THE EFFECTIVENESS OF TEACHING MULTIMEDIA ON TOPIC OF THREE DIMENSIONS IN TERMS OF THE MATHEMATICS LEARNING ACHIEVEMENT AND INTEREST OF STATE SENIOR HIGH SCHOOL

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Abstract

This research aims to: (1) describe the effectiveness of the use of multimedia in terms of the mathematics learning achievement and interest and (2) investigate the difference of the effectiveness of mathematics learning achievement and interest on the teaching using multimedia and that not using multimedia. The research population was six classes of the tenth grade students of Senior High School 1 Aimas. Classes XA and XF were established as the research sample randomly. Class A received the lesson with multimedia and class XF received lesson without multimedia. The research instruments were a mathematics achievement test and a questionnaire for the students' interest in learning mathematics.The result of research shows that: 1) teaching mathematics using multimedia is effective in terms of mathematics learning achievement and interest; 2) there is a difference in mathematics learning achievement and interest in learning mathematics of the students taught using multimedia and those taught without using multimedia; 3) teaching with multimedia is more effective than that without multimedia in terms of students' mathematics learning achievement and interest.

Keywords: *Multimedia Learning, Three Dimensions, Achievement, Interest.*

Introduction

Mathematics is one of compulsory lesson in Senior High School. The students are obliged to learn mathematics from X-class until XII-class, although in future they will choose major of social science or language. Thus, the students have to learn it. However, there are any observations revealed that students still difficult to learn mathematics, it can be seen from their learning achievement result which in general their mathematics score are not exceeding other lesson scores such as Bahasa, English, Economy, Biology and so on.

The student's obstacles when studying mathematic is important to be revealed, thus recovery can be held in order to improve student's learning achievement related to mathematic lesson. In addition, the research about it necessary to be reviewed from various

aspects to indicate it. Hence, a difficulty that experienced that may be just come from learning / conventional, which is monotonous means teacher do not create an atmosphere of learning which active, innovative, creative, effective and pleasing or it can also because the subject matter that is fairly abstract for some students.

Although fairly abstract, and a mastery of mathematical concepts to be ruled by such a student who listed for the purpose of learning a standard in, because it is important for students to understand math and things pertaining to it themselves. Because of that required a high and patience teacher in learning so students can master the concept.

Pertaining to the purpose of learning and to expand it, the mathematics geometry is one component that matters which requires to be studied in mathematics. Material spatial dimensions three is part of geometry and measurements. One of the reasons the importance of study geometric is to develop skill space on our daily lives. This is in accordance with the opinions Kennedy, Tipps, Johnson (1993, p.98) that geometry provide a close relation to the world. The aspect of practical and esthetical on geometry found in art and architecture, design the exploration of space, planning a house, and garments and the car. The topic is interesting students and can be used to develop student's knowledge and skill, geometry understanding the space of students and the ability of completion of problem solving students.

Useful aspect think geometry is building and manipulated the mind through object infinite-dimensional two and three, and perceive objects of different points of view (NCTM, 2000, p.41). Basic subjects of geometry learned in Senior High School level and related to object infinite-dimensional two and three spatial dimensions is three.

Based on observation in SMAN 1 Aimas (Senior High School 1 Regency Aimas), material spatial dimensions three hard enough studied for most students, because it is an abstract while the ability of the teacher own in conveying the subject matter with visualization are lacking. A picture produced the teacher was exciting and possible only occur inaccurate delineation of it is drawn on the board. In addition, teachers are less have in making teaching media knowledge for students. As manifested by Amin & Wan (without years, p.1) that the teacher is still lacking the skillful use of ICT in their experiences. Teachers usually only teaching in an conventional method so that add to the difficulty of students in learn mathematics.

Although in Piaget theory that students age 15 -18 years (equal to Senior High School) has been in stage operation formal, but no harm to clarify concepts taught teacher using media to the concept of an abstracting nature that may be understood and pre-sighted students. It means that learning school math also deals between the nature of mathematics

that abstract and the intellectual development of students. So there are things / subject matter in mathematics that not every student can understand in the abstract, but requires media / aids to understand it.

As happened in the learning landscape with matter dimensions three in most schools still has not yet reached the purpose of learning mathematics. Most high school students still have difficulties in learning the dimensions of the three. The fact that is powered by the data from the National Examination academic year 2009/2010 on any material dimensions three. On this material only be tested competence with an indicator absorptiveness: "Calculate the distance point to a line in the plane geometric" with absorptiveness students SMAN 1 Aimas at 0 %. This result indicates the need to be researched factors what is the cause low-self the attainment of competence on any material dimensions three in SMAN 1 Aimas district mizzen. Low-self the attainment of competence students to the matter is also very influential to low-self student's achievement, and could be interest students against that matter is low.

Based on the fact that can be found in one of the students at SMAN 1 Aimas, the poll, by pre-survey was to attract the students to learn that lesson in the mathematical dimension three especially still low. Students tend to pay less than the lesson to the teacher to student competency completeness effect in three dimensions, the only lesson 0% percent of the total 65 of Minimal Completeness Criteria that which is prescribed.

Completeness whose competence very low caused by interest learn that is low. It is proven by the results of a survey on the kids SMAN 1 Aimas that has been or never joined the activity of learning with matter dimensions three. The survey interest learn from this material through poll said that interest the students to a criterion low on this lesson.

Students who have interest on certain objects tends to impart a higher profile against that object. Matter mathematics, learning mathematics, math teacher, book mathematics, duty mathematics, about/duty mathematics, and test. mathematics is the object of interest on mathematics. Thus, students who have interest on mathematics are likely to pay more attention towards an object related to math.

The low interest learning about mathematics result in low students achievement. A fact reveal that high school student at a value of the final exam national on mathematics under some another lesson as Bahasa and English. This shows that student's achievement on mathematics is low.

As anticipation step, since early needs to be done an attempt in such until students interested in three subjects, spatial dimensions to be implied to optimality the results of study.

This will create when the student did not undergo an obstacle or difficulty in learning. A learning disability experienced students can only because of learning that does not attract students.

In a learning process in the classroom he paid his dues to find an alternative to deal with the achievement of the students. Learning that both are learning it enables the student to be active innovative, creative, effective and fun. The alternative is a lesson to be taken to make active creative, effective and fun is to develop the appropriate and dissect in order to improve the learning students.

One strategy to learning attractive and exciting and in order for the purpose of learning mathematics high school achieved then to be able to achieve this is to use multimedia in the process of learning.

Learning to use multimedia is learning by using computer aids, as for presentation, as props and so forth. By using computer in learning, then the advantage gained is a computer can accommodate students sluggish accept the study, because it can give effectiveness in their experiences in a more individuals, never forget and never bored, very patient in running instruction as desired program used, computer can also stimulates students to do exercises, performs activities laboratory or simulation because availability animation charts, color and music that can add realism, besides control being at hand students learn that speed students can be adjusted to level master, computer also have the ability recording the activity of students individually and were attributed to other apparatus like video tape, flash disk, and others (Euis Ismayati, 2011, p.15).

Learning with multimedia has developed lately and has proved benefits to help teachers in teaching and help learners in ease understand the concepts and subject matter. As the result showed that learning after using multimedia interactive increase test scores of 42 % and there was a very significant before and after the use of learning multimedia of the standard trust 95 % (Dwi Sudarmanto, Yetty Widya KS. & Yuni Ekawati, 2006: 54).Excellence multimedia with aids computer, learning make more meaningful, because it capable of presenting a kind of classroom interactive. Under observation the utilization of multimedia in learning is expected to add level mastery mathematics, in other words learning use multimedia significantly affect increase study result of the students.

If seen from its function learning by using multimedia it has a dual function in learning, namely (1) a function media pure, namely as media learning interesting and fun and (2) train students to know technology, and so students not being human "stuttering"

technology. Multimedia interactive medium that is very good at heightens the learning process (Zaidel & Xiaohui, 2010: 11-16).

Multimedia in learning mathematics used to simplify resources abstraction performed by a student. Text, images and animation used to help students in understanding matter, to arouse interest learning and are expected to improve performance learning students. The multimedia used is macromedia flash 8 who makes learning being attractive because there are features interesting to be attentive students. Use multimedia with macromedia flash 8 need aids namely computer. From data pre-survey of availability in focus not optimized, teacher more dominant do learning conventional. If linked with existing problems, that this is very possible for teachers to do learning by using multimedia in which computers as tools so hopefully its use can optimized.

Based on description above, the and there are a few issues that need to be considered, such achievement is low interest in learning, the absorption capacity of the three dimensions, as one branch of geometry, and lack of multimedia utilization not as a result of the media in teaching learning and interest achieved, students study algebra to question the effectiveness of learning to use multimedia viewed from three dimensions of learning and interest achieved students at SMAN I Aimas, Sorong Regency.

Research method

It is quasi experimental research with *pre-test –post-test non equivalent group* design. This research is conducted in SMAN 1 Aimas, Sorong Regency at academic year 2012/2013 from April until May 2013. The population is students of class X, SMAN 1 Aimas at academic year 2012/2013. It is consists of 6 classes. Sample is selected in random way; it two classes from 6 existing classes, and obtained class XA and XF. And then XA selected as class/group which learning with multimedia and class XF selected as class/group which learning without multimedia.

Instrument used is test and non-test instrument. Test instrument of learning achievement is question with optional choice and essay which given at early treatment (pre-test) and end-treatment (post-test). The obtained score is converted into score range between 0 – 100. It will be grouped into criteria based on Minimal Completeness Criteria (KKM) set up by school. The KKM score of mathematic lesson is 65. This score used to decide student's percentage who achieves completeness criteria.

Non-test instrument is questionnaire about student's learning interest towards mathematics by Likert scale. It is used to measure student's interest towards mathematic. After be calculated and converted, the obtained interest score as follows:

Table 1.

Score Criteria of Student's Learning Interest Towards Mathematics

Interval	Criteria
$80 < X \leq 100$	Very high
$73,33 < X \leq 80$	High
$53,34 < X \leq 73,33$	Medium
$40 < X \leq 53,34$	Low
$20 \leq X \leq 40$	Very low

Before given treatment, all students in class XA and XF are asked to fill out questionnaire about student's learning achievement towards mathematics and solve pre-test question. After given treatment, all students in both classes are asked to fill out questionnaire about student's learning achievement towards mathematics and solve post-test quiz.

Research Result and Discussion

To give description about initial and final condition of student's learning achievement towards mathematics, this following picture provides test result of student's learning achievement towards mathematics (*pre-test* and *post-test*).
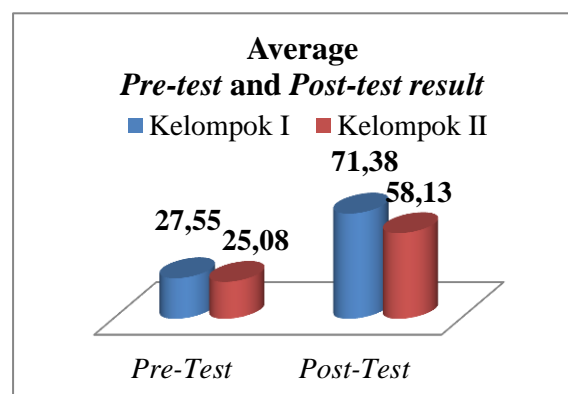
Picture 1.
Diagram of *Pre-Test* and *Post-Test score average*

Based on analysis result and the picture 1, it is revealed that result average of student's learning achievement towards mathematics on group with multimedia after given treatment is

met defined standard of minimal completeness criteria (KKM) which is 65. While on group without multimedia after given treatment is remain not yet met defined standard of KKM. Based on students who met KKM standard, most of students on class XA who met defined standard of KKM is 86.21%, while students on class XF who met defined standard of KKM is only 12.5%. Therefore, can be concluded that there is improvement due to student's learning achievement towards mathematics on both classes/groups. The result also indicated that average of student's learning achievement towards mathematics on class with multimedia is much better than class without multimedia.
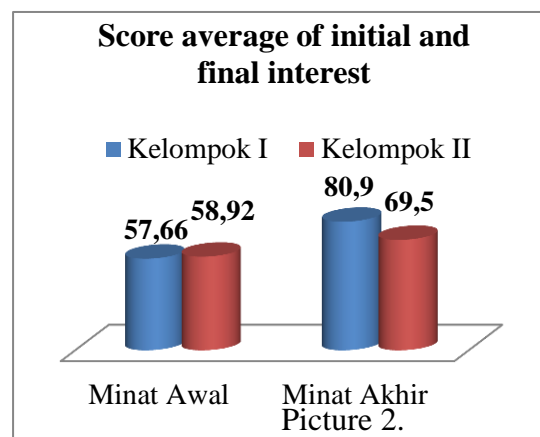

Diagram of interest score average

Based on analysis result and picture above, it is revealed that average score of student's final interest after given treatment on first group and second group is highly different. On first group, the average score is 80.90; it belonging to very high criteria, while on second group, the average score is 69.50; it belonging to medium criteria. It is indicates that there is quite significant alteration from initial interest to final interest on group I ; group which using multimedia in their learning process, while on group II; group which conduct learning process without multimedia, there is alteration from initial interest to final interest, but it is not too different as happened on group I.

Table 2.
Distribution of student's learning interest

Group	Exp.	Pre %	Post %
Group with Multimedia	ST	0	48,28
	T	0	41,38
	S	27,58	10,34
	R	72,41	0
	SR	0	0
Group without Multimedia	ST	0	8,33
	T	0	20,83
	S	91,67	70,83
	R	8,33	0
	SR	0	0

Based on table 2, compared with group which use multimedia, students on group without multimedia have no percentage as well as on group with multimedia. It because on group with multimedia, interest criteria percentage belonging to very high criteria; it reaches 89.66%, while interest criteria on group without multimedia is only 29.16%. It means that students on group with multimedia have more interest towards mathematics compared than students on group without multimedia during learning process.

And then the research data is analyzed in order to find out effectiveness of each learning group. It is conducted by one sample t test with SPSS 16 for windows. Hypothesis examined using one sample t test can be conducted if normality assumption is met. Based on normality test result using *Kolmogorov Smirnov* test, all of significance value is greater than 0,05. It means that all of data is distributed normally. Thus, one sample t test can be conducted. And the result of one sample t test as follows

Table 3
Test Result of Learning Effectiveness With Multimedia and Without Multimedia

Group	Variable	t_{count}	t_{table}
With Multimedia	Achievement	4,32	
	interest	6,16	2,31
Without Multimedia	Achievement	-5,00	
	Interest	-2,28	

From summary of analysis result using *SPSS 16 for windows* on table 3 above, it indicates that learning with multimedia have t_{count} value is greater than t_{table}, so can be concluded that learning with multimedia is effective if viewed by student's learning achievement and interest. While on learning without multimedia, the t_{count} value is smaller than t_{table}. So, it can be concluded that learning with multimedia is not effective if viewed by student's learning achievement and interest.

To compare learning effectiveness with multimedia and without multimedia, it is used univariat test (*independent samples t test*). Before execute univariat test, prior to conduct average difference test towards score data before given treatment using MANOVA test of $T^2 Hotelling$ criteria. If the result conclude that both classes is different, score data analyzed to compare learning effectiveness is score data after given treatment. And then, multivariate test $T^2 Hotelling$ can be conducted if assumption test is met. Assumption test must be met is homogeny and normality test.

Homogenity test is conducted towards score data obtained before and after given treatment using Box's M test. From that test, it is obtained significance value is greater than 0,05. So, it can be concluded that variants-covariant matrix of both populations is homogeny.

When assumption test of score data before and after treatment is met, it is followed by multivariate hypothesis test. This following table provides hypothesis test result using $T^2 Hotelling$.

Table 4.

Hypothesis test result using $T^2Hotelling$

Condition	Value	F_{count}	Sig.
Initial	0,106	2,660	0,080
Final	1,137	28,430	0,000

Based on test result using SPSS 16 for windows software on table 4 above, significance values is greater than 0,05. It can be concluded that student's learning achievement and interest towards mathematic of class XA before given treatment is not different with student's learning achievement and interest towards mathematic of class XF. For *Hotelling Trace (T^2)* test towards score data after given treatment is obtained significance value smaller than 0.05. So, it can be concluded that there is difference of learning effectiveness with multimedia and without multimedia.

To find out which learning is more effective, it is conducted univariat test (*independent sample t-test*). Beforehand, it is conducted homogeneity and normality test. Homogeneity test is conducted towards score data obtained after given treatment using levene test. It is obtained result as follows:

Table 5
Homogeneity test result using *Levene'sTest*

	Variable	*Levene'sTest* (Sig.)
After given treatment	Achievement	0,637
	Interest	0,592

Homogeneity test result toward final score data on student's learning achievement and interest using *levene* test is obtained significance value greater than 0,05. Based on these results, then can be concluded that variant both population is similar, while results test normality use *kolmogorov smirnov*, it is obtained that significance value is greater than 0.05. Therefore, data can be distributed normally. It because data score homogeny distributed normally, then test hypotheses use independent t test samples can be done with the result as follows:

Table 6.

The results hypothesis test using independent t test samples

Variable	t_{count}	df	Sig.
Learning achievement	6,464	51	0,000
Learning interest	5,591	51	0,000

The results of comparison learning test with effectiveness of the value of significance smaller than 0.025, so that it can be concluded that multimedia learning is more effective than learning without the use of multimedia review of achievement learning about mathematics and interest learn students.

Conclusion and suggestion
Conclusion

Based on the result analysis of data and the then inferred some things as follows: (1) learning use multimedia effective review of achievement learning about mathematics student's learning, and interest (2) learning without the use of multimedia ineffective review of achievement learning about mathematics students learning, and interest (3) there are differences effectiveness of learning that use multimedia and learning without the use of multimedia review of achievement learning about mathematics students learning, and interest and (4) learning that use multimedia more effective than learning without the use of multimedia review of achievement learning about mathematics and interest learn students.

Suggestion

Based on the result of the study, and findings suggestion that can be conveyed is as follows: (1) advised to the math teacher to apply learning to use multimedia by increasing the interest of students to learn mathematics which implied to increase students achievement, (2) on learning that use multimedia nor did the teacher must be able to facilitate the needs of a student to be able to understand the material, (3) the teacher began to make multimedia to the matter another so that the learning more interesting to trace expected implied to understanding the student will be learned, matter and, (4) the need for training the manufacture of the media learns in the form of multimedia to teachers Senior High School.

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