The Comparison of Interest and Learning Outcomes Between the Use of *E-Multimedia* and Educational Game-Based Multimedia on Renewable Energy Material for Class X Students of Sma Negeri 9 Gowa

Andi Ferawati Jafar[1], Muhammad Yusuf Hidayat[2], Fahreza[3]
[1]UIN Alauddin Makassar
[2]UIN Alauddin Makassar
[3]UIN Alauddin Makassar

Author Correspondence Email: *rezaand2209@gmail.com*

ABSTRACT

This study aims to investigate the differences between learning interest and learning outcomes of students taught using *E-multimedia* and multimedia-based educational games on renewable energy materials. This study employed a quasi-experimental design with a pretest-posttest nonequivalent control group design. The sample of this study consisted of 72 students of class X at SMA Negeri 9 Gowa, selected using simple stage sampling technique. The results of descriptive analysis showed that there was no significant difference in learning outcomes between students taught using *E-multimedia* and multimedia, as evidenced by the average score of 55.00 for the experimental class 1 and a learning interest score of 55.81. Using an independent sample t-test, the calculated t-value was 0.988, while the t-table value was 1.688 at a significance level of 0.661. Since the calculated t-value is less than the t-table value, it can be concluded that H0 is accepted and H1 is rejected. The implication of this study is that educators can consider using *E-multimedia*-based educational games and multimedia-based educational games to improve learning outcomes and learning interest of students.
Keywords: *E-Multimedia*, Multimedia, Game Edukasi, Minat Belajar, Hasil Belajar

1). INTRODUCTION

Rapid technological developments have led to the emergence of various media as teaching aids. Each type of media has unique qualities and capabilities that can be used according to the needs of the situation, available resources, and the intended audience. Therefore, choosing the right media is very important to convey messages and information efficiently. Learning media has an important role in overcoming various challenges in education. Differences in learning styles, interests, intelligence levels, physical limitations, or geographical and time constraints can be overcome by using learning media. Collaboration between educators and the media helps in conveying learning messages. The use

of relevant learning media is key to creating student-centered learning, where students are actively involved in the learning process.

Multimedia can be used in teaching and learning activities because it has several advantages, including being interactive, providing an individual affective climate, increasing learning motivation, providing feedback and control over its use is entirely in the hands of the user. Therefore, the use of learning media in teaching and learning activities can be an effective strategy in increasing students' interest in learning, while helping them to expand their knowledge and overcome existing limitations.

Students' interest in learning in participating in learning is very important in the smooth running of the teaching and learning process. Students who have a high interest in learning in the learning process can balance the teaching and learning process to be better, likewise, if the interest in learning of students is low, the quality of learning will decrease and will affect learning outcomes.

The verse of the Quran Surah Al-Nahl, verse 44 explains that Allah has sent down the Quran as a medium containing commands and prohibitions conveyed to humans so that they think and learn from it. In this study, we will discuss the use of learning media in increasing students' interest in learning and overcoming the limitations that exist in the learning process.

2). METHODS

As a subject based on four basic principles of research ethics, namely:

1. Respect For Person

   Researchers consider the rights of subjects to obtain open information related to the course of the research and consider in depth the potential dangers and misuse of research. In addition, subjects have the right to freely determine the choice of parking to participate in research activities.

2. Beneficence

   Beneficence is providing benefits to research objects, conducting research in accordance with research procedures in order to obtain. which is as beneficial as possible for research subjects and can be generalized at the population level. The ethical requirement to seek maximum benefits and minimize losses or risks for subjects and minimize research errors.

3. Non-Mafelefience

One of the main points is to reduce harm to the subject and protect the subject.

4. Justice

   This aspect is an act of providing justice. In this study all subjects were treated well without any differences in this study the researcher did not differentiate between one respondent and another

This study used a quasi-experimental design with a nonequivalent control group pretest-posttest approach. The independent variables were E-multimedia learning media (X1) and multimedia learning media (X2), while the dependent variables were learning interest and learning outcomes (Y). The population consisted of 216 students from SMA Negeri 9 Gowa in the 2022/2023 academic year, with a sample of 2 classes (X MIPA 1 and X MIPA 2) selected using simple random sampling. This study was conducted at SMA Negeri 9 Gowa in the 2022/2023 academic year. The research instrument was used to collect data, and the data were analyzed using quantitative methods, including descriptive statistics and inferential statistics (t-test) to test the hypothesis. The data were analyzed using SPSS version 20.0, and normality tests, homogeneity tests, and hypothesis testing were carried out to ensure the validity of the results.

This study will use a nonequivalent control group pretest-posttest design. Information related to this research design can be found in the table presented below.

Table 1 Research Design

Sample	Before/pretest	Treatment	After/posttest
Experiment 1	O_1	X_1	O_2
Experiment 2	O_3	X2	O_4

Description:

X1: Use of e-multimedia learning media

X2: Use of multimedia learning media

O1: Learning outcomes of students before being taught using E-multimedia learning media

O2: Learning outcomes of students after being taught using E-multimedia learning media

O3: Learning outcomes of students before being taught using multimedia learning media

O4: Learning outcomes of students after being taught using multimedia learning media

The research process will begin by collecting information and gaining an understanding of the initial conditions at the location that will be the object of research. Overall, this research consists of three main stages, namely the preparation stage, the implementation stage, and the evaluation stage.

1. Preparation stage

The preparation stage begins by conducting observations at the research location, which includes checking the number of classes and obtaining information about the type of curriculum used in the school through interaction with educators or principals.

2. Preparation stage

After that, the researcher initiated a research instrument that included learning modules, syllabus, questions for pretests and posttests, and validated the instrument. In addition, the researcher also designed and created learning media that were relevant to the research objectives

3. Implementation stage

At this stage, the researcher conducted direct observations in the field to collect concrete data using research tools. In the implementation stage, the researcher followed a series of steps to achieve the research objectives.

1) In the early stages of the research, the researcher conducted a previous pretest to the research participants, namely students in class X MIPA 1 and X MIPA 2 at SMA Negeri 9 Gowa. The purpose of this trial was to measure the level of learning achievement of students before the intervention was carried out. In addition, the researcher also provided an explanation to students in class X MIPA 1 using E-multimedia Learning Media, and to students in class X MIPA 2 using Multimedia Learning Media.
2) In the second meeting, the researcher continued to deliver the material to both classes, namely class X MIPA 1 and X MIPA 2. After the material was delivered, the researcher gave a post-test to both classes to measure students' learning outcomes in renewable energy material. This post-test uses questions that have been presented through E-multimedia and multimedia that have been developed into educational games.

4. Evaluation stage

Collecting data in the form of student learning outcomes which will later be used as objects of analysis.

3) RESULTS AND DISCUSSION

This research has been conducted in class X1 as experimental class 1 and class X2 as experimental class 2 at SMA Negeri 9 Gowa. Where in this study for experimental class 1 is a class that uses E-multimedia learning media, while experimental class 2 is a class that uses multimedia learning media. During the study, the researcher used class hours according to the existing schedule so that learning can run effectively.

This research was conducted using learning tools, test instruments and questionnaires that had previously been validated by two experts, so that they could be used in the research process. The research results are as follows:

1. **Description of learning interests of students taught using E-multimedia learning media on renewable energy material for class X1 of SMA Negeri 9 Gowa**

   After being given treatment in experimental class 1, namely by using E-multimedia learning media, the following data was obtained on students' learning interests:

Table 3.1 Frequency distribution of students' learning interests in the experimental class

No	Value (*Xi*)	Frequency (*fi*)	No	Value (*Xi*)	Frequency *(fi)*
1	45	1	9	56	5
2	48	1	10	57	4
3	50	2	11	58	1
4	51	2	12	59	2
5	52	2	13	60	1
6	53	2	14	61	1
7	54	3	15	62	1
8	55	8	16	66	1

1) Results of Descriptive Statistical Analysis

Based on table 3.1, the following descriptive analysis data were obtained:

Table 3.2 Statistical data on learning interests of students taught using E-multimedia learning media on renewable energy material for class X1 of SMA Negeri 9 Gowa

Parameters	Nilai
Maximum Value	66
Minimum Value	45
Average	55, 81
Standard Deviation	3,92
Variance	15,41

Based on table it can be seen that the maximum value is the highest learning interest result value obtained by students who are taught using E-multimedia learning media with a score of 66. While the minimum value is the lowest value obtained by students with a score of 45. In table the average or mean value is obtained which is the overall value obtained by students on the test that has been given which is divided by the number of students of 55.81. Standard deviation is a measure that describes the level of distribution of average values, the table above shows the standard deviation value of 3.92. The variance is the diversity of values obtained in the experimental class, in the data table above, the experimental class variance value is 15.41.

2) Categorization of Learning Interests

The data obtained in table 3.3, is a benchmark for determining the categorization of learning interests of students taught using E-multimedia learning media as shown in the following table:

Table 3.3 categorization of learning interests of students in experimental class 1

Interval	F	%	Categori
$X \geq 60$	12	0%	High
$40 \leq x < 60$	88	0%	Medium
$X < 40$	0	%	Low

It is shown that students who have an interest in learning in experimental class 1 with a frequency of 13 students with a percentage of 36% are in the sufficient category and with a frequency of 23 students with a percentage of 64% are in the good category.

2. Description of learning outcomes of students taught using E-multimedia learning media on renewable energy material for class X1 of SMA Negeri 9 Gowa

Table 3.5 Frequency distribution of learning outcomes of students in experimental class 1

No	Value(*Xi*)	Frequency (*fi*)
1	20	1
2	30	3
3	35	2
4	40	3
5	45	6
6	50	1
7	55	4
8	60	3
9	65	4
10	70	2
11	75	3
12	80	3
13	95	1

1) Results of Descriptive Statistical Analysis

Based on table 4.1, the following descriptive analysis data were obtained:

Table 3.6 Statistical data Learning outcomes of students taught using E-multimedia learning media on renewable energy material for class X1 of SMA Negeri 9 Gowa

Parameters	Nilai
Maximum Value	95
Minimum Value	20
Average	55, 00
Standard Deviation	17, 56
Variance	308, 57

obtained the average value or mean which is the overall value obtained by students on the test that has been given which is divided by the number of students of 55.00. Standard deviation is a measure that describes the level of distribution of the average value, in the table above the standard deviation value is shown as 17.56. The variance is the diversity of values obtained in the experimental class, in the data table above the experimental class variance value is obtained as 308.57.

2) Categorization of Learning Outcomes

The data obtained in table 4.1, is a benchmark for determining the categorization of learning outcomes of students taught using E-multimedia learning media as shown in the following table:

Table 3.7 categorization of learning outcomes of students in experimental class 1

Category	Value Range	Fi
Very high	87,75 – 100	1
High	71,25- 87,50	6
Medium	54,50 – 71,00	13
Low	37,75 – 54, 25	10
Very low	0, - 37,50	6

Shown that students who have Physics learning outcomes in experimental class 1 with a very high category are 1 student, in the high category are 6 students, in the medium category are 13 students, in the low category are 10 students, and in the very low category are 6 students. To better understand the data on Physics learning outcomes in experimental class 1 after being given treatment, the data in table 4.9 is presented in the form of a bar chart as follows:

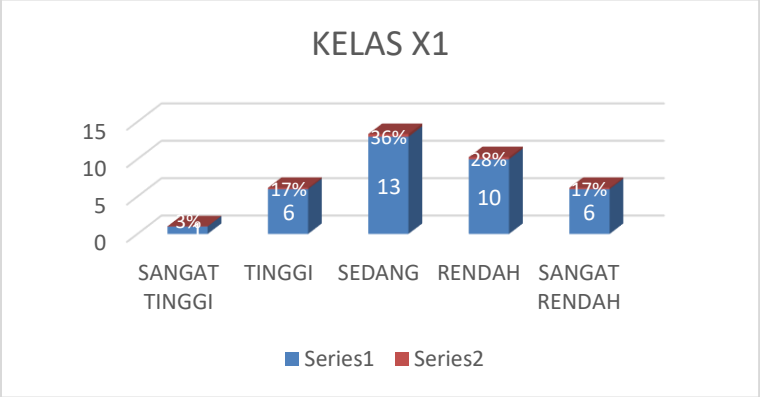

Figure 4.1 Diagram of Physics learning outcomes for experimental class 1

3. Description of learning interests of students taught using multimedia learning media on renewable energy material for class X2 of SMA Negeri 9 Gowa

After being given treatment in experimental class 2, namely by using multimedia learning media, the following data on students' learning interests were obtained:

Table 3.8 Frequency distribution of students' learning interests in experimental class 2.

No	Value (*Xi*)	Frequency (*fi*)	No	Value (*Xi*)	Frequency (*Fi*)
1	49	1	8	58	3
2	52	3	9	59	2
3	53	2	10	60	1
4	54	4	11	61	1
5	55	5	12	62	2
6	56	9	13	63	1

7	57	2

Results of Descriptive Statistical Analysis

Based on table 4.4, the following descriptive analysis data were obtained:

Table 3.9 Statistical data on learning interests of students taught using multimedia learning media on renewable energy material for class X2 of SMA Negeri 9 Gowa

Parameters	Value
Maximum Value	63
Minimum Value	49
Average	56,11
Standard Deviation	3,06
Variance	9,41

It can be seen that the maximum value is the highest learning interest value obtained by students who are taught using E-multimedia learning media with a score of 63. While the minimum value is the lowest value obtained by students with a score of 49. the average or mean value is obtained which is the overall value obtained by students on the test that has been given which is divided by the number of students of 56.11. Standard deviation is a measure that describes the level of distribution of average values, in the table above the standard deviation value is shown as 3.06. Meanwhile, variance is the diversity of values obtained in the experimental class, in the data table above the experimental class variance value is obtained as 9.41.

2) Categorization of Learning Interests

The data obtained in table 3.10, is a benchmark for determining the categorization of learning interests of students taught using multimedia learning media as shown in the following table:

Table 3.10 categorization of learning interests of students in experimental class 2

Interval	F	%	Categori
X ≥ 60	14	0%	High
40 ≤ x < 60	86	0%	Medium
X < 40	0	%	Low

4. Description of learning outcomes of students taught using multimedia learning media on renewable energy material for class X2 of SMA Negeri 9 Gowa

After being given treatment in experimental class 2, namely by using multimedia learning media, the following data on student learning outcomes were obtained:

Table 3.11 Frequency distribution of learning outcomes of students in experimental class 2.

No	Value (*Xi*)	Frequency (*fi*)
1	25	1
2	30	2
3	35	5
4	40	1
5	45	2
6	55	4
7	60	5
8	65	4
9	70	3
10	75	2
11	80	3
12	85	1
13	90	1
14	95	2

1) Results of Descriptive Statistical Analysis

Based on table 3.1, the following descriptive analysis data were obtained:

Table 3.12 Statistical data on learning outcomes of students taught using multimedia learning media on renewable energy material for class X2 of SMA N 9 Gowa

Parameters	Value
Maximum Value	95
Minimum Value	25
Average	59,31
Standard Deviation	19,35
Variance	374, 50

It can be seen that the maximum value is the highest learning outcome value obtained by students who are taught using multimedia learning media with a score of 95. While the minimum value is the lowest value obtained by students with a score of 25. the average or mean value is obtained which is the overall value obtained by students on the test that has been given which is divided by the number of students of 59.31. Standard deviation is a measure that describes the level of distribution of average values, in the table above the standard deviation value is shown as 19.35. Meanwhile, variance is the diversity of values obtained in the experimental class, in the data table above the experimental class variance value is obtained as 374.50.

2) Categorization of Learning Outcomes

The data obtained in table 3.7, is a benchmark for determining the categorization of learning outcomes for students taught using multimedia learning media as shown in the following table:

Table 3. 13 categorization of student learning outcomes in experimental class 2

Category	Value Range	Fi
Very high	87,75 – 100	3
High	71,25- 87,50	6
Medium	54,50 – 71,00	16
Low	37,75 – 54, 25	3
Very low	0, - 37,50	8

The table shows that students who have Physics learning outcomes in experimental class 2 with a very high category are 3 students, in the high category are 6 students, in the medium category are 16 students, in the low category are 3 students, and in the very low category are 8 students. To better understand the Physics learning outcome data in experimental class 2 after being given treatment, the data in table 4.12 is presented in the form of a bar chart as follows:

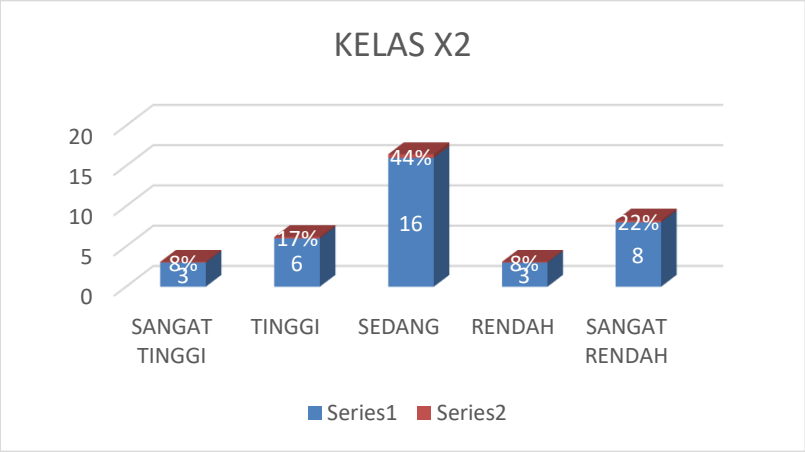

Figure 4.2 Diagram of Physics learning outcomes for experimental class 2

Normality and homogeneity tests were conducted to determine whether the physics learning outcome data of experimental class 1 and 2 students were normally distributed and had the same variance. The results of the normality test using Kolmogorov-Smirnov at the 0.05 level showed that the physics learning outcome data of experimental class 1 and 2 students were normally distributed. Furthermore, the homogeneity test using the F (Fisher) test showed that both experimental classes had the same variance, with a significant value of 0.322 which was greater than 0.05. Thus, it can be concluded that the physics learning outcome data of experimental class 1 and 2 students met the assumptions of normality and homogeneity, so that it can be continued with a hypothesis test using

the independent two-sample t-test. The normality and homogeneity tests were conducted to determine whether the physics learning outcome data of experimental class 1 and 2 students were normally distributed and had the same variance. The results of the normality test using Kolmogorov-Smirnov at the 0.05 level indicate that the physics learning outcomes data of experimental class 1 and 2 students are normally distributed, with significant values of 0.115 and 0.200 which are greater than 0.05. Furthermore, the homogeneity test using the F test (Fisher) shows that both experimental classes have the same variance, with a significant value of 0.661 which is greater than 0.05. Thus, it can be concluded that the physics learning outcomes data of experimental class 1 and 2 students meet the assumptions of normality and homogeneity, so that it can be continued with a hypothesis test using the independent two-sample t test.

4). CONCLUSIONS

The results of the study showed that the average learning interest of students taught using educational game-based E-multimedia was 55.81, while the average learning outcomes were 55.00. Meanwhile, the average learning interest of students taught using educational game-based multimedia was 56.11, and the average learning outcomes were 59.31. Based on these results, there was no difference in learning interest between students taught using E-multimedia and multimedia, with an average learning interest that was almost the same, namely 55.81 and 56.11. In addition, there was no significant difference in learning outcomes between students taught using E-multimedia and multimedia learning media, with a t count of 0.988 and a t table of 1.688 at a significance level of 0.661. Therefore, it can be concluded that H0 is accepted and H1 is rejected.

Acknowledgment

The implementation of E-multimedia Based on Educational Games and Multimedia Based on Educational Games in this study can affect student learning outcomes and student learning interests. In the future, it is better if the one who provides the material or teaches is the Educator himself by using the teaching materials offered, the educator factor also influences the student's interest in learning to be even better. Considerations for Physics Subject Educators can consider using E-multimedia based on educational games and multimedia based on educational games on student interest and learning outcomes.

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