

EFFECTIVENESS OF INTERACTIVE MULTIMEDIA ARTICULATE STORYLINE 3 USING PAIRED SAMPLE T-TESTS

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ABSTRACT

In facing the era of globalization, especially in the field of education, the government must improve and prepare a better government system. Therefore, efforts are needed to be made, one of which is by increasing basic abilities in the mathematics. The lack of innovation in the process of learning mathematics makes students feel bored with the material provided. Therefore, students often get mathematics score below the graduate competency standards and even fail. Based on these facts, it is necessary to develop interactive multimedia learning innovations in mathematics by creating interactive multimedia using articulate storyline 3 in mathematics learning and see the effectiveness of it. So the research was conducted on the effectiveness of interactive multimedia using storyline articulation 3 using paired sample t-tests. This research was using 166 students of class X SMAN 4 Kotabumi. This study aims to see the effectiveness of interactive multimedia articulating storyline 3 on understanding concepts and increasing students' academic scores in mathematics. Based on the results of the paired sample t-test, the p-value is 0.000, which is less than the 0.05 significance level. So it can be concluded that the application of multimedia articulate storyline 3 is effective in increasing student's understanding of mathematical concepts and academic scores in mathematics.

Keywords: *Articulate Storyline 3, Effective, Paired Sample T-Tests*

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INTRODUCTION

The development of science and technology is increasingly progressing and developing rapidly, especially in Indonesia. This has resulted in the government being more prepared and sensitive in preparing the quality human resources. In facing the era of globalization, the government must improve and prepare a better government system, especially in the field of education. In order to perfect and improve science and technology in improving the quality of the national education system, one of the efforts that can be made is to increase basic abilities in the field of mathematics. Mathematics is a means of scientific thinking to develop the ability to think systematically, critically and logically in students. In addition, mathematics is an important basic science for students in pursuing the higher education.

However, the fact that is the mathematics is known as a frightening educational field for some people. In addition, there are still many children who do not like mathematics education. This is because the teaching methods of the educators are less attractive, in which the educators only explain the material and the students only take notes, without any interaction between them. This is evidenced by the mathematics scores of Indonesian students in PISA which have decreased, namely 386 (2015) to 379 (2018). In addition, the poor ability of Indonesian students in mathematics is showed by the results of the 2017 Indonesian Student Competency Assessment (AKSI), namely mathematical literacy with an average score of 27.51 (very bad).

The process of teaching mathematics requires an innovation in conveying and explaining material. If an educator only explains material without innovation and application in the real world, then students can only memorize math problems without being able to understand math problems in the real world. Therefore, in the learning process, learning support media is needed, one of which is interactive multimedia.

Interactive multimedia is multimedia that interacts between educators and students as users. The most common type of learning media used by educators is Microsoft Power Point. Microsoft Power Point provides a feature in the form of a presentation slideshow that can help in making presentations that are effective, professional and easy to use (Azhar, 2017). However, Microsoft Power Point can't be used as an effective interactive learning multimedia. This is because the features owned by Microsoft Power Point do not have an interactive system between system and users and only have one brother to run it. One of the interactive multimedia learning that can provide an interactive system between its users is an articulate storyline 3.

Articulate Storyline 3 is an interactive media that combines learning videos, technical skills, and creative skills to create engaging presentations. Articulate storyline 3 has advantages in animation features, so that the visual effects that appear in interactive multimedia can look more dynamic (jujun Muhammad). In addition, interactive multimedia learning that uses articulated storylines 3 has the ability to combine scenes and slides with audio visuals.

There have been many developments of interactive multimedia based on Articulate Storyline 3, such as what was done by Mariyatul Kiptiyah (2022), namely the Development of Interactive Learning Multimedia Using Articulate Storyline 3 in the Basics of Electrical Engineering Subject at SMKN 1 Sidoarjo. Besides that, Siti, et al (2021) also developed it, namely the Development of Articulate Storyline 3 Media in STEM-Based Science Learning to develop the Creativity of SD/MI Students. However, this research was not carried out using a contextual teaching and learning approach and was not see the effectiveness of that interactive multimedia. So that the developed interactive multimedia does not bring up material related to real life and its applications and applied the paired sample t-test to know the effectiveness of this interactive multimedia.

Mathematics learning activities are currently mostly carried out with a theory-based system and only use physical books as a source of knowledge. Besides that, the monotonous way of learning is conveyed by educators to students, so students feel bored with the material provided. Therefore, students often get academic grades in mathematics below graduate competency standards and even fail. Based on the facts that occur, it is necessary to develop interactive multimedia learning innovations in the field of mathematics which are useful for increasing student's academic mathematics scores and understanding of mathematical concepts, one of which is by creating interactive multimedia using articulate storylines 3 in mathematics learning and see the effectiveness of interactive multimedia using storyline articulation 3 using paired sample t-test. So a research was conducted on the effectiveness of interactive multimedia using storyline articulation 3 using paired sample t-tests.

MATERIALS AND METHODS

Materials

The sample in this study was 166 students consisting of 102 students in class X IPA and 64 students in class X IPS at SMAN 4 Kotabumi. Data collection techniques used pretest and posttest students' concept understanding abilities in mathematics.

Methods

This research is experimental research with a one group pretest-posttest design, was giving a pretest before being given treatment so as to produce an accurate treatment compared to the situation before being given treatment (Sugiyono, 2016). The analytical method used is the interesting test and the effectiveness test. The effectiveness test used is the paired sample t-test. The paired sample t-test is a test of differences in two sample means that correlate to produce two data distributions (Kadir, 2017). The data used in the paired sample t-test are the pretest and posttest results after applying multimedia articulate storyline 3. Analysis of paired sample t-test used SPSS Version 24. This research was conducted in several steps, namely:

- a. Make pretest questions about inverse functions and composition
- b. Distributing pretest to students
- c. Assessing the pretest
- d. Pretest data exploration
- e. Making interactive multimedia articulating storyline 3 about inverse function material and composition
- f. Applying the interactive multimedia articulates storyline 3 to students
- g. Distributing posttest to students, after applying the multimedia
- h. Assessing the posttest
- i. Posttest data exploration
- j. Doing interesting test

The interesting test for this learning media uses a questionnaire with closed questions. There are 12 closed questions to test the interesting of this learning media. The likert scale is used as an answer scale for closed questions. As for the details of the values on the likert scale, are 1 means strongly disagree, 2 means disagree, 3 means agree, and 4 means strongly agree (Sugiyono, 2019). The results of the questionnaire can be converted into numbers with the following formula (Akbar, 2017):

$$\bar{x} = \frac{\sum_{i=1}^n x_i}{n} \quad (1)$$

and

$$x_i = \frac{\text{sum of scoring}}{\text{Maximum score}} \times 100\% \quad (2)$$

Where:

- \bar{x} = the final average value
 x_i = score of questionnaire of every student
 n = sum of student

The interesting score of student assessment scores can be seen from the following criteria Table 1 (Akbar, 2017):

Interesting Criteria	Interesting Level
85,01% – 100%	Very Interesting
70,01% – 85%	Quit Interesting
50,01% – 70%	Less Interesting
1,00% – 50%	Uninteresting

- k. Doing effectiveness test using the paired sample t-test

Effectiveness test of this research is to evaluate multimedia articulating storyline 3 in improving students' ability to understand mathematical concepts and academic score in mathematics. This effectiveness test was carried out using paired sample t-test. The paired sample t-test is a test of differences in two sample means that correlate to produce two data distributions (Kadir, 2017). Data criterias that can be used on The paired sample t-test are: (1) small data sample size (<30); (2) the data is normally distributed; and (3) scale interval or ratio data measurement (Paisal, Satyahadewi & Perdana, 2021). The data used in the paired sample t-test are the pretest and posttest(after applying multimedia articulate storyline 3). Prior to the paired sample t-test, the pretest and posttest data will be tested for normality with the aim of knowing the distribution of the two data is normally distributed. The normality test used is the Liliefors Test (Susilo & Ernawati, 2018). The paired sample t-test formula is as follows (Johnson, 2010):

$$t_{hit} = \frac{\bar{D} - \mu_{D0}}{s_D / \sqrt{n}} \quad ; \quad df = n - 1 \quad (3)$$

$$\bar{D} = \frac{\sum_{i=1}^n D_i}{n} \quad (4)$$

$$s_D = \sqrt{\frac{\sum_{i=1}^n (D_i - \bar{D})^2}{n-1}} \quad (5)$$

and

$$D_i = X_i - Y_i$$

Where:

- X_i : independent X
- Y_i : dependent Y
- n : number of sample
- s_D : standard deviation of the differences
- D_i : the differences
- \bar{D} : the mean differences

The hypothesis used in the paired sample t-test in this study is :

$H_0 : \mu_d = \mu_{D0}$ (no difference in math test scores before and after the application of multimedia articulate storyline 3)

$H_1 : \mu_d \neq \mu_{D0}$ (have difference in math test scores before and after the application of multimedia articulate storyline 3)

If $t_{hit} > t_{tabel}$ then H_0 is rejected. It means that there is a significant difference between the averages of the two treatments (have difference in math test scores before and after the application of multimedia articulate storyline 3). Whereas if $t_{hit} < t_{tabel}$ then H_0 is do not rejected. It means that there is no significant difference between the two averages treatment (Animar, 2020).

1. Taking Conclusion.

RESULTS AND DISCUSSION

Data Exploration

Before applying interactive multimedia articulate storyline 3 to 166 students of class X at SMAN 4 Kotabumi, the students were given a pretest related to the material of inverse functions and composition. This is to see the ability of students in solving the problem of the material. Then after the judgment was carried out, there were 41 students who scored below the KKM. Based on this, interactive multimedia is applied which articulates storyline 3 to students. The material presented in interactive multimedia storyline articulation 3 is the same material as the pretest material. After students study and understand the material independently with the help of interactive multimedia articulating storyline 3, students are given a posttest to see students' abilities after being given interactive learning media. In fact, after implementing interactive multimedia storyline 3 in the learning process, the number of students who scored above the KKM increased, namely to 149. This is shown in Figure 1.

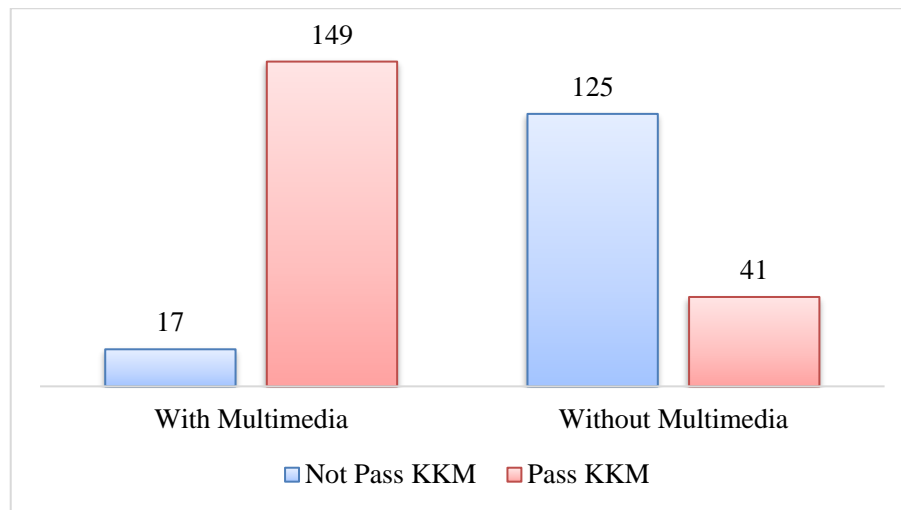


Figure 1. Number of Students Who Pass KKM in Mathematics

Based on the posttest and pretest results after the application interactive multimedia articulate storyline 3, it was find that the posttest average score of 166 students after the application of interactive multimedia articulate storyline 3 was greater than the pretest average score, which was 63.1205. This also resulted in the diversity of the posttest data being greater than the pretest values, which were 12.82915 and 9.93969 respectively. This is presented in Table 2.

Table 2. Data Description of Pretest and Posttest Score

Variables	Mean	Standard Deviation	Sample
Pretest Score	63.1205	9.93969	166
Posttest Score	84.9699	12.82915	166

The diversity of pretest and posttest data is also visualized using boxplots. Based on Figure 2, the tail length of the posttest data boxplot is longer deviated to the left than the pretest data boxplot tail length. This shows that the diversity of the posttest data is greater than the posttest data. This also supports the statement that the standard deviation value of the posttest data is greater than the pretest data. In addition, based on Figure 2, it can be seen that 50% of class X students have posttest scores above 85. Meanwhile, 50% of class X students have pretest scores above 64.

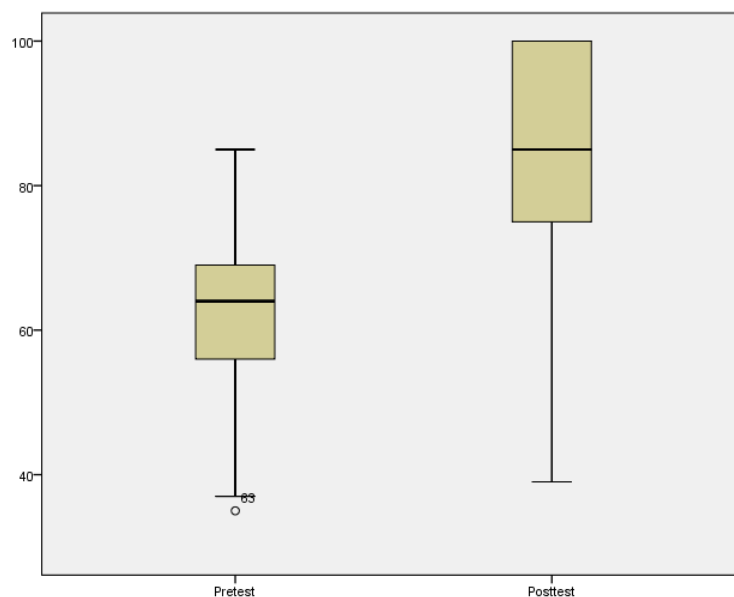


Figure 2. Boxplot of Pretest and Posttest Score

Interesting Test

The interesting test learning media aims to determine the proportion of interesting values from interactive multimedia 3 storylines in improving conceptual understanding skills can be seen in Figure 3.

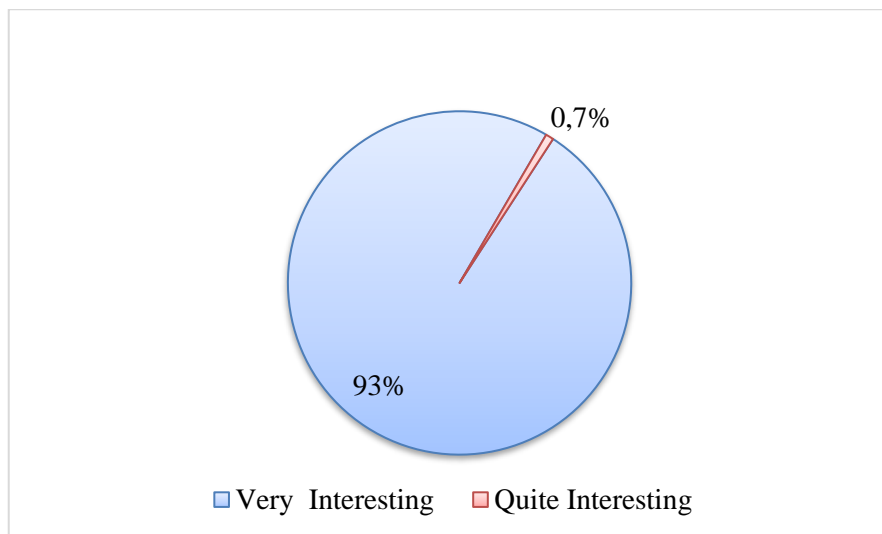


Figure 3. Pie Chart of Result of Interesting Test

Based on Figure 3, the results of the interesting test of interactive multimedia articulate storyline 3, obtained an interesting percentage value of 93% with the "very interesting" criteria, and 7% with the "quite interesting " criteria. So it can be concluded that students think that interactive multimedia articulate storyline 3 is interesting to use in understanding the material concepts in mathematics and solving mathematical problems in the real world.

Effectiveness Test

The effectiveness test in this study is useful for evaluating the storyline of multimedia articulation 3 in improving students' understanding of mathematical concepts. This effectiveness test was carried out using paired sample t-test. Before the paired sample t-test was carried out, the first step was the normality test using the Lilliefors test. Based on the results of the Lilliefors test in Table 3, it shows that the p-values in the pretest and posttest data, respectively 0.067 and 0.083. This shows that the p-value of the two data is more than the 0.05 significance level. So it does not support to reject the null hypothesis, meaning that the pretest and posttest data have a normal distribution. Because the assumption of normality is done, it will proceed to the paired sample t-test.

Table 3. Result of Lilliefors Test Between Pretest and Posttest Score

Variables	Statistic	Degree of Freedom	Sig
Pretest Score	0.095	166	0.067
Posttest Score	0.193	166	0.083

Based on the correlation test between the pretest and posttest score (Table 4), the correlation value (*r*) was 0.698, meaning that the pretest and posttest data had a strong positive relationship. In addition, a p-value of 0.000, which is less than the 0.05 significance level. This shows that it supports the null hypothesis, meaning that there is a strong positive relationship between the pretest and posttest score, 0.698.

Table 4. Result of Correlation test between Pretest and Posttest Score

Variable	Correlation	Sig
Pretest and Posttest Score	0.698	0.000

Based on Table 5 shows that the p-value of the paired sample t-test is 0.000, which is less than the 0.05 significance level. This shows that it supports rejecting the null hypothesis, meaning that there are differences in the average pretest and posttest scores after applying multimedia articulate storyline 3. So it can be interpreted that after applying multimedia articulate storyline 3 in the mathematics

learning process, students can better understand the concept of mathematical material and increase their scores. In other words, the application of multimedia articulating storyline 3 is more effective in increasing students' understanding of mathematical concepts and academic score in mathematics.

Table 5. Result of The Paired Sample T-test Between Pretest and Posttest Score

Variable	T statistics	Degree of Freedom	Sig
Pretest and Posttest Score	-30.484	165	0.000

CONCLUSION

Based on the results of the paired sample t-test, the p-value of the paired sample t-test is 0.000, which is less than the 0.05 significance level. This shows that it supports rejecting the null hypothesis, meaning that there are differences in the average pretest and posttest scores after applying multimedia articulate storyline 3. So it can be interpreted that after applying multimedia articular storyline 3 in the mathematics learning process, students can better understand the concept of mathematical material and increase their academic mathematics score, in other words the application of multimedia articulating storylines 3 is effective in increasing student's understanding of mathematical concepts and academic scores in mathematics.

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