

## Effectiveness of Using M-Learning Media Based on Articulate Storyline Application on Energy Source Material to Improve Learning Outcomes of Class X MIPA 3 Students at MA Allu Bangkala

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### ABSTRACT

The aim of this research is to determine the ability of students' learning outcomes before and after being taught using M-learning learning media based on the Articulate Storyline application. describes how effective the use of M-learning learning media based on the Articulate Storyline application is to improve the learning outcomes of class X MIPA 3 students at MA Private Allu. This type of research is classified as experimental research with a One Group Pretest-Post Test Design research design. The population used in this research is students of class X MIPA 3 at MA Allu Bangkala, namely, which consists of three classes and a total of 82 students. The research instrument used was the Learning Outcome Test and the teaching module used. Furthermore, the data analysis technique uses descriptive analysis and also N-Gain test analysis to see the effectiveness of this research. The results of descriptive research show that the average score for student learning outcomes in the pre-test is 30.00, which is in the very low category, while for the post-test score, the average score is 48.18, which is in the low category. Based on the results of non-parametric analysis using the Mann-Whitney test which shows a significant level of value, namely the Asymp value. Sig (2-tailed) shows the number 0.001. Asymp value. Sig (2-tailed) is smaller than the 0.05 significance level so that H0 is rejected and H1 is accepted. This shows that there is a difference between the learning outcomes of students before using the M-Learning learning media based on the Articulate Storyline application on energy sources material for Class X MIPA 3 at MA Allu Bangkala. The implication of this research is that the learning outcomes instrument produced in this research has gone through a validation process, so that it can be used to assess student learning outcomes. For future researchers who are interested in the same research title, it is recommended to look for learning media that are more effective in improving student learning outcomes.

**Keywords:** Include a set of relevant keywords that represent the core concepts of your research

### 1). INTRODUCTION

Education is a conscious and planned effort to create a learning environment and learning process that allows students to actively develop their potential. Technological advances in education pose

Paper presented at The 1<sup>st</sup> ICONETT on August 21<sup>st</sup>-22<sup>nd</sup>, 2024

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challenges for students and teachers because they must compete to keep up with the changes that occur. Articulate Storyline learning media is one of the learning media that is deliberately created to package a learning application. Articulate Storyline is an E-learning software tool that functions to help build interactive content (learning). Interactive learning media based on Articulate Storyline is declared very suitable for use to support teaching and learning activities in the classroom or as independent learning. Based on the observations made, the problem that I can capture at the school is that students often still use textbooks in the learning process, because according to the results of observations from one of the physics subject teachers, namely saying that "students are less interested in using textbooks because using the textbook makes students less concentrated when learning physics, so that's why I offer M-learning learning media based on the Articulate Storyline application. In the study of the Effectiveness of the use of M-learning learning media based on the Articulate Storyline application which will be used to facilitate the teaching and learning process more lively and enthusiastically besides that students also do not misuse the Articulate Storyline they have and can be useful in the teaching and learning process. Based on this, by proposing the title of the study, namely "The Effectiveness of Using M Learning Media Based on the Articulate Storyline Application on Energy Source Material to Improve Learning Outcomes of Class X MIPA 3 Students at MA Swasta Allu"

## 2). METHODS

This type of research is classified as experimental research with a research design of One Group Pretest-Post Test Design. The population used in this study were students of class X MIPA 3 at MA Allu Bangkala, consisting of three classes and totaling 82 students. The research instrument used was the Learning Outcome Test and the teaching module device used. Furthermore, the data analysis technique used descriptive analysis and also N-Gain test analysis to see the effectiveness in this study.

The data analysis techniques used are:

### 1. Descriptive Statistical Analysis

#### a. Average (Mean)

The average score of students is determined using the following formula:

$$(\bar{X}) = \frac{\sum f_{ixi}}{\sum f}$$

Description:

$\bar{X}$  = Average score

$\sum fxi$  = Total score of students

$\sum f$  = Number of respondents

### b. Standard Deviation

Determine the standard deviation using the following formula:

$$S = \sqrt{\frac{\sum fxi^2 - \frac{(\sum fxi)^2}{n}}{n - 1}}$$

Description:

S = Standard deviation

$\sum fxi$  = Total score of students

$\sum fxi^2$  = Average score

N = Number of research subjects

### c. Varians

$$S^2 = \frac{\sum fi - (xi - X)^2}{(n - 1)}$$

Description:

S : Standard Deviation

X : Arithmetic Mean

Xi : Data From I To N

N : Number Of Data/Data Size

### d. Categorization

The following is a categorization of physics learning outcomes for students:

Table 3.8 Categories of students' cognitive learning outcomes

Interval	Categorization
$X < (\mu - 1,0(\sigma))$	Low
$(\mu - 1,0(\sigma)) \leq X < (\mu + 1,0(\sigma))$	Medium
$X \geq (\mu + 1,0(\sigma))$	High

(Source: Saifuddin Azwar, 1999)

Description:

$\mu$  = hypothetical mean value

$\sigma$  = hypothetical standard deviation

In this study, the hypothetical mean value obtained by the researcher was 50 which was obtained from  $\mu = \frac{1}{2} (X_{max} + X_{min})$ , then for the hypothetical standard deviation value of 16.67 which was obtained from  $\sigma = \frac{1}{6} (X_{max} - X_{min})$ , where for the  $X_{max}$  value of 100 and for the  $X_{min}$  value of 0.

Table 3.9 Values of categories of student learning outcomes

Interval	Categorization
$X < 33,33$	Low
$33,33 \leq X < 66,67$	Medium
$X \geq 66,67$	High

## 2. Inferential Analysis

### a. Data Normality Test

To conduct parametric statistical tests on quantitative data, the main requirement is that the data must have a normal distribution. To prove whether the data has a normal distribution or not, a normality test is needed using the Liliefors test. The steps for testing the normality of the data obtained in the study can be carried out using the Liliefors test according to the method suggested by Sudjana, namely:

- 1) Sort the  $x_1$  values from the smallest to the largest value.
- 2) observations  $x_1, x_2, x_3 \dots x_n$  converted into standard numbers  $z_1, z_2, z_3 \dots z_n$  by using the formula
$$Z_i = \frac{x_i - \bar{x}}{s}$$
( $\bar{x}$  and  $s$  each is the mean and standard deviation of the sample)
- 3) From each standard value, the critical value can be found.  $z$  ( $z$  table) by using the standard normal distribution list, then the probability is calculated  $F(z_i) = P(z \geq z_i)$  with the provision that if  $z_i$  negative, so  $F(z_i) = 0,5 - z_{table}$ , whereas if  $z_i$  positive, so  $F(z_i) = 0,5 + z_{table}$
- 4) Next, this proportion is calculated and stated by  $S(z_i)$ , So  $S(z_i) = \frac{\text{the amount } z_i z_2 z_3 \dots z_n \text{ Which } \leq z_i}{n}$
- 5) Calculate the difference  $F(z_i) - S(z_i)$  then determine the absolute price
- 6) Take the largest task among the absolute prices of the difference, this price is called  $L\_count$  [1]

In decision making,  $L\_count$  is compared with  $L\_table$  using the Liliefors test critical value table with a real level of  $\alpha=5\%$ . If  $L\_count \leq L\_table$  then the sample distribution is normal, and if  $L\_count > L\_table$  then the sample is not normally distributed.

## b. Hypothesis Testing

If the data is not normally distributed, then to conduct a hypothesis test, the Mann-Whitney Test is used using IBM SPSS v.26. The Mann-Whitney Test is a non-parametric test used to test for differences between two independent populations. The Mann-Whitney Test is an alternative when the assumption of population normality is not met, and the data does not have a normal distribution.

$$U_1 = n_1 n_2 + \frac{n_1(n_1+1)}{2} R_1$$

$$U_1 = n_1 n_2 + \frac{n_2(n_2-1)}{2} - R_2$$

Description:

$n_1$  = observations in the first sample

$n_2$  = observations in the second sample

$R_1$  = number of ranks in the first sample

$R_2$  = number of ranks in the second sample

**c. Effectiveness Test**

The effectiveness test with N-Gain is used to test how effective the use of M-learning media based on the Articulate Storyline application is. This effectiveness test is used to answer the third problem formulation or the second hypothesis in this study.

The N-Gain test is carried out when there is a significant difference between the average pre-test and post-test values through the independent sample t-test.

$$Uji\ N - Gain = \frac{score\ posttest - score\ pretest}{score\ ideal - score\ pretest} \times 100\%$$

Description:

- N – Gain = Normalized gain
- Pre test = Initial learning value
- Post test = Final learning value

Table 3.10 N-Gain index criteria[2]

Score	Category
$g > 0,70$	High
$0,7 > g \geq 0,3$	Medium
$g < 0,29$	Low

**3). RESULTS AND DISCUSSION**

**A. Research Results**

The type of research used in this study is an experimental method using a research design, namely One Group Pre-Test Post Test Design. In this study, 3 meetings were conducted using only one class, namely class X MIPA 3 MA Swasta Allu with 22 students who were given treatment using M-Learning Media Based on the Articulate Storyline Application on Energy Source Material. The pre-test and post-test each consist of 20 multiple-choice questions to measure the level of student learning outcomes. The findings of the student learning outcome score level before and after using M-Learning Media Based on the Articulate Storyline Application are as follows:

## 1. Descriptive Statistical Analysis

### a. Overview of the level of learning outcomes of class X MIPA 3 students at MA Allu Bangkala before using application-based M-learning media *Articulate Storyline*

Based on the results of the research conducted in class X MIPA 3 at MA Allu Bangkala, the researcher collected data through student learning outcome test questions. The results of the student learning outcome test can be seen in the following table:

Table 1 Frequency Distribution of Pre-test Results of Learning Outcomes

Xi	Fi
20	2
25	5
30	10
35	3
40	1
50	1

Based on table 1 above, the learning outcome test of class X MIPA 3 students at MA Allu Bangkala is used as a reference in processing descriptive analysis using the IBM SPSS program which can be shown as follows:

Table 2 Results of descriptive analysis of pre-test learning outcomes of students

Pre-Test Valid N (listwise)	N	Minimum	Maximum	Mean	Std Deviation
	22	20	50	30.00	6.547
	22				

Based on the results of the descriptive analysis in table 2, it shows that the maximum value or highest value obtained by students is 50, while the minimum value or lowest value obtained by students is 20, with The average score obtained by students was 30.00 and the standard deviation obtained was 6.547.

The pre-test value of student learning outcomes can be shown in a frequency distribution table or based on the categorization in table 3.3, which can be seen in the following table:

Table 3 Categorization of student learning outcomes (Pre-test results)

Interval	Frequency	%	Categorization
$X < 33,33$	17	77%	low
$33,33 \leq X < 66,67$	5	23%	currently
$X \geq 66,67$	0	0%	tall
<b>Amount</b>	<b>22</b>	<b>100 %</b>	<b>low</b>

Based on table 4.3 above, it shows that of the 22 students who participated in this study, 77% were categorized as low and 23% were categorized as medium.

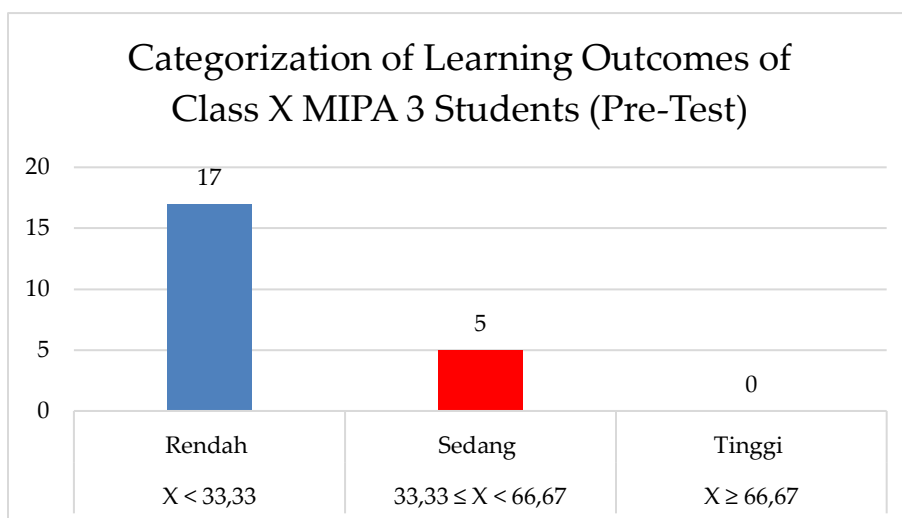


Figure 1 diagram of categorization of student learning outcomes (pre-test scores)

The diagram shows that the frequency of low pre-test learning outcomes for students is in the range  $X < 33.33$ , which means it is in the very low category, namely 17 students.

**b. Description of the level of learning outcomes of Class X MIPA 3 students at MA Allu Bangkala before using M-learning media based on the Articulate Storyline application.**

Based on the results of the research conducted in class X MIPA 3 at MA Allu Bangkala, the researcher collected data through student learning outcome test questions. The results of the student learning outcome test can be seen in the following table:



Table 4 Frequency distribution of post-test results Learning outcomes

Xi	Fi
25	2
30	3
35	1
40	1
45	4
50	4
55	1
60	1
65	1
70	3
75	1

Based on table 4 above, the learning outcome test of class X MIPA 3 students at MA Allu Bangkala is used as a reference in processing descriptive analysis using the IBM SPSS program, which can be shown as follows.

Table 5 Results of descriptive analysis of post-test learning outcomes of students

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
<i>Post-Test</i>	22	25	75	48.18	15.395
Valid N (listwise)	22				

Based on the results of the descriptive analysis in table 5, it shows that the maximum or highest score obtained by students is 75, while the minimum or lowest score obtained by students is 25, with an average score obtained by students of 48.18 and a standard deviation obtained of 15.395.

The post-test scores of students' learning outcomes can be shown in a frequency distribution table or based on the categorization in table 3.3, which can be seen in the following table:

Table 6 Categorization of student learning outcomes (post-test results)

Interval	Frequency	%	Categorization
$X < 33,33$	5	23%	Low
$33,33 \leq X < 66,67$	13	59%	Currently
$X \geq 66,67$	4	18%	High
<b>Amount</b>	<b>22</b>	<b>100%</b>	<b>Currently</b>

Based on table 6 above, it shows that of the 22 students who participated in his study, 23% were low, 59% were categorized as medium, and 18% were in the high category. The data is then depicted in the following histogram or bar chart:

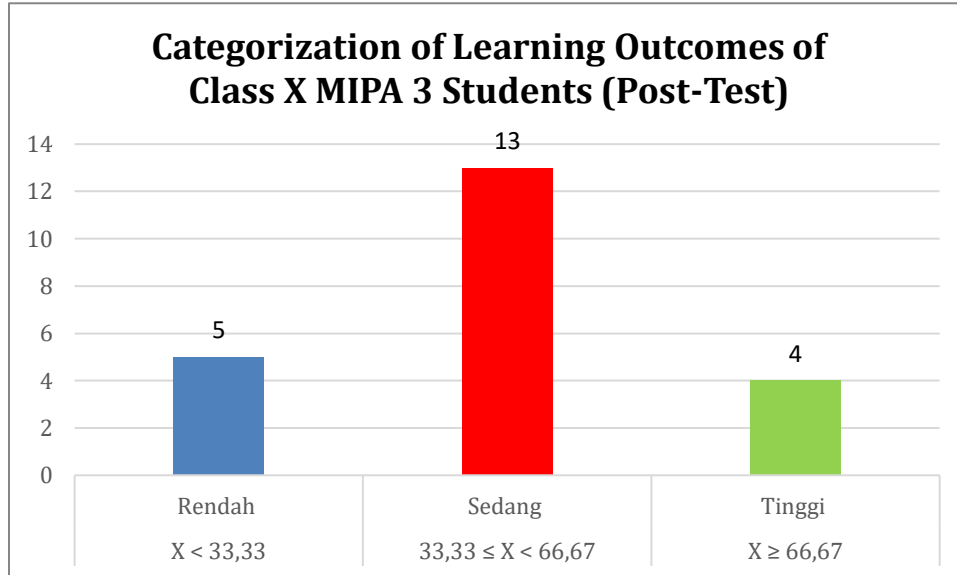


Figure 4.2 diagram of categorization of student learning outcomes (pre-test scores)

The diagram shows that the frequency of the high Post-Test scores for student learning outcomes is in the range of  $33.33 \leq X < 66.67$ , which means that it is in the moderate category, namely 13 students.

## 2. Inferential Analysis

### a. Normality Test

The normality test was conducted to determine whether the physics learning outcome data obtained, both from the pre-test value and the normal distribution or not. In this study, the data normality test was conducted using the Liliefors test at a significance level of  $\alpha = 0.05$ . The results of the normality test calculation in this study using IBM SPSS are as follows:

Table 7 Results of the Normality Test of Learning Outcome Tests

Tests of Normality						
	Kolmogorov-Smirnov <sup>a</sup>			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	Df	Sig.
PreTest	.273	22	.000	.863	22	.006
PostTest	.135	22	.200*	.941	22	.204
*. This is a lower bound of the true significance.						
a. Lilliefors Significance Correction						

Based on table 7, the significant value in the Pre-Test is 0.001 and in the Post-Test, the significant value is 0.200. If the significant value is greater than 0.05 ( $\text{sig} > 0.05$ ), then it can be said that the data is normally distributed, conversely if the significant value is less than 0.05 ( $\text{sig} < 0.05$ ) then the data is not normally distributed. So it can be concluded that the Pre-Test data is not normally distributed, while the Post-Test data is normally distributed. Then it is continued with a non-parametric test because the data is not normally distributed.

In addition to IBM SPSS analysis, it can also be done by testing normality using the Liliefors test manually. The results of the Liliefors normality test for student learning outcome data before being given treatment obtained a calculation value of  $L_0 = 0.279$  and  $L_{table} (\alpha = 0.05; n = 22) = 0.190$ , so it can be concluded that  $L_0 > L_{table}$ . This shows that the data is not normally distributed. Meanwhile, the data after being given treatment obtained  $L_0 = 0.135$  at a significance level of 0.05 so it can be concluded that  $L_0 < L_{table}$ . This means that the data is normally distributed.

**b. Hypothesis Testing**

The prerequisite analysis test shows that the learning outcome data before being given treatment is not normally distributed, so the test is continued using a non-parametric statistical test. The test used is the Mann-Whitney (U) test at a significance level of  $\alpha = 0.05$ .

Based on the calculation results, the  $Z_{count}$  value = 3.962 and  $Z_{table} = 1.96$  are obtained. These results indicate that  $Z_{count} > Z_{table}$ , so it can be concluded that  $H_0$  is rejected and  $H_1$  is accepted.

This shows that there is a difference between student learning outcomes before using M-Learning media based on the Articulate Storyline application on energy source material for class X MIPA 3 at MA Allu Bangkala.

The following is an analysis using IBM SPSS v.26:

Table 8 Mann-Whitney analysis using IBM SPSS v.26

<b>Ranks</b>				
	Group	N	Mean Rank	Sum of Ranks
Mark	Pretest	22	14.95	329.00
	Posttets	22	30.05	661.00
	Total	44		

<b>Test Statistics<sup>a</sup></b>	
	Nilai
Mann-Whitney U	76.000
Wilcoxon W	329.000
Z	-3.962
Asymp. Sig. (2-tailed)	.000
a. Grouping Variable: Group	

From the table above, the Asymp. Sig (2-tailed) value shows the number 0.001. The Asymp. Sig (2-tailed) value is smaller than the significance level of 0.05 so that H0 is rejected and H1 is accepted. This shows that there is a difference between student learning outcomes before using M-Learning media based on the Articulate Storyline application on the material of energy sources for class X MIPA 3 at MA Allu Bangkala.

**c. Effectiveness Test**

The N-Gain calculation is used to determine how effective the use of M-Learning learning media based on the Articulate Storyline application is to improve the learning outcomes of class X MIPA 3 students at MA Allu Bangkala. The N-Gain test analysis was carried out using manual analysis and the following results were obtained

Table 9 Manual N-Gain results

No.	Pre-Test	Post-Test	Post-Pre	Skor Ideal (100-Pre)	N-Gain	Kategori
1	30	30	0	70	0,00	Rendah
2	30	25	-5	70	-0,07	Rendah
3	25	30	5	75	0,07	Rendah
4	35	25	-10	65	-0,15	Low
5	20	30	10	80	0,13	Low
6	25	45	20	75	0,27	Low
7	30	70	40	70	0,57	Low
8	30	65	35	70	0,50	Low
9	25	45	20	75	0,27	Low
10	30	45	15	70	0,21	Low
11	30	70	40	70	0,57	currently
12	35	50	15	65	0,23	Low
13	30	50	20	70	0,29	Low
14	25	70	45	75	0,60	currently
15	30	75	45	70	0,64	currently
16	35	55	20	65	0,31	currently
17	30	60	30	70	0,43	currently
18	30	50	20	70	0,29	Low
19	50	50	0	50	0,00	Low
20	25	45	20	75	0,27	Low
21	20	40	20	80	0,25	Low
22	40	35	-5	60	-0,08	Low
<b>average</b>	<b>30</b>	<b>48,18</b>	<b>18,18</b>	<b>70</b>	<b>0,25</b>	<b>Low</b>

This result can also be proven by using the IBM SPSS program. The results mentioned can be seen in the following table.

Table 10 N-Gain Results of IBM SPSS Program

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
N-Gain	22	-.15	.64	.2533	.23276
Valid N (listwise)	22				

The results of the N-Gain test on student learning outcomes are shown in the frequency distribution table or based on categorization, which can be seen in the following table.

Table 11 Categorization of N-Gain test of learning outcomes

Interval	Frequency	%	Categorization
$g > 0,70$	0	0%	high
$0,7 > g \geq 0,3$	5	23%	currently
$g < 0,29$	17	77%	low
<b>Amount</b>	<b>22</b>	<b>100%</b>	

Based on the results of the N-Gain test calculations that have been carried out, the Gain index value or average value before and after treatment is 0.25, which is in the low category. So it can be concluded that the effectiveness of using M-Learning learning media based on the Articulate Storyline application to improve the learning outcomes of class X MIPA 3 students at MA Allu Bangkala is still in the low category.

**B. Discussion**

In this study, researchers looked at the differences in learning outcomes of class X MIPA 3 students at MA Allu Bangkala before (pre-test) and after (post-test) being taught using M-learning learning media based on the Articulate Storyline application.

**1. Description of the differences in learning outcomes of students before (pre-test) and after (post-test) being taught using M-learning learning media based on the Articulate Storyline application for Class X MIPA 3 MA ALLU BANGKALA students.**

The results of the research that has been conducted show that there are differences in student learning outcomes before and after being given treatment in the form of M-learning learning media.

This can be seen from the differences in maximum and average values obtained from pre-test and post-test data. To prove this, an analysis was carried out manually and using the SPSS Statistics version 26 for Windows program.

Based on the results of the research and analysis that has been carried out, the level of learning outcomes of 22 students who participated in this study obtained an average value of learning outcomes before being given treatment, which was in the low average category, then divided into several categories according to the results of the analysis obtained, namely in the very low and low categories. This condition is caused because students are only taught with lecture methods or using conventional learning models and the absence of M-learning media based on the Articulate Storyline application that was used previously in the learning process.

Based on the results of the descriptive analysis, the average between the pretest and posttest was 30.00 and 48.18. This shows that the learning outcomes of students in class X MIPA 3 at MA Allu Bangkala after being given treatment (post-test) and before (pre-test) the application of M-learning learning media based on the Articulate Storyline application provided better learning outcomes compared to students before being given treatment. This is in line with research conducted by Ahmad Raihan (2022) that Mobile Learning media can improve student learning outcomes if the media is used properly and correctly according to needs, it will affect student learning outcomes.[4]

After the descriptive analysis was conducted, an inferential analysis was conducted which included normality test, hypothesis test, and effectiveness test. The data was tested for normality to determine whether the data was normally distributed or not. The Lilliefors Significance Correction test at the  $\alpha = 0.05$  level is the normality test used in this study. Based on the Lilliefors test using the SPSS Statistic version 26 for Windows program, the pretest data obtained a value of 0.001 and the posttest was 0.20. The significant value for the pretest data obtained was less than 0.05 ( $\text{sig} < 0.05$ ) so it can be concluded that the student learning outcome test scores before the treatment was applied were not normally distributed and after the treatment was given were normally distributed because the significant value for the post-test data obtained was greater than 0.05 ( $\text{sig} > 0.05$ ).

After the normality test, the hypothesis test was carried out using non-parametric because one of the data was not normally distributed. The results of the hypothesis test using the Mann Whitney test were that there were differences in student learning outcomes before and after being taught using M-learning media based on the Articulate Storyline application for class X MIPA 3 at MA Allu Bangkala.

This is also in line with research conducted by Erni and Mukminan (2017) that based on the results of statistical tests, it was shown that in the pre-test and post-test there were differences in learning outcomes between students who used m-learning and those who did not use m-learning.

## **2. Overview of the Use of M-Learning Learning Media Based on the *Articulate Storyline* Application for Class X MIPA 3 at MA Allu Bangkala**

The results of the study showed that student learning outcomes increased after being given treatment in the form of using M-learning learning media based on the Articulate Storyline application. However, based on the N-Gain test analysis, the increase was not very significant. Therefore, it can be concluded that the use of M-learning learning media assisted by the Articulate Storyline application in improving student learning outcomes is in the low category.

The results of the N-Gain test calculation show that the average value of the N-Gain score before and after being given treatment in the form of using M-learning media based on the Articulate Storyline Application is in the low category. However, there are students who do not maximize the application of the learning media used, so that some of them are less active in their groups and do not fully maximize their responsibilities as group members.

This is because the pretest scores before and after the treatment are not much different. The low physics learning outcomes of students before the multimedia articulate storyline is applied are caused by several factors. One of them is the lack of motivation and interest in learning physics among students.

In addition, the results of this analysis are supported by the results of initial observations that students rarely learn with M-learning media, as a result students are not accustomed to the learning process using M-learning media based on the Articulate Storyline application. This is in line with the research of Syahdiani, et al. (2015) which states that learning media is a tool that can be used to convey learning messages. Educators must design this multimedia-based learning well and create a relaxed, comfortable, and friendly atmosphere with the aim that students are interested in participating in learning Syahdiani S., Kardi, S., & Sanjaya, I. G. M, "Development of Inquiry-Based Interactive Multimedia on Human Reproductive System Material to Improve Learning Outcomes and Train Students' Critical Thinking Skills.," JPPS (Journal of Science Education Research) 5, no. 1 (2015): 727–741.



#### 4). CONCLUSIONS

Based on the research conducted, the following conclusions can be drawn:

1. The level of students' learning ability before using M-Learning learning media based on Articulate Storyline obtained an average learning outcome value of 30.00 which is in the low category
2. The level of students' learning ability after using M-Learning learning media based on Articulate Storyline obtained an average learning outcome value of 48.18 which is in the medium category
3. There is a difference in students' learning outcomes before and after being given treatment in the form of using M-Learning learning media based on Articulate Storyline for class X MIPA 3 at MA Allu Bangkala
4. The effectiveness of using M-Learning learning media based on Articulate Storyline for class X MIPA 3 at MA Allu Bangkala on the material of energy sources is in the low category.

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