Quality Review of Computer Based Interactive Mathematics Learning Media on Geometry Topics in Flat Fields for Elementary Students

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Abstract. This study is a continuation of the 2018 study, namely the assessment of the impact of the application of mathematics learning using computer-based interactive media on flat plane geometry in grade VI elementary school students. The quality of learning seen is the effectiveness of learning from the learning outcomes observed in the learning process in the classroom, namely student activities and learning outcomes in mathematics. The point is the learning outcomes obtained through tests after using Computer-Based Interactive Media. Great expectations are hung on Computer-Based Interactive Learning Flat Topic Geometry Topics to improve the quality of mathematics learning. Then it is predicted that the quality of mathematics learning will be better and more enjoyable in accordance with the characteristics of elementary school students who are still in a concrete operational phase. The purpose of this study is to describe the quality of learning in elementary schools using computer-based interactive learning media and describe teacher responses about interactive media and disseminate innovative learning of mathematics using computer media. This study took the population of the Madya Pekanbaru elementary school in Riau Province and the sample in the study was taken two elementary schools namely Babussalam private elementary school 2 classes (control class and experimental class) and 37 public elementary school Pekanbaru 2 classes (control class and experimental class). The control and experiment classes are homogeneous learning abilities (proven by statistical tests). After being given treatment the experimental class learning outcomes are higher than the control class learning outcomes (as evidenced by the t test or the different test). Means the quality of learning using interactive computer-based learning media is better than learning not using a computer. This teaching material is very effective to improve the quality of learning because it can lead to positive activities for students (fun). Teaching material for interactive learning media based on flat geometry computer is very effective to generate creativity and fun and can help students learn independently and can help teachers in teaching (in accordance with facts obtained from 2 observers). Means that teaching materials of interactive computer-based learning media that have been tested can be used by teachers and students of grade VI specifically in the city of Pekanbaru.

1. Introduction

Education spending in Indonesia has increased significantly from year to year. In fact education spending increased twice from 2000 to 2006. In 2007, education spending was greater than other sectors, reaching US $ 14 billion or more than 16 percent of total government spending. The Law on National Education (No.20 / 2003) and Constitutional Amendment III emphasize that all Indonesians are entitled to education, that the government is obliged to pay for basic education without fees and that the government is mandated to allocate 20% of spending on education. But Indonesia's achievements in education are very low and inversely proportional to the cost of education that has been presented. In 2003, Indonesia ranked 33 out of 45 countries in the Third International Mathematics Science Study (TIMSS). In 2006, the Program for International Student Assessment (PISA) was ranked 50th out of 57 countries in the fields of science, reading and mathematics.

Based on the data above, education in Indonesia still needs help and quality improvement, both nationally and regionally. Referring to the part of Sumatra, Riau is a province with a large population. Based on the 2016 Riau Province Central Statistics Agency survey, the population of Riau was 6,344 million, but not all Riau residents had the maximum education. Based on Law No. 20 of 2003, "Education is a conscious and planned effort to create an atmosphere of learning and learning process so that students actively develop their potential to have spiritual spiritual strength, self-control, and the skills needed by themselves, society, nation and state". How can Riau citizens get comfort in an atmosphere of learning as attached in the Act, if there are still many inhibiting factors of education. The quality of mathematics education especially at the level of primary education is still of concern (Soedjadi, 2004). Mathematics learning in Indonesia, specifically the topic of arithmetic, takes place mechanistically, namely the learning process begins with the teacher explaining the algorithm, accompanied by a few examples then students work on the exercises according to the examples given by the teacher. Students are not given the opportunity by teachers to understand the rationale behind the algorithm taught to them (Fauzan, 2003). Until now, learning as mentioned by Pak Fauzan was still seen in elementary schools when classroom observations were made in several elementary schools in Riau province.

In elementary school, the difficulties faced by students are often seen in mathematical operations on the geometry of the plane, namely the operation / use of times, for, added and lacking. teacher. The facts obtained from the results of observations and discussions with teachers in several elementary schools in the City District of Pekanbaru, found that the ability to teach teachers is lacking, the availability of facilities and infrastructure, student motivation is relatively low and parents' attention is also low, teachers are less creative to make / creating learning media and monotonous learning processes, namely the teacher delivering the material without using media, giving examples of questions and discussing problems (teacher-centered), some teachers already have laptops / computers but are not used to teach mathematics.

From the facts obtained, for the first year the research team has developed a computer-based interactive mathematics learning media on the topic of flat geometry for elementary students (has produced a prototype in the form of a CD and teaching materials) in 2017. For the second research in 2018 a study was conducted to examine :

1. How is the quality of learning with the application of computer-based interactive mathematics learning media to elementary school students in grade VI for the topic of flat geometry.

2. How is the effectiveness of interactive computer-based learning media on geometry of flat fields.

3. How is the teacher's response to the application of computer-based interactive mathematics learning media in elementary school students grade VI for the topic of geometry in the flat field.

This research is expected to provide significance for teachers in terms of products used to utilize computer technology. For students, especially a) students can do mathematics learning independently with the help of computers, b) can make students more active in learning activities. For schools a) it can be used to find out the quality of learning using computer-based interactive media for elementary school students in grade VI and research expects to improve the quality and quality of learning at school.

2. Methodology

A. Research Design

This research is in the form of experimental research which is characterized by observations of symptoms that appear on the dependent variable as a treatment effect. Because the purpose of this study is to comprehensively examine the quality of learning through the application of computer-based interactive mathematics learning media to fourth grade elementary school students on the topic of geometry of flat planes, the design research used is the experimental group, the experimental group and the control group. According to Ruseffendi (2005: 35) experimental or experimental research is research that is really to see the causal relationship. The experimental group is a group of students who obtain learning by Application of Scientifi using Media in the Problem-Based Learning Model. While the control group is a group of students who take regular learning. Subject grouping is done randomly.

The research design used in this study was the pretest-posttest control group design. The research design is in the form of:

A O X O
A O O Ruseffendi (2005: 53).

Keterangan :
O : *Pretest dan Postest* (tes hasil belajar),
X: The treatment of mathematics learning with the Scientific Approach uses media in the Problem Based Learning Model

B. Research Location and Time

This research will be carried out for one year and carried out in 2 elementary schools namely Babussalam Private Elementary Class VI A and VI B; SD Negeri 37 class VI D and VI F.

C. How to Determine the Sample Size

The population of this study was all of the Pekanbaru City Primary Schools. Samples were taken from 2 elementary schools, namely Babussalam Private Elementary School and Pekanbaru 37 Public Elementary School.

D. Data Collection Techniques

To obtain data in this study used instruments, namely the test results of learning outcomes, the format of observation during the learning process, and the scale of students' attitudes towards learning with student response sheets in small groups given.

a) Learning Outcome Test Questions

Learning achievement test questions are used to measure students' mathematical understanding and reasoning abilities. These questions are arranged in two sets of questions, namely questions to measure comprehension skills and questions to measure students' mathematical reasoning abilities. In compiling these questions, the questions are first arranged, followed by compiling the questions, making the answer key and scoring guidelines for each item.

b) Observation Format

The observation format is used to measure student activities during the learning process and is observed by 2 observers.

E. Data Analysis Technique

There are two types of data analyzed, namely quantitative data in the form of tests of students' understanding and mathematical reasoning abilities and qualitative data in the form of observations, student attitude scales.

Quantitative data

Data analysis of test results is intended to determine the magnitude of the increase in student mathematical learning outcomes. So that the primary data of student test results before and after the treatment of mathematics learning with Scientific approaches using Media in Problem Based Learning are analyzed by comparing the pretest and posttest scores. The statistical test used in this study is the average difference test, with the following steps:

1. Calculate the average score of pretest and posttest using the formula

$$\bar{x} = \frac{\sum_{i=1}^{k} x_i}{n}$$, Ruseffendi (1998: 76)

2. Calculate the standard deviation of the pretest and posttest using the formula

$$s = \sqrt{\sum_{i=1}^{k} \frac{(x_i - \bar{x})^2}{n}}$$, Ruseffendi (1998: 123)

3. Test the normality of the pretest and posttest score data, with the Chi Square test

$$\chi^2 = \sum \frac{(f_e - f_o)^2}{f_e}$$ Ruseffendi (1998; 283)

f_0 = frequency of observation
f_e = frequency estimation

4. Test the homogeneity of variance using the formula

$$F_{maks} = \frac{s^2_{besar}}{s^2_{kecil}}$$, Ruseffendi (1998: 295)

5. If the data distribution is normal and homogeneous, test the significance with the following t test statistics:

$$t = \frac{\bar{x}_e - \bar{x}_k}{\sqrt{s^2_{x-y}\left(\frac{1}{n_x} + \frac{1}{n_y}\right)}}$$ with df = $n_x + n_y - 2$, and

varians $s^2_{x-y} = \frac{s_x^2(n_x - 1) + s_y^2(n_y - 1)}{n_x + n_y - 2}$, (Ruseffendi, 1998:315)

If the data obtained is not normally distributed and not homogeneous, then the test uses a non-parametric test instead of the t-test, the Mann-Whitney test or the Wilcoxon test (Ruseffendi, 1998).

3. Result and Discussion

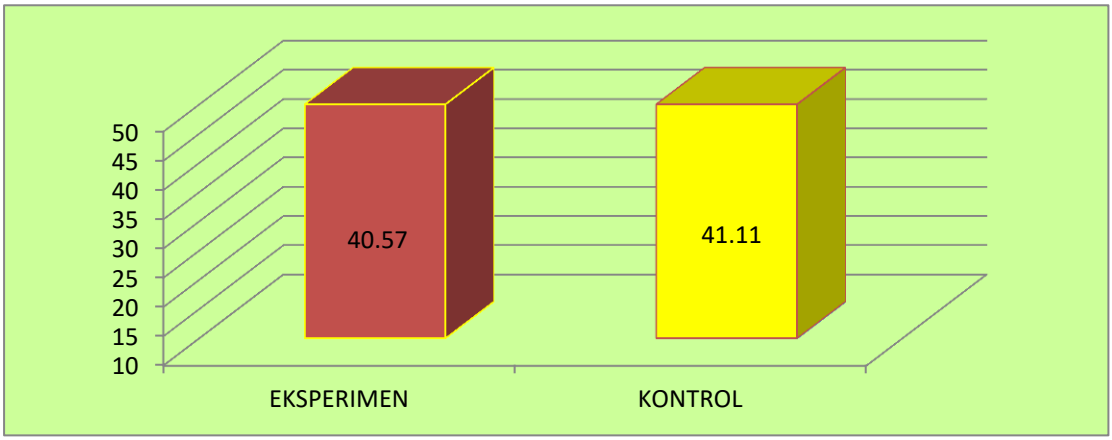
A. Research Results

1. Data on the results of the initial test (pretest) and the final test (posttest) basic mathematics ability in class VI students in Babussalam elementary school and 37 elementary school Pekanbaru

Tabel 1. Mean and Standard Deviation of Pretest Grade Students in Class VI.A and VI.C Babussalam on Geometry Material Flat Field

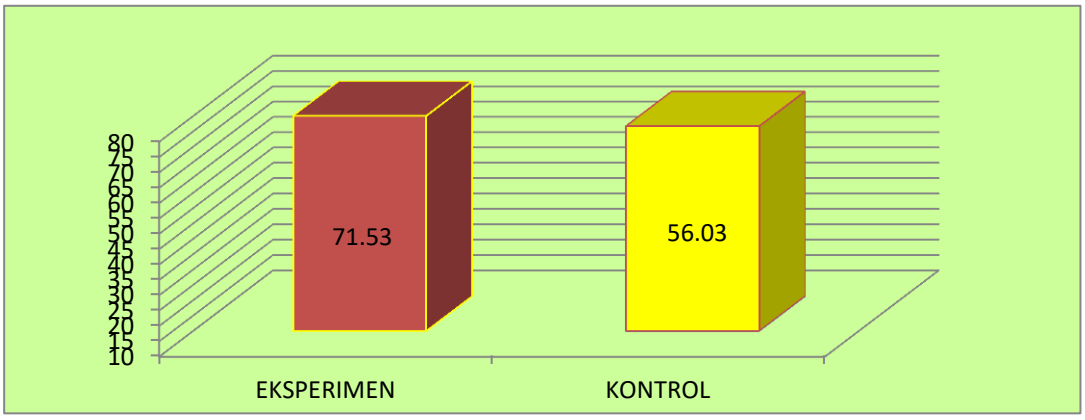
Class	N	Rata-rata	Simpangan Baku	Minimum	Maksimum
Eksperimen	30	40.57	17.15	13.33	80.00
Kontrol	30	41.11	18.69	13.33	87.00

For more details can be shown with a bar chart:



Tabel 2. Average and Standard Deviation of Postes Test for Elementary Students of Class VI.A and VI.C Babussalam on Geometry Material Flat Field

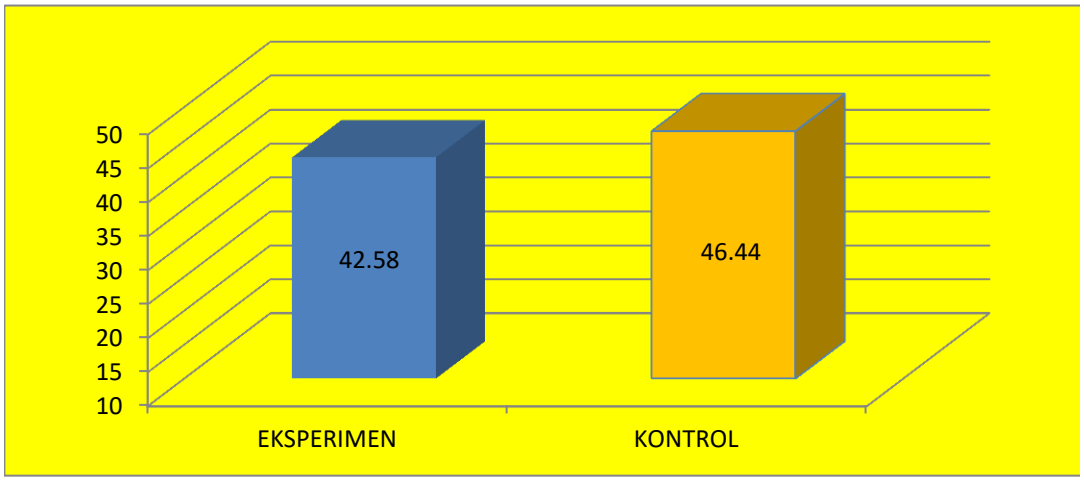
Class	N	Average	Standard deviation	Minimum	Maximum
Experiment	30	71.58	22.33	26.67	100
Control	30	56.03	21.4	13.33	100



Tabel 3. Mean and Standard Deviation of Student Pretest Score in Grade VI.D and VI.F SDN 37 Pekanbaru on Flat Field Geometry Material

Class	N	Average	Standard Deviation	Minimum	Maximum
Experiment	31	42.58	18.48	6.67	86
Control	29	46.44	18.13	13.33	93

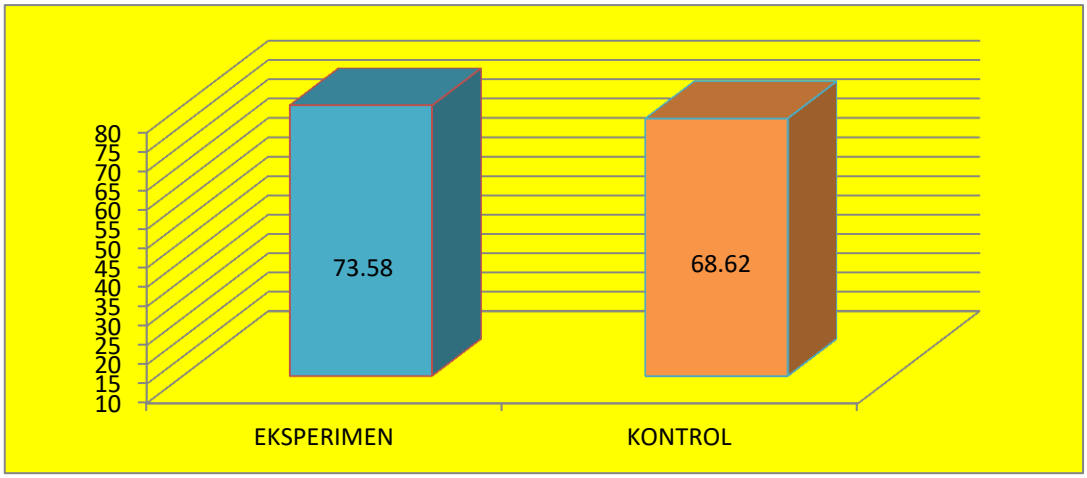
for more details can be shown with a bar chart:



Tabel 3. Average and Standard Deviation of Postes Test for Students in Class VI.D and VI.F SDN 37 Pekanbaru on Flat Field Geometry Material

Class	N	Average	Standard Deviation	Minimum	Maximum
Experiment	31	73.58	13.80	50	100
Control	29	68.62	13.06	50	100

For more details can be shown with a bar chart:



After learning as much as 4 times meeting in the two groups with different treatments, the intention is in the experimental class using computer-based interactive mathematics learning and in the control class of teaching taught by the teacher as he does everyday (as usual the teacher did). both classes at

Babusalam Elementary School and Pekanbaru 37 Second Elementary School were given post-test with the same problem to students to find out the ability / success of students in following a different approach / treatment. Analysis of the posttest data (experimental group and control group) of the two groups for SD Babussalam and SD Negeri 37 Pekanbaru. After the data in the analysis it turns out that the average score obtained by the experimental class is higher than the average score of the control class. This states that the experimental class has a better ability to solve mathematical problems in flat plane geometry after being able to treat mathematics learning by using computer-based interactive media.

In other words there are differences in learning outcomes of students who learn to use computer-based interactive media compared to students who learn not to use computer-based interactive media meaning that computer-based interactive learning media on flat geometry material is effectively used because it can make students creative and can be used by students to learn to be independent.

1. The Effectiveness of Computer-Based Interactive Field Geometry Mathematics Mathematics

Tabel 3. Observer Observation Results Data on Student Activities in Interactive Computer-Based Flat Field Geometry Learning at Babussalam Elementary School Students in Pekanbaru

No	The observed aspect	Meeting				averag e
		I	II	III	IV	
1	Starting activities	65	80	90	100	83,75
2	Student creativity in the learning process	80	90	100	100	92,5
3	Look at the pictures / animations used in learning	90	100	100	100	97,5
4	See the relationship between the concept and the problem being worked on	85	95	90	90	90
5	Discuss with friends	80	60	45	50	58,75
6	Chat outside the material	0	0	0	0	
7	Complete learning on time	80	95	90	90	88,75

Tabel 4. Observer Observation Results Data on Student Activities in learning Computer Based Interactive Flat Field Geometry at SDN 37 Pekanbaru

No	The observed aspect	Meeting				averag e
		I	II	III	IV	
1	Starting activities	65	80	90	100	83,75
2	Student creativity in the learning process	80	90	95	100	91,25
3	Look at the pictures / animations used	90	100	100	100	97,5

	in learning					
4	See the relationship between the concept and the problem being worked on	85	90	95	95	91.25
5	Discuss with friends	80	60	45	50	58,75
6	Chat outside the material	0	0	0	0	
7	Complete learning on time	80	90	95	95	90

Student activities during the learning process using computer-based interactive media have been observed by 2 observers and researchers can immediately see for themselves namely the meeting I students have shown a positive attitude towards learning mathematics using computer-based interactive media proof that students scramble to find a seat and immediately turn on the computer all requesting CDs on media for learning to be rounded and to be copied as soon as possible for each component. After that, an introduction is given about the buttons that students will use to pay close attention. Then they shut up and began to study by themselves according to the commands and menus in the media. In learning I, indeed there are still many who ask in using the program, we can understand elementary students (its characteristics). But at the meeting II, III, and IV the students were already accustomed so that there were those who applauded themselves if the questions they answered were true. In other words the learning process always makes students enthusiastic in participating in learning (students are excited and feel happy). Everything is seen in student behavior and data are shown based on data obtained from 2 observers.

B. Discussion Of Research Results

1. Analysis of Pretest and Posttest Results of Experimentation and Control Classes at SD Babussalam and SDN 37 Pekanbaru

Data obtained at the two schools are SD Babussalam and SD Negeri 37 Pekanbaru, namely pretest and posttest scores. Then analyzed and the results of the analysis of two mean tests in the experimental class and the control class stated that there was no difference in initial ability between the two groups in SD Babusallam and in SD Negeri 37 Pekanbaru. The analysis results between the two groups did not differ. In other words the experimental group and the ability control group were initially the same, so it can be concluded that the two groups in SD were the same.

Based on these data it can be assumed hypothesis testing to see the effect of learning using computer-based interactive media on flat plane geometry can be done. After learning as much as 4 meetings in the two groups with different treatments, the intention was in the experimental class using interactive computer-based mathematics learning and in the control class taught by the teacher as he did everyday (as usual the teacher did).

Furthermore, the two classes at Babusalam Elementary School and Second Class 37 Public Elementary School in Pekanbaru were given the same test with questions on students to determine the ability / success of students in following learning with different approaches / treatments. Analysis of the posttest data (experimental group and control group) of the two groups for SD Babussalam and SD Negeri 37 Pekanbaru.

After the data in the analysis it turns out that the average score obtained by the experimental class is higher than the average score of the control class. This states that the experimental class has a better ability to solve mathematical problems in geometry of the plane after being able to treat mathematics learning by using computer-based interactive media..

2. Practicality of computer-based interactive flat plane geometry teaching materials

From the results of interviews and student response sheets, as well as the results of observations of the implementation of learning that is about mathematics teaching materials in computer-based interactive flat geometry, it can be concluded that the mathematics teaching material in interactive computer-based flat fields is already practical, it can be proven by:

a) The results of observations of the implementation of mathematics learning geometry on computer-based interactive flat areas from the first meeting to the fourth meeting was obtained that the teaching-learning process always increases student enthusiasm in participating in learning (students are excited and happy) can be seen in student behavior and can be shown based on data that is each meeting students can finish learning on time (some people are late). These computer-based teaching materials really help students learn independently.

b) Results of interviews and student response sheets on the use of computer-based interactive mathematics learning media on the topic of flat plane geometry, the average student answers are:

1) Learning to use computer-based media for the topic of flat plane geometry is very interesting and fun so it's easy to understand in learning
2) Learning with computer media makes students more active than learning with the media that teachers have used so far
3) Learning with computer media makes them learn independently
4) Learning with computer media makes students master mathematics learning quickly
5) The design of teaching materials is interesting, so the time used is according to what has been determined by the teacher.

From the results of the interviews and student response sheets it can be concluded that the use of interactive computer-based mathematics teaching materials for the topic of geometry of the flat plane is practically seen in student responses and the results of the interview

a) Analysis of the effectiveness of computer-based mathematics teaching materials

Student activities during the learning process using computer-based interactive media have been observed by 2 observers and researchers can immediately see for themselves namely the meeting I students have shown a positive attitude towards learning mathematics using computer-based interactive media proof that students scramble to find a seat and immediately turn on the computer all requesting CDs on media for learning to be rounded and to be copied as soon as possible for each component. After that, an introduction is given about the buttons that students will use to pay close attention.

Then they shut up and began to study by themselves according to the commands and menus in the media. In learning I, indeed there are still many who ask in using the program, we can understand elementary students (its characteristics). But at the meeting II, III, and IV the students were already accustomed so that there were those who applauded themselves if the questions they answered were true. In other words the learning process always makes students enthusiastic in participating in

learning (students are excited and feel happy). Everything is seen in student behavior and data are shown based on data obtained from 2 observers.

The effectiveness of computer-based mathematics teaching materials can also be proven from the data that has been analyzed, namely the scores obtained from the results of the experimental and control class posttests in both private and public elementary schools. There are differences in the results / scores obtained by students in solving questions (correct answers) between the experimental and control classes it turns out the average grade / score of the experimental class obtained is higher than the control class.

In other words there are differences in learning outcomes of students who learn to use computer-based interactive media compared to students who learn not to use computer-based interactive media meaning that computer-based interactive learning media on flat geometry material is effectively used because it can make students creative and can be used by students to learn to be independent.

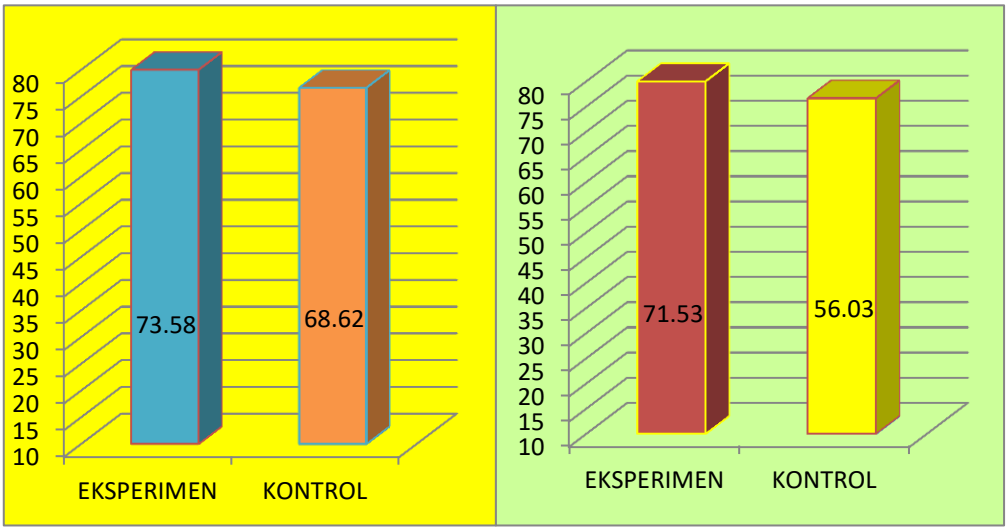
4. Conclusions and Recomendation

A. Conclusion

Effective computer-based learning materials / interactive mathematics learning media are used as proof

1. Can improve student learning outcomes specifically on the geometry of the flat field with evidence that trials were carried out in two schools in the city of Madiyah Pekanbaru namely SD Babussalam and SD Negeri 37 Pekanbaru each taken two classes with different treatments (experimental class using interactive computer-based mathematics learning media and the learning control class conducted by the teacher) turns out the average learning outcomes of the experimental class are higher than the control class, can be seen in the diagram below.

Average post-test scores for the experimental and control classes of elementary school students in grade VI Babussalam and SDN 37 Pekanbaru



SD Babussalam Pekanbaru

SD Babussalam Pekanbaru

Based on the analysis of interview data and student responses it can be concluded that teaching materials are effective in eliciting student learning activities

2. From the teacher's response mathematics teaching materials using media can help learning in the classroom.

B. Recommendation

1. Computer-based interactive mathematics teaching materials on the topic of flat geometry can be used to help teachers in learning mathematics in elementary school.

2. Interactive computer-based mathematics teaching material on the topic of flat geometry can be used to help students study independently at school or at home.

3. Interactive computer-based mathematics teaching materials on the topic of flat plane geometry can be used as an example to develop teaching materials for other mathematical topics.

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