, i.e. no negative sign.

Take the largest number of the difference $F(Z_i) - S(Z_i)$ and compare it with the table value according to the amount of data. If the price of $F(Z_i) - S(Z_i)$ is greater than the table value, the data is not normally distributed, and if the price of $F(Z_i) - S(Z_i)$ is smaller than the table value, the data is normally distributed.

Homogeneity Test

The homogeneity test determines whether the sample class data has a homogeneous variance. To test homogeneity, the Bartlett test was carried out with the Syafril (2019, p.174) with the following steps:

- i. Count (dk) $\text{Log } S^2$ as in the table below

TABLE 1. Calculation Steps of Barlett's Test

Sample to	Dk	$\frac{1}{dk}$	S_i^2	$\text{Log } S^2$	$(dk) \text{Log } S^2$
1	$n_1 - 1$	$1/(n_1)$	S_1^2	$\text{Log } S_1^2$	$(n_1-1) \text{Log } S_1^2$
2	$n_2 - 1$	$1/(n_2)$	S_2^2	$\text{Log } S_2^2$	$(n_2-1) \text{Log } S_2^2$
K	$n_k - 1$	$1/(n_k)$	S_k^2	$\text{Log } S_k^2$	$(n_k-1) \text{Log } S_k^2$
Total	$\sum (n_i-1)$	$\sum (\frac{1}{n_i-1})$	-	-	$\sum (n_i-1) \text{Log } S_i^2$

Source: Syafril (2019:147)

- ii. Calculate the combined variance of the samples as follows:

$$S^2 = \frac{\sum (n_i-1)S_i^2}{\sum (n_i-1)}$$

$$X^2 = (L n 10) \{B - \sum (n_i - 1) \text{Log } S_i^2\}$$

$L n 10 = 2.3026$ Natural logarithm of the number 10

- iii. Calculate the Log of S^2 or Log of the pooled variance
- iv. Calculate the unit of B with the formula:

$$B = (\text{Log } S^2) \sum (n_i - 1)$$

- vi. Compare the calculation results x^2_{hitung} with the table.

If the calculation result of x^2 is smaller than the x^2 table, the data comes from a homogeneous group.

- v. For the Bartlett test, the chi-square statistical test is used with the formula:

Hypothesis Test

Hypothesis testing is done to determine students' learning outcomes in mathematics subjects by utilising interactive multimedia based on the learning test results. To carry out this test, the *t-test* formula will then be used, the difference test (*t-test*) with the formula according to Syafril (2019) that:

$$t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{SD^2 X_1}{N_1 - 1} + \frac{SD^2 X_2}{N_2 - 1}}}$$

Description:

\bar{t} = Mean difference $X_1 - X_2$

\bar{X}_1 = Experimental group average

\bar{X}_2 = Control group average

SD^2 = Variance

SD = Standard deviation

N_1 = Number of experimental groups

N_2 = Number of the control group

The hypothesis testing criteria are if the t count is equal to or greater than the t value in the table, then the null hypothesis (H_0) is rejected). If the t count is smaller than the t value in the table, then the null hypothesis (H_0) is accepted—data processing through static calculations with a confidence level ($=0.05$).

RESULTS AND DISCUSSION

This research was carried out at SMP Negeri 25 Padang on class VIII students in the 2022/2023 academic year. This research is focused on determining the effectiveness of interactive multimedia on the learning outcomes of class VIII students at SMP Negeri 25 Padang by calculating the data obtained from two samples, namely experimental class VIII 6 and control class VIII 7. In the experimental class, treatment

was given using multimedia. Interactive based on an *Articulate Storyline*, and in the control class, learning treatment is given using textbooks and teaching aids.

Data Description

Mathematics learning outcomes for both the experimental and control classes were assessed using a test consisting of 20 multiple-choice questions, each with four answer choices, conducted at the end of the session.

The students in the research study are learning about three-dimensional shapes with flat faces. There are four themes, each of which will be covered over four sessions, both in the experimental and control classes. However, each class undergoes different treatments according to the design. In the experimental class, besides using textbooks and teaching aids, interactive multimedia is employed, displayed through a projector, with the teacher providing additional explanations to the students. On the other hand, the control class only utilises textbooks and teaching aids, along with explanations from the teacher.

- i. Data on Mathematics Learning Outcomes in the Experimental Group (Learning Using Interactive Multimedia Based on Articulate Storyline)

From the data on learning outcomes obtained in class VIII 6 at SMP Negeri 25 Padang in the 2022/2023 school year, the number of students who participated in Mathematics learning in the experimental class amounted to 30 people. After obtaining the learning outcomes, it can be seen that the highest score achieved by students is 95, and the lowest score is 60, with an average score of 76.17 and a Standard Deviation of 10.31. For more detailed information, the range of interval scores for the mathematics learning outcomes of the experimental class is presented in Table 2.

TABLE 2. Frequency Distribution Data of Mathematics Learning Outcomes in Experimental Classes

Interval Class	Center Point	F
90 - 95	92,5	5
84 - 89	86,5	3
78 - 83	80,5	4
72 - 77	74,5	5
66 - 71	68,5	8
60 - 65	62,5	5
		30

- ii. Data on Mathematics Learning Outcomes in the Control Group (Learning Using Textbooks and Props)

From the data on learning outcomes obtained in class VIII 7 at SMP Negeri 25 Padang in the 2022/2023 school year. The number of students who participated in

mathematics lessons in the control class was 29. After obtaining the learning outcomes, it can be seen that the highest score achieved by students is 90, and the lowest is 55, with an average score of 70.52 and Standard Deviation of 9.851. For more detailed information, the range of scores for the mathematics learning outcomes of the experimental class can be found in Table 3.

TABLE 3. Frequency Data of Mathematics Learning Outcomes in Control Class

Interval Class	Center Point	F
85 – 90	87,5	4
79 – 84	81,5	3
73 – 78	75,5	4
67 – 72	69,5	6
61 – 66	63,5	5
55 – 60	57,5	7
		29

The comparison of learning outcomes between classes using interactive multimedia based on *Articulate*

Storyline (Experimental) and those using textbooks and teaching aids (Control) can be found in Table 4.

Variables	Experiment	Control
N	30	29
Highest Score	95	90
Lowest Score	60	55
Total Value	2.285	2.045
Average	76,17	70,52
Standard Deviation	10,31	9,851
Variance	106,351	97,044

Data Analysis

Normality Test

Based on the normality test in the experimental class obtained $L_{count} = 0.1583$ with $n = 30$, the L value in the table list = 0.161 with a real level $\alpha 0.05$. Regarding this,

L_{count} is smaller than L_{table} , so it can be concluded that the experimental group comes from normally distributed data.

The normality test in the control class obtained $L_{count} = 0.1415$ and $L_{table} = 0.161$ at a significant level $\alpha 0.05$. This explains that L_{count} is smaller than L_{table} , so it can be concluded that the control group comes from normally distributed data.

TABLE 5. Comparison of Liliefors Test Calculations

Class	SD	N	Counter	$L_{table} \alpha 0,05$	Description
Experiment	10,313	30	0,1583	0,161	Normal
Control	9,851	29	0,1415	0,161	Normal

Homogeneity Test

The homogeneity test is carried out to determine whether there is an increase in the value of learning outcomes in the two sample classes (experimental class

and control class) has a homogeneous variance or not, to test homogeneity using the technique with the Barlett Test. The following results were obtained from the data processing in both sample classes.

TABLE 6: Homogeneity Test Results in Both Sample Classes

Class	SD2	N	χ^2 count	χ^2 table α 0,05	Conclusion
Experiment	10,313	30	1,089	3,841	Homogeneous
Control	9,851	29			

Based on the table above, which shows the results of the homogeneity of variance test by conducting data on the final test in both sample classes, it turns out that χ^2 count = 1.089 and χ^2 table = 3.841 with a real level $\alpha = 0.05$, so chi-squared count < chi-squared table, namely $1.089 < 3.841$. It can be concluded that the data from the experimental and control classes come from homogeneous groups.

Hypothesis Test

If $t_{count} > t_{table}$, then there is a significant difference in learning outcomes between the experimental and control classes. The statistical data obtained from the data analysis is shown in the following table.

TABLE 7. Hypothesis Test

Aspects	Experiment	Control
N	30	29
\bar{x}	76,17	70,52
SD^2	106.351	97,044

$$\begin{aligned}
 t &= \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{SD^2 X_1 + SD^2 X_2}{\sqrt{\frac{N_1 - 1}{N_1 - 1} + \frac{N_2 - 1}{N_2 - 1}}}}} \\
 &= \frac{76,17 - 70,52}{\sqrt{\frac{106,351}{30 - 1} + \frac{97,044}{29 - 1}}} = \frac{76,17 - 70,52}{\sqrt{\frac{106,351}{29} + \frac{97,044}{28}}} \\
 &= \frac{5,65}{\sqrt{3,66 + 3,46}} = \frac{5,65}{\sqrt{7,12}} = \frac{5,65}{2,66} = 2,124
 \end{aligned}$$

TABLE 8. Research Hypothesis t Test Results

Class	\bar{x}	T calculation	Table α 0,05	Conclusion
Experiment	76,17	2,124	2,000	Significant
Control	70,52			

In the t table with $dk = (N1-1) + (N2-1)$ for $\alpha 0.05$ is 2.000. Results t_{count} compared with t_{table} . to see the table first calculated $df = (N_x - 1) + (N_x - 1)$, so $df = (30 - 1) + (29 - 1) = 29 + 28 = 57$. From the explanation above, it can be concluded that interactive multimedia based on an articulate story significantly affects student learning outcomes in Mathematics subjects at SMP Negeri 25 Padang. This is stated that found $t_{count} = 2.124$ is greater than $t_{table} = 2,000$.

DISCUSSION

Based on the data analysis that has been carried out, it can be seen that there are quite significant differences between the experimental class, which uses articulate storyline-based interactive multimedia and the control class, which uses textbooks and teaching aids. This can be seen from the achievement of student learning outcomes. In the experimental class (VIII 6), the research results showed that the average score obtained in the Mathematics subject, which used articulate storyline-based interactive multimedia on student learning outcomes, was higher than the average score in the control class (VIII 7), which used books, text and props.

The results of hypothesis testing using the t_{count} test formula found that $t_{count} = 2.124$ was greater than $t_{table} = 1.672$. Thus, it can be seen that t_{count} is greater than t_{table} , which means that there is a significant difference in student learning outcomes between classes that use articulate storyline-based interactive multimedia and classes that use textbooks and displays. So, the hypothesis that articulates storyline-based interactive multimedia is effective in class VIII Mathematics at SMP Negeri 25 Padang is accepted. So, it can be concluded that articulate storyline-based interactive multimedia significantly affects student learning outcomes in class VIII Mathematics at SMP Negeri 25 Padang. These results can be obtained with several supporting theories.

Based on the opinion of Munir (2015), multimedia is made with a display that fulfils the function of conveying information or messages and has interactivity for its users. The use of interactive multimedia in the learning process will be more interesting, and students will not get bored because learning will become more interactive. Media use in the learning process is not intended to replace the teacher's teaching method but to complement and assist teachers

in delivering material or information. In general, the purpose of using learning media is to help transmit information from the teacher to the learner so that the material is easy to understand, more interesting, and more enjoyable for students.

The uses of learning media, according to Sadiman et al. (2018), are:

- i. Clarify the presentation of the message so that it is not too monotonous by only displaying written or spoken words.
- ii. Overcoming the limitations of space, time, and sensory power. Such as material about the solar system, which is impossible to see with the human senses and space differences, can be replaced with images or videos to see the components of the solar system. Meanwhile, objects that are limited by time include past events, such as the eruption of Mount Merapi, which can be seen in ' photos or videos.
- iii. Providing the same stimulus can equalise students' experience and perception of the lesson content.
- iv. Learning media can provide students with a shared experience of events in their environment and enable direct interaction with teachers, the community, and the environment, for example, through field trips and visits to museums or zoos.

Munir (2015) explains the advantages of using interactive learning multimedia in learning, namely:

- v. Learning will be more interactive and innovative
- vi. Teachers, as educators, are required always to be creative and innovative to achieve learning breakthroughs.
- vii. Multimedia can combine various media, such as text, audio, images, video, animation, and many more, in one unit that supports each other to achieve learning objectives.
- viii. Student motivation during the learning process can increase to achieve the expected learning objectives.
- ix. Visualising difficult material can be easier if conventional tools or props are used.
- x. Train students to learn independently in seeking and gaining knowledge.

So, it appears that learning using interactive multimedia based on articulate storylines can obtain higher learning outcomes than textbooks and teaching aids.

CONCLUSION

Based on the results of the data description, data analysis and discussion previously described, it can be concluded that:

Based on the research results, the average value obtained from student learning outcomes using articulate storyline-based interactive multimedia (experimental class) is higher than that of student learning outcomes using textbooks and teaching aids (control class). This is in accordance with the average student learning outcome of 76.17, which is higher when using articulate storyline-based interactive multimedia, while the average student learning outcome using textbooks and teaching aids is 70.52. The results of hypothesis testing using the t_{count} test formula found that $t_{count} = 2.124$ was greater than $t_{table} = 1.672$. From the explanation above, it can be concluded that articulate storyline-based interactive multimedia significantly affects student learning outcomes in class VIII Mathematics at SMP Negeri 25 Padang.

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