



The Effectiveness of Mathematics Learning Using Adobe Flash Media on Student Learning Outcomes

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Abstract

Students in the era of school digitalization very much need numeracy skills. Numeracy skills are related to solving a problem. Adobe Flash media is suitable for solving a problem with the help of interactive animated videos. This study aimed to determine the effectiveness of mathematics learners using Adobe Flash Media, which was assisted by interactive animated videos on students' numeracy skills. The research method used is quantitative in the form of a true experiment. The sample in this study were students in grades VIII8 and VIII7, who were selected randomly. The data collection techniques used were documentation and tests. The data analysis techniques used were normality tests, homogeneity tests and independent sample tests. The results of the study showed that the $t_{\text{count value}} > t_{\text{table}}$ where $t_{\text{count}} = 7.602$ and $t_{\text{table}} = 1.6905$. This means that there is a significant difference in the average numeracy ability of students between the experimental group and the control group.

INTRODUCTION

Mathematics is one of the subjects at all levels of education, from elementary school to college. Even mathematics is taught in kindergarten normally. "Mathematics is abstract ideas that contain symbols, so mathematical concepts must be understood first before manipulating the symbols [1]. Mathematics is a field of science that is a tool for thinking, communicating, and solving various practical problems, whose elements are logic and intuition, analysis and construction, generality and individuality, and has branches including arithmetic, algebra, geometry, and analysis [2].

Flat-sided space is one of the materials in mathematics lessons. This material has been studied since elementary school and is studied again in grade VIII and even in the semester. One of the materials in flat-sided space is cuboid surface area and volume. The cause of students' low understanding of mathematics is rooted in students who tend to memorize concepts rather than the process of mastering concepts [3]. Development IPTEK encourages teachers to produce computer-based

learning media. With the advancement of technology, it is easier for teachers to create learning media for subjects that require high costs [4].

The development of information technology today causes various changes in various lines of life. The development also penetrates the world of education. Therefore, education requires an increase. Improving the quality of education and learning helps respond to developments in science and technology [5]. The learning process in the classroom is a significant part of education. Poor quality learning from within the classroom will get less promising results, while quality learning will get better results.

Professional teachers have competence in their fields. In addition to having professional competence, which means mastering their field, teachers must have pedagogical competence, namely mastering learning methods, curriculum mastery, designing the learning process, implementing the learning process, conducting evaluations and analysis of learning, and implementing follow-up programs.

Multimedia brings something good for educators because, with multimedia, educators can develop learning techniques to improve learning outcomes. Multimedia-based learning is one of the alternative learning methods that can be used in the classroom. Through multimedia-based learning, teachers can help deliver students to a learning situation in such a way as to provide a concrete understanding of the material presented [6]. Multimedia-based learning can present real situations in the classroom. Multimedia is still not utilized well by some teachers in conducting classroom learning. As a result, learning is carried out conventionally even though multimedia devices are fully available in the classroom [7].

Learning to use computer media can stimulate students to do exercises and carry out simulation activities because of the availability of graphic animations and colors [8]. Learning media is more effective and practical [9]. Using learning media in the teaching and learning can arouse new desires and interests, arouse motivation, stimulate learning activities, and even psychologically influence students [7]. Based on the description above, the author developed an Adobe Flash-based learning media in mathematics learning, which is expected to be one way to improve the quality of education and as an alternative teaching material in mathematics learning that can reduce students' perceptions that the lessons are boring.

Ariani and Dany [8] explain that "multimedia is the result of a combination of various media in the form of text, images, graphics, sound, animation, and video used to convey messages to the public". Macromedia Flash is one of the multimedia tools that can create videos, animations, images, and sounds efficiently and effectively.

Based on previous research by [10], it was found that the percentage obtained from Adobe Flash learning media was very suitable for use because it could improve student learning outcomes. Then, research by Napsiyah et al. [11] found that Android-based learning media using the Adobe Flash application was effective for student learning outcomes.

According to Hadi, as quoted by Firdaus [12], Adobe Flash is an application software for animation used on the internet and can, therefore, be used to develop interactive multimedia for CD production and networks and on the web.

METHODS

According to Sugiyono [12], the research method is a scientific way to obtain data with specific purposes and uses. The research method can be in the form of research implementation steps starting from determining the object, the root of the problem being studied, data collection and management techniques used, estimated funds, and the period needed to the chronology and systematics of writing the report, which is the main guideline. The method used in this study is the experimental method. The experiment is a way to find a causal relationship (casual relationship) between two factors intentionally caused by researchers Arikunto [13]. The method used in this study is the test method, and when viewed from its type, it is an experimental study. The design used is the Pre Test-Post Test Control Group design method.

Table 1. Pre-Test-Post-Test Control Group Designs [12]

Sample	Pre Test	Treatment	Post Test
R	O ₁	X	O ₂
R	O ₃	X	O ₄

In this research design, there are two groups: the control class and the experimental class. The control class was given treatment (X) using Adobe Flash Media. Furthermore, both classes were given tests in the form of questions to measure the learning outcomes in the control class (K) and the learning outcomes of the experimental class (E).

Documentation and testing as data collection techniques. Documentation includes photos and videos during learning, while the test contains a pre-test (initial test) and post-test (final test) of numeracy skills. Before conducting the research, the researcher conducted a trial test of the instrument in another class, studying the material of spatial shapes. The results of the instrument trial were then tested for validity, reliability, level of difficulty, and discriminatory power using SPSS software version 22, where the instrument test results were suitable for use in research.

The research data were analyzed using two steps. The first step is the initial data analysis (pre-test) and the final data analysis (post-test). The initial data analysis includes normality and homogeneity tests using SPSS version 22 software to test whether the two classes are typically distributed and homogeneous at the initial conditions. Meanwhile, the final data analysis includes normality tests, homogeneity tests, and independent sample hypothesis tests using SPSS version 22 software to see whether the post-test scores of the numeracy abilities of the two classes are normal and homogeneous and to see the effect of providing Adobe Flash media. Assisted by interactive animated videos in the experimental class.

RESULTS AND DISCUSSION

Adobe Flash

The researcher started the learning in class VIII.8, or the experimental class, by greeting, praying, taking students' attendance, and starting a little game to motivate students to be enthusiastic about learning. The researcher began to focus the students' attention by showing learning media. Then, the researcher communicated the learning objectives regarding spatial figures (Area and Volume of Cuboids). The researcher conducted apperception to students by asking and answering the question, "Have you ever learned spatial figures?" all students answered "Yes", the researcher asked another question, "Try to mention what spatial figures you know?" some answered, "Cube" some answered "Cube" some answered "Cylinder" and some answered "Cone". The researcher asked another question: "From the types of spatial figures that you mentioned, try to give examples of spatial figures that exist in everyday life." There were six children who answered, namely Marchela, Chika, Faiz, Amel, Dzakiyyah, and Zahra. The six answered, "cupboard, pencil box, flower pot, water gallon, birthday hat, the roof of the house," and the researcher answered, "Yes, that is the right, good answer".

After carrying out apperception, the researcher informed the learning model that would be used in the learning process, namely, and explained the learning steps using Adobe Flash learning media for the material on cuboid nets.



Figure 1. Researchers Are Giving Pre-Test



Figure 2. Delivering Learning Objectives

In Figure 4.3, the opening is done by saying hello and conveying that after studying the material using Adobe Flash media, students are expected to be able to solve questions regarding the material on the area and volume of cuboids.



Figure 3. Students Understand the Material

In Figure 4, the researcher provides material using Adobe Flash media; due to limited school facilities and infrastructure, learning is carried out in the prayer room. After that, students return to class. Students are enthusiastic about the material given at this stage because they have never used Adobe Flash media while learning with the math teacher.



Figure 4. Researcher Explains Material

Figure 4. At this stage, the researcher re-explains the material students did not understand during their previous learning using Adobe Flash media. There are still students who do not understand the solution to the volume of a cuboid, so the researcher re-explains it.



Figure 5. Students Complete Problems in LKS

Figure 4.5 is one of the images from a small group. Each group has seven members; then, for the method of solving the area and volume of cuboids, students work on the questions in (LKS).

The third meeting was held on 'Tuesday, March 7, 2023, for two teaching hours. The researcher opened the lesson by greeting and taking students' attendance; then, the researcher gave post-test questions to students.



Figure 6. Students Complete Post Test

Initial Data Analysis

Before the learning was carried out, the researcher analyzed the results data before being given treatment (*pre-test*) to see the initial conditions of the control and experimental classes using *SPSS software* version 22.

Normality Test

The homogeneity test is conducted after the normality test. Based on the analysis of the homogeneity of variance test using SPSS software version 22, the significance value (Sig.) Based on the mean of 0.489 and the value of $0.489 > 0.05$, it can be concluded that the variance of the pre-test data of the experimental class and the pre-test data of the numeracy ability of students in the control class are the same or homogeneous.

Final Data Analysis

After the initial data analysis above, learning was done by applying the problem-based learning model assisted by interactive animated videos to the experimental class and direct learning to the control class. Then, at the end of the learning, a post-test of numeracy skills was given to see whether there was an effect of providing the problem-based learning model assisted by interactive animated videos on numeracy skills to the experimental class.

Normality Test

The analysis of the normality test in this study used the help of SPSS Version 22 Kolmogorov-Smirnov ^a. The normality test results for the experimental class using Kolmogorov-Smirnov a were $0.058 \geq 0,05$ and the control class $0.461 \geq 0,05$. Both classes were normally distributed, as evidenced by the normality test above the 5% significance level.

Homogeneity Test

The homogeneity test is conducted after normality test. Based on the analysis of the homogeneity of variance test using SPSS software version 22, the significance value (Sig.) Based On the Mean of $0.743, > 0.05$, it can be concluded that the variance of post-test data of the numeracy ability of experimental class students and pre-test data of numeracy ability of control class students are the same or homogeneous.

Independent Sample Test

The independent sample t-test is used to determine whether there is a difference in the average of two unpaired samples. The independent sample t-test in this study was used to see whether "Is there a difference in students' numeracy skills in spatial geometry material between Adobe Flash media assisted by interactive animated videos and conventional models?" and whether "Is there an effect of Adobe Flash media assisted by interactive animated videos on students' numeracy skills in spatial geometry material in class VIII of SMP Muhammadiyah Pagar Alam in the 2022/2023 academic year?" This test was carried out using SPSS software version 22.

Table. 2 Group Statistics

	Class	N	Mean	Std. Deviation	Std. Error Mean
Numeracy ability	Post-test Experiment	34	80.68	7,490	1.285
	Post-test Control	34	67.00	7,344	1,260

Group statistics table above, the average value of the control class was 67.00, so it can be concluded that the use of *Adobe Flash media* is more effective than conventional learning.

Table 3. Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Hello Student Learning	Equal variances assumed	.108	.743		66	.000	13,676	1,799	10,085	17,268
	Equal variance			7,602	65.9	.000	13,676	1,799	10,085	17,268
	not assumed			7,602	74					

With the provision that if $\text{sig (2-tailed)} > 0.5$ then H_0 is accepted, and if $\text{sig} < 0.5$, then H_0 is rejected. Based on the output above, the sig value is obtained. (2-tailed) of $0.000 < 0.05$, meaning H_0 is rejected. Then, it can be concluded that Adobe Flash media effectively improves the learning outcomes of class VIII students of Muhammadiyah Pagar Alam Middle School. At a significant level $\alpha = 5\%$ with the criteria for rejecting H_0 and dk each $(n_1 - 1) = (34 - 1)$ with the interpolation formula obtained $t_{\text{table}} = 1.6905$, it can be seen that $t_{\text{count}} = 7.602 > 1.6905$, then H_0 rejected and H_1 is accepted, meaning the research hypothesis is accepted. So, learning using Adobe Flash effectively improves the learning outcomes of class VIII students of SMP Muhammadiyah Pagar Alam in the 2022/2023 academic year.

Discussion

Based on the results of the research conducted, the learning outcomes of students at Muhammadiyah Pagaralam Middle School are different between classes taught using Adobe Flash media and classes that do not use Adobe Flash media; the average value of students in the experimental class is 80.68 and the control class is 67.00 so that the hypothesis in this study, learning using Adobe Flash media is compelling on the learning outcomes of class VIII students at Muhammadiyah Pagaralam Middle School in the 2022/2023 academic year and can be accepted as valid. This is proven based on the statistical calculation of $t_{\text{count}} = 7.602$ and $t_{\text{table}} = 1.6905$, which shows $t_{\text{count}} > t_{\text{table}}$.

Meanwhile, the analysis test used normality, homogeneity, and hypothesis tests. The normality test was used using the Kolmogorov-Smirnov test with normally distributed results. The homogeneity test uses the Homogeneity of variance test based on a significant value > 0.05 to make this study's control and experimental classes homogeneous. While in the hypothesis test conducted with an independent sample t-test by looking at the sig value (2-tailed), based on the results of the hypothesis test, it can be concluded that H_1 is accepted, so it can be said that there is a significant influence of effective Adobe Flash media on the learning outcomes of class VIII students of SMP Muhammadiyah Pagaralam.

CONCLUSION

Based on the results of the research and discussion, it can be concluded that learning using Adobe Flash media is effective on the learning outcomes of class VIII students of SMP Muhammadiyah Pagaralam, which can be seen in the results of the analysis of the hypothesis test using the Independent Sample T-Test with a significant value of 0.000. Learning using Adobe Flash media in the experimental class increased the average learning outcome compared to learning in the control class.

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