THE INFLUENCE OF MACROMEDIA FLASH LEARNING ON THE STUDENTS' MATHEMATIC CONCEPT UNDERSTANDING

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Abstract

This study aimed to determine the effect of Macromedia flash learning on the mathematical concepts understanding. This experimental research was conducted at the SMP PGRI 20 JAKARTA in the academic year 2016/2017. The sample of the research was the students of class VII with the number of students as many as 56 students consisting of 28 students of class VII-2 as the experimental group and 28 students consisting of grade VII-3 students as the control group, with different treatment from each skill program. Research data from each group was obtained by posttest using an instrument in the form of 10 items about the form of description by fulfilling the assessment aspect for the concept comprehension ability. The instruments used in this study had been tested in advance and all items were valid and had a high degree of reliability. Data analysis of research results using t-test by first testing the assumption of normality and homogeneity. The results showed that there was a significant influence of Macromedia Flash learning on the mathematical concepts understanding, especially in triangle and quadrilateral materials in class VII SMP PGRI 20 JAKARTA.

Keyword: e-learning for secondary school, e-learning in mathematics, SMP PGRI 20 Jakarta.

A. Introduction

Mathematics is one component in a series of subjects that have an important role in education. Mathematics is one field of study that supports the development of science and technology. But until now, there are still many students who feel that mathematics as a difficult subject, not fun, even a frightening specter. Every individual has a different view of mathematics lessons. Some view mathematics as a fun lesson and some view math as a difficult lesson. For those who consider the math is fun, it will grow the motivation in the individual to learn math and optimism in solving challenging problems in math lessons. Conversely, for those who consider mathematics as a difficult lesson, then the individual will be pessimistic in solving math problems and less motivated to learn it. These attitudes will certainly affect the outcomes they will achieve in learning.

According to Asri & Andinny (2015: 113), Mathematics is the study of logical reasoning that has practical value, discipline, and culture with objects in the form of abstract ideas or concepts that are embodied in the form of symbols and deductive reasoning. Fajriyah & Supardi (2015: 9) Mathematics is an exact learning science that can be a pattern, shape, and space, and the operation of the calculation of abstract concepts that can lead to the process of scientific thinking and develop the thinking power required by learners for life in society and in the higher education.

From the above understandings, it can be deduced that mathematics is a science that arises because of human thoughts associated with ideas, processes, and reasoning mathematics consisting of 4 broad insights namely: arithmetic, algebra, geometry, and analysis.

Seeing these problems, the researcher wants to provide other alternatives in learning mathematics is by learning using Macromedia Flash. Today, computers have had a powerful influence on learning. Such tools offer the possibility to become better at learning, but teachers will be different when using the media in their learning. Media is one of the supporting factors to achieve learning objectives, by using learning media, students will be more interested in mathematics and facilitate students in understanding the concepts of mathematics. Learning by using computer media can stimulate students to do the exercises, performing simulation activities due to the availability of animated graphics, colors, and music. Computers can also accommodate students who are slow in receiving lessons because it can provide a more effective climate, so students are not easy to forget, not easily bored, and more patient in carrying out instructions as the desired program. The condition of schools equipped with computer laboratory facilities and various media that support the learning of mathematics is actually very supportive of teachers to convey material to students.

Mathematics is one of the disciplines in education that plays an important role in the development of science and technology. One of the objectives of learning mathematics is that students are expected to have good skills in understanding mathematical concepts. According to Kilpatrick, et al. (Afrilianto, 2012: 193), conceptual understanding is the ability to understand concepts, operations, and relationships in mathematics. Sumarmo (Afrilianto, 2012: 193) also states the vision of developing mathematics learning to meet the present needs of mathematics learning needs to be directed to understanding the concepts and principles of mathematics that are then needed to solve mathematical problems, problems in other disciplines, and problems in daily life day.

Meanwhile, according to Nasution (Rizal, 2013: 5), conceptual understanding is the ability of individuals to understand a particular concept. Someone is said to have had an understanding of the concept when students have captured the meaning or meaning of a concept. The importance of understanding the mathematical concepts seen in the first objective of mathematics learning is to understand the concepts of mathematics, explain the inter-linkage of concepts, and to apply the concept or algorithm flexibly, accurately, efficiently, and appropriately in problem-solving. In accordance with the objectives of learning mathematics above then after the learning process, students are expected to understand a mathematical concept so that it can use that ability in dealing with mathematical problems.

The indicators of concept understanding contained in the Regulation of the Directorate General of Primary and Secondary Education Number 506 / C / Kep / PP / 2004, the indicator that students understand the mathematical concept is able to: a) reiterate a concept; b) classify certain objects according to their concepts; c) provide examples and not examples of concepts; d) present the concept in various forms of representation; e) develop sufficient terms or conditions of a concept; f) use and utilize and select specific procedures or operations; g) apply concepts or algorithms in problem solving. According to Rizal (2013: 4) a learner is said to understand something if he can provide an explanation or provide more detailed description of it by using his own words. To reach the stage of a mathematical concept understanding, students must have knowledge of a concept. From the description, it can be understood that the ability to understand the concept of mathematics wants students to be able to use or apply what has been understood into learning activities. If the student has a good understanding, then the student is ready to give a definite answer to the statements or problems in learning. According to Tiya & Novitasari (2015: 326), misconceptions in learning mathematics can be caused by factors of teachers and students, the teacher factor is because the teacher does not master the appropriate approaches and learning methods he uses to deliver the material. In addition, the cause of the error of the concept in the learning of mathematics is the less master master the material of the material delivered. Another cause is the lack of variation by teachers in choosing learning media in mathematics learning. While the factors of students, among them is because

students are less interested in learning mathematics so that students do not pay attention to the material and ultimately do not understand the concept. The application used to measure the effect of understanding of mathematical concepts uses triangular and quadrilateral materials for class VII SMP.

B. Literature Review

Understanding the concept is a very important aspect of learning because by understanding the concept, students can develop their abilities in each subject matter. Understanding is a standard tool of educational programs that reflect competence so as to lead students to become competent in various sciences. The student is said to have understood the concept if he has been able to abstract the same trait, which is characteristic of the learned concept and has been able to generalize the concept. From the description, it can be understood that the ability to understand the concept of mathematics requires students to be able to utilize or apply what has been understood as learning activities. If the student has a good understanding, then the student is ready to give a definite answer to the statements or problems in learning.

Macromedia Flash is animated software that uses the computer. Today, computers have had a powerful influence on learning. The choice of Macromedia Flash is due to its ability to provide conceptual descriptions as well as giving the presentation of material clearly and interactively. Macromedia Flash has the ability to create animated images, sound animation, interactive animation, and others. By using this media, students can directly see simulations and demonstrations that resemble actual events, so that students can capture the concepts well and correctly and can be applied in everyday life.

According to Rayandra (2011: 187), Macromedia Flash is one application program used to design animations that are widely used today. Macromedia flash also introduces how to create a movie clip, frame animation, animated tween motion and its command of the script action. Macromedia Flash is a professional standard authoring tool application program used to create vector and bitmap animations that are amazing to create interactive, engaging, and dynamic websites. This software can also be used to generate a website, presentation, game, movie, or learning CD.

Thus, learning using Macromedia Flash needs to be applied as an alternative to learning model Problem-based learning as a variation in mathematics learning. It is hoped that with the learning that interesting and not boring then can grow a positive attitude towards mathematics so as to increase understanding of mathematical concepts. The choice of Macromedia Flash as a medium is due to its ability to provide conceptual descriptions as well as giving the presentation of material clearly and interactively compared with using problem-based learning (PBL). Selection of this media was also based on the lack of media use during the learning activities of mathematics. The material to be experimented was class VII material, visualized using software (software) on the computer. For that, researchers chose interactive multimedia-based learning by using Macromedia Flash as a tool, because by using these programmed animations, the material can be visualized.

Based on some understanding of Macromedia flash described above, it can be concluded that what is meant by Macromedia flash in learning is a software application that is used to design and build learning media tool to make it more interesting and easy to understand in conveying learning.

C. Methodology

In this study, researchers used quantitative research methods, in the form of quasi-experimental methods. Sugiyono (2012: 30) explains that the purpose of experimental research is to obtain information that can be obtained from actual experiments in circumstances that are not possible to control all variables. Because in quasi-experiments this is a research model that does not allow researchers to control all variables then only done on one variable that is the most dominant. In the implementation, the researcher involves two groups, the experimental group treated with the Macromedia Flash learning model and the control group treated with the Problem-Based Learning (PBL) learning model. The two groups are the experimental group as the treatment group and the control group as the comparison group in the seventh grade of SMP.

This research is comparative, because it is done to compare the equation and the difference of two or more facts and properties of the object under study based on certain frame of mind, so that the research design used is Randomized Group Only Design where the experimental group is subjected to different treatment and both groups subject to the same measurement.

Table 1. Research design

Group	Treatment	Result
Experiment	X1	Y1
Control	X2	Y2

Explanation:

X1   : Treatment performed on experimental group

X2   : Treatment performed on the control group

Y1   : Score test results with the same problem in the experimental group

Y2   : Score test results with the same problem in the control group

Samples used in this study were 56 students consisting of 28 experimental group participants and 28 control group learners. The technique of taking data in this research was by using posttest with the amount of 10 questions in the form of description which had been validated first. Data analysis technique was done by descriptive data analysis test, prerequisite analysis test, and hypothesis analysis test. Descriptive data analysis was calculating mean, median, mode, and standard deviation and variance. The prerequisite analysis was done by using the normality and homogeneity test. Testing of research hypothesis conducted by using a t-test for two groups of data from two groups of samples.

D. Finding and Discussion

1. Findings

Based on the calculation, the data obtained from the experimental group whose average learning outcome is 75.50; median of 76.07; mode of 76.83; standard deviation of 11.52 and variance of 128.00. While in the control group, the average learning outcome is 68.79; median of 69.50; mode equal to 71,17; standard deviation of 11.82; and variance of 134.78.

Table 2. Description of the Ability of the Mathematics Concept Understanding

Statistic	Experimental Group	Control Group
Lowest score	48	45
Highest score	94	91
Mean	75,50	68,79
Median	76,07	69,50
Modus	76,83	71,17
Standard of Deviation	11,52	11,82

Source: Analyzed primary data

Testing The normality of data is done by Liliefors test with significant level 0,05. The summary of the data normality test can be seen in table 3.

By testing criteria:

If $L_0 = L_{count} < L_{table}$ H_0 accepted

If $L_1 = L_{count} > L_{table}$ H_1 rejected

Based on the results of the calculation on the normality test in table 3, it is known that L_0 is less than the L_{table} value. Based on the calculation of the group of learners using Macromedia Flash (Y1) method, it is obtained that the price of L0 is 0.0837 while L_{tabel} for df = 28 with α = 5% obtained price 0.1655. The value hypothesis states if L_0 is less than L_{tabel}. Based on the results obtained, L_0 is less than L_{tabel} so that the hypothesis of the value stating the sample comes from a normally distributed population is accepted.

Based on the calculation of the group of learners using the method of Problem Based Learning (Y2), it is obtained that the price of L_0 is 0.1019 while L_{tabel} for df = 28 with α = 5% obtained price 0.1655. The value hypothesis states if L_0 is less than L_{tabel}. Based on the results obtained, L_0 is less than L_{tabel} so that the hypothesis of the value stating the sample comes from a normally distributed population is accepted.

Table 3. Recapitulation of Calculation Result of Normality Test

Group	Number of sample	L_{count}	L_{table} α= 0.05	Result
Y1	28	0.0837	0,1655	Normal
Y2	28	0,1019	0,1655	Normal

Source: Analyzed primary data

Homogeneity test used in this research is Fisher test. Based on the data obtained, F_{tabel} is the largest variance divided by the smallest variance in this study then obtained $\frac{134,78}{128,00} = 1,053$ and obtained F_{table} where the largest variance is the numerator n-1 which is 28-1 and the smallest variance becomes denominator of n-1 is 28-1 and obtained F_{table} of 1.905 so it is concluded F_{count} <F_{table} is 1.053 <1,905 so it can be concluded research data on the group of the method of Macromedia Flash and PBL is homogeneous.

Data analysis for testing the hypothesis in this study used t-test. The hypothesis testing Criteria is to reject H_0 if t_{count}> t_{table}. Based on the calculation of the results of research and hypothesis testing using the t-test on the significance level α = 5% (0.05), obtained t_{count}> t_{table}, it is 2.25> 1.673, thus H_0 is rejected and H_1 is accepted. So it can be concluded that the understanding of the mathematical concepts of groups of learners using Macromedia Flash is higher than the group of learners who use the PBL method. In other words, accepting an alternative hypothesis which states that there is a significant influence between the method of Macromedia Flash learning on the ability of understanding the concept of mathematics.

Table 4. Results of Hypothesis Testing

Group	Research hypothesis						
	N	Mean	Variance	α	S	T_{count}	t_{table}
Experiment	28	74,07	141,96	0.05	12,88	2,77	1,673
Control		64,79	189,63				

Source: Analyzed primary data

Based on the calculation, the data obtained from the experimental group, the average learning outcome is 75.50; median of 76.07; mode of 76.83; standard deviation of 11.52 and variance of 128.00. Meanwhile, in the control group, the average learning outcome is 68.79; median of 69.50; mode equal to 71,17; standard deviation of 11.82; and variance of 134.78.

Testing The normality of data is done by Liliefors test with significant level 0,05. Based on the calculation of the group of learners using Macromedia Flash (Y1) method, it is found that the price of L_0 is 0,0837 while L_{table} for df = 28 with α = 5% is 0,1655. The value hypothesis states if L_0 is less than L_{table}. Based on the results obtained, L_0 is less than L_{table} so that the hypothesis of the value stating the sample comes from a normally distributed population is accepted.

Homogeneity test used in this research is Fisher test. In testing homogeneity with F-test, obtained F_{count} = 1.053; for α = 5%, df numerator = 27 and df denominator = 27 obtained by F_{table} = 1.905. Because the value of F_{count} <F_{table}, that is 1.053 <1.905. It can be concluded that the data is homogeneous. The results of research and hypothesis testing using t-test on the significance level α = 5% (0.05) obtained t_{count}> t_{table} = 2.25> 1.673 H_0 rejected and then H_1 accepted then it can be concluded that understanding the mathematical concepts of groups of learners who use Macromedia Flash is higher than the group of learners using the PBL method.

From the results of the above test, it can be seen that the average result of understanding the concept of experimental group mathematics is higher than the average understanding of mathematical concepts of the control group. This provides an illustration that learning using Macromedia flash given to the experimental group can encourage learners to have a better understanding of the concept so that the learning outcomes will be higher. This shows that the different understanding of mathematical concepts is not by chance but because of differences in treatment between the two groups. Destiniar (2016) states that the average understanding of group mathematical concepts taught with Adobe Flash Player and In-focus is significantly higher than the average understanding of group mathematical concepts being taught without media. The average understanding of the group's mathematical concepts taught by In-focus is significantly higher than the average understanding of group mathematical concepts being taught without the media. So it can be concluded, there is a significant influence understanding of mathematical concepts of students in terms of learning media used. Thus, based on the results of research, Macromedia Flash method can be applied at the SMP PGRI 20 Jakarta. Macromedia flash learning method allows students more interested in learning, with the animations in the presentation of the material to make students more focused on digesting the material provided. Macromedia Flash learning method has a very significant influence on the ability to understand the concept of mathematics not by chance but because of differences in treatment between Macromedia flash learning method with Problem Based Learning method.

Macromedia Flash method makes students better understand the material provided, compared with using Problem-Based Learning Methods that is more to the problem solving.

2. Discussion

The results of this study conclude that there is a significant influence Macromedia Flash on the understanding of mathematical concepts. Understanding the concept is the basis and the important stage in the series of mathematics learning. The student's ability to study mathematics is directly related to his understanding of mathematical concepts and principles. Ministry of National Education (2003: 2) revealed that:

Understanding the concept is one of the skills or mathematical skills that are expected to be achieved in learning mathematics is to show the understanding of mathematical concepts he studied, explain the interconnection between concepts and apply the concept or algorithm in a flexible, accurate, efficient, and appropriate in solving the problem.

Macromedia Flash learning is one proof of the use of computers in the field of education. This is an opportunity as well as a challenge for practitioners to create interesting and interactive learning media. Macromedia flash is often used by animators for interactive animation and non-interactive animation, such as animation on web pages, animated cartoons, presentations, a company's portfolio, games, and some other media animation (Istiono, 2008: 1).

Benefits of learning using Macromedia Flash can be felt by students as well as teachers, because with this learning, students can better understand in learning mathematics, teachers have the opportunity to direct or help students learn, so that the learning atmosphere feels interesting and fun, because it will have a positive effect on the results of teaching mathematics.

E. Conclusion

Based on the result of the research, it can be concluded that there are differences in the ability of understanding mathematical concepts between students learning using Macromedia flash method with students using Problem-Based Learning (PBL) method on triangle and quadrilateral subjects in class VII SMP PGRI 20 East Jakarta. The average score of the ability to comprehend the concepts of mathematics students learning using Macromedia Flash method is higher than the average score of the ability to comprehend the concept of mathematics students who learn to use the PBL method on triangle and quadrilateral subjects in class VII SMP PGRI 20, East Jakarta.

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