Videoscribe with Mastery Learning to Improve Critical Thinking Skills and Learning Interest of Vocational High School Students in Geometry

Agfie Nurani Hanifah, R Poppy Yaniawati, Panca Pertiwi Hidayati, Nenden Mutiara Sari

Master of Mathematic Education, Pasundan University.

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ABSTRACT

Mathematical critical thinking ability is a process of thinking by recognizing and analyzing something to formulate an answer or find a solution. The importance of mathematical critical thinking is to help students to be able to identify, analyze and solve the problem/question creatively and logically so as to produce the right decision. The research method used is convergent. The sample in this study were students of class XI Multimedia at SMK Mahaputra, Bandung Regency. The critical thinking ability test instrument given was 6 questions accompanied by a learning interest questionnaire, observation sheets and interviews with each student. Then the results obtained were analyzed descriptively and inferentially. The results show that students who receive learning using videoscribe products through mastery learning show better results than students who receive conventional learning. This study shows that learning using videoscribe products through a mastery learning approach is more effective in improving mathematical critical thinking skills of class XI Multimedia students at SMK Mahaputra, Bandung Regency compared to conventional methods, because this approach facilitates students in analyzing and solving problems logically and creatively. These findings reinforce the importance of using interactive media and learning strategies that are oriented towards mastery of the material, so that they can be considered in developing more adaptive and technology-based mathematics learning methods.

Keywords*:* Critical thinking skills, Learning Interest, Mastery learning, Videoscribe.

INTRODUCTION

One of the goals of learning mathematics is that students are able to apply it in everyday life. This is because in everyday life, careful calculations are needed in making decisions. In facing a life full of competition and challenges today, human resources are needed who have high abilities in solving various problems faced. A person who has high ability in solving various problems must be able to think logically, rationally, critically and creatively. Abdullah (2013) stated that the ability to think logically, rationally, critically and creatively is included in the high-level thinking ability that cannot happen by itself, but is obtained through the education process, especially mathematics education in schools.

Likewise, the main purpose of schooling was conveyed by Slavin (2011) who stated that one of the main purposes of schooling is to form students' critical mathematical thinking skills and one of the subjects that is considered to be able to teach critical thinking skills is mathematics. This is in accordance with the Indonesian Minister of National Education Regulation No. 23 (2006) which states that mathematics subjects need to be given to all students at every level of education including vocational schools as a basis for equipping students with logical, analytical, systematic, critical, creative and collaborative thinking skills.

Based on this, one of the abilities that students need to have is critical thinking skills. Poedjiadi (Karim, 2010: 4-5) stated that critical thinking is a provision for students to face world-class competition. Anderson (Dodi, 2010: 3) also stated that if critical thinking is developed, a person tends to seek the truth, think divergently (open and tolerant of new ideas), can analyze well, think systematically, be curious, mature when thinking, and can think critically independently. This means that in critical thinking students are trained to analyze and think systematically, thus in critical thinking students are also trained to have a deep curiosity so that students will continue to investigate the problem until they find the solution to the problem needed.

However, in reality the critical thinking ability of Indonesian students is still not optimal, as proven by a preliminary study that the author has conducted in one of the vocational schools in Bandung Regency, namely Mahaputra Vocational School, the results showed that students' mathematical critical thinking ability is still low in almost all indicators (Hanifah, 2018: 29-36). The following are the results of the study:

Table 1. Preliminary Study of Mathematical Critical Thinking

Indicator	Category	1	2	3	4	5
Formulating the problem	Good	0	0	0	100%	0
Giving arguments	Low	50%	5%	45%	0	0
Perform deduction and induction	Very low	100%	0	0	0	0
Conduct an evaluation	Very low	100%	0	0	0	0
Make decisions	Good	20%	5%	0	70%	5%

Based on the data above, it was found that students' abilities in providing arguments, making deductions and inductions, and making evaluations were in the low category. Vocational high school students with high, medium, and low abilities showed an average level of mathematical critical thinking ability that was still relatively low. This is in line with the results of research conducted by Sahin (2016), that the level of disposition of students' mathematical critical thinking ability is still relatively low.

Gani (2015) stated that the low mathematical critical thinking ability of students is partly caused by the low interest of students in learning mathematics. Most students give up and choose to see the results of their friends' work when facing difficult problems, as a result, students find it difficult to solve a problem and students' knowledge and academic achievement will not increase. Interest in learning is one of the factors that can affect students' academic achievement and is important to consider in students' academic success or failure. Therefore, students' interest in learning also needs to be developed.

Based on the problems above, efforts to facilitate students so that critical thinking skills and student learning interests develop and student learning is carried out optimally, namely by learning that starts from learning that is in accordance with student expertise competencies so that students are active and free to think and question what they receive from their teachers. This was stated by Ibrahim (2007) that to lead to learning that can develop critical thinking skills must start from learning that makes students active. To overcome this problem, schools and teachers must take the necessary steps to improve student skills and improve weaknesses in using ICT (Halili, 2018), Teachers need to choose models and learning applications that are appropriate to improve critical thinking skills and learning interest habits of vocational high school students according to their expertise competencies, namely multimedia. One of the learning models and applications that can be used is the mastery learning model with products that can maximize student skills in their fields, namely videoscribe. This was stated by Sobri (2017), who argued that skills that are in accordance with student expertise need to be developed and fostered through integrated school processes and classroom activities.

Due to the importance of the two abilities above for students to have, in this case the author is interested in analyzing the two abilities, which is expected if there is an increase in students' interest in learning, there will also be an increase in students' ability to think critically mathematically. Furthermore, because of this, the researcher conducted a study entitled "Mastery learning model with videoscribe to improve critical thinking skills and learning interests of vocational high school students in Geometry".

METHODS

Types of research

The method that will be used in this study is a quasi-experimental method, which is a combination of quantitative and qualitative research. The mixed method used is the convergent parallel design. Quantitative method research

is used to obtain data related to critical mathematical thinking skills after receiving learning with a mastery learning model, while qualitative research is used to obtain data related to students' learning interests who receive learning with a mastery learning model.

Sample and Population

The research sample consisted of 54 students, selected from one vocational high school based on KAM (superior, moderate and asor). Purposive sampling technique was used to select the sample. This technique allowed the researcher to select two intact groups from multimedia classes in Bandung district with the same number of males (24 students) and females (30 students) involved in this study. The first group (multimedia 1 with 11 male students and 16 female students) was selected as the experimental group, while the second group (multimedia 2 with 13 male students and 14 female students) became the control group.

RESULT

The improvement of critical mathematical thinking skills of students who received mastery learning model learning and produced better videoscribe products than students who received conventional learning based on KAM as a whole. From this hypothesis, the following statistical hypothesis can be formulated:

$H0 : \mu\varepsilon = \mu k$ $H1 : \mu\varepsilon > \mu k$

The hypothesis can be explained as follows:

$H0$: The increase in critical thinking skills of students who receive the mastery learning model and produce videoscribe products is the same as students who receive conventional learning based on KAM as a whole.

$H1$: The increase in critical thinking skills of students who received the mastery learning model and produced better videoscribe products than students who received conventional learning based on KAM as a whole. The results of the two-way ANOVA test using SPSS obtained the following results:

Table 2. Data on Improvement of Mathematical Critical Thinking Skills of Between-Subjects Effects

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	,823a	5	,165	98,009	,000
Intercept	9,418	1	9,418	5607.350	,000
CLASS	,173	1	,173	102,843	,000
THURSDAY	,637	2	,319	189,705	,000
CLASS * THU	,013	2	,007	3,895	,027
Error	,081	48	,002		
Total	10,322	54			
Corrected Total	,904	53			

Based on the table above, the results of the two-way ANOVA trial, the test statistics obtained were $Fhitung$ = 102.843 and (0.05) = 2.56 with df = 54 Because

$Fhitung > Ftabel$ then $H0$ is rejected. This means that at a 95% confidence level, the increase in critical mathematical thinking skills of students who receive mastery learning model learning and produce videoscribe products is better than students who receive conventional learning based on KAM as a whole.

The interaction between learning and initial mathematical abilities (KAM) towards increasing critical

mathematical thinking skills is seen from the results of the two-way ANOVA trial, the test statistics obtained are $Fhitung$ = 102.843 and $_{(0.05)}$= 2.56 with df = 54 Because $Fhitung > Ftabel$ then $H0$ is rejected. More details can be seen in the following image and table:

Figure 1. Interaction between Learning and KAM on Improving Thinking Skills Mathematical Criticality

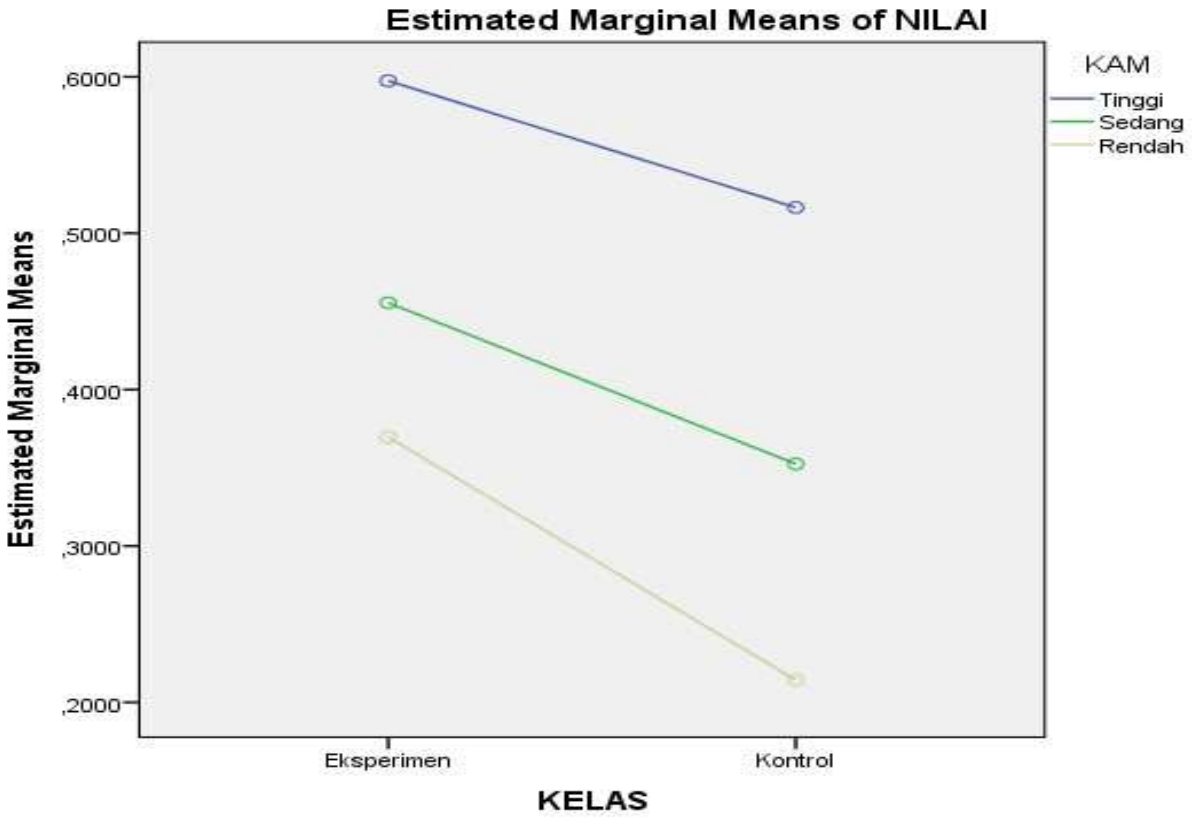


Table 3. Relationship between Independent Variables, Dependent Variables and Control Variables

Type		**Mathematical Critical Thinking Skills**										
THURSDAY		**Experimental Group**						**Control Group**				
	N	**Pretest**	**N**	**Posts**	**N**	**Gains**	**N**	**Pretest**	**N**	**Posts**	**N**	**Gains**
Height (T)	9	58	9	86	9	0.597	9	52	9	77	9	0.561
Medium (S)	9	36	9	50	9	0.455	9	30	9	45	9	0.352
Low (R)	9	22	9	36	9	0.369	9	22	9	32	9	0.214
Average	-	31.96	-	63.78	-	0.474	-	35.85	-	59.07	-	0.361
Std. Deviation	-	86.66	-	9.43	-	0.102	-	8.03	-	9.49	-	0.132

Interpretation of two way anova in SPSS shows the plot diagram above to assess whether there is interaction between variables. The diagram above shows that there is a misalignment of the lines, so there is an interaction between the learning model and the level of students' initial mathematical ability towards improving critical thinking skills. Thus, simultaneously the learning model and KAM factors have a significant influence on improving students' critical mathematical thinking skills.

After the learning interest data is transformed into interval data, then calculate the average, standard deviation, minimum data, and maximum data for both the experimental and control classes, as shown in the following table:

Table 4. Learning Interest Scale Based on Class and KAM

Category THURSDAY	Data Description	Interest in Learning		
		Experiment	Control	Amount
Tall	N	12	11	24
	Maximum	72,170	65,602	137,772
	Minimum	53,671	60,239	113.91
	Mean	66,204	59,636	125.84
	SD	9,397	10,185	19,582
Currently	N	9	7	18
	Maximum	63,202	66,977	130,179
	Minimum	51,271	55,074	106,345
	Mean	57,263	61,012	118,275
	SD	9,930	7,525	17,455
Low	N	6	9	12
	Maximum	57,520	55,118	112,638
	Minimum	45,590	43,188	88,778
	Mean	51,555	49,152	100,707
	SD	8,580	7,375	15,955
Total	N	27	27	54
	Maximum	59,587	62,234	121,821
	Minimum	52,698	55,346	108,044
	Mean	58,790	56,143	114,933
	SD	1,713	1,713	3,426

From the table data above, it shows that the group of students who obtained the highest average learning interest score of 6.204 is the group of students from the High KAM category who received the mastery learning model. While the group of students who obtained the lowest average learning interest score (49.152) are students from the low KAM category who received conventional learning. Overall, the average learning interest score of students in the experimental group (58.790) is greater than the average learning interest score of students in the control class (56.143)

The standard deviation for the experimental class (1.713) is the same as the standard deviation of the control class (1.713). Thus, the distribution of data for the experimental and control classes has the same level of homogeneity. The standard deviation based on KAM has decreasing results, starting from High KAM which has a standard deviation of 19.582 then Medium KAM has a standard deviation of 17.455 and Low KAM with a standard deviation of 15.955. The lower the more spread, it can be concluded that KAM does not affect the distribution of data in interest in learning mathematics.

The data from the conversion of categorization of the scores of mathematical critical thinking ability and learning interest are presented in a correlation table to test whether the two variables are correlated or not. The category grouping is summarized in the following table.

Table 5. Correlation Test between Mathematical Critical Thinking Ability and Learning Interest

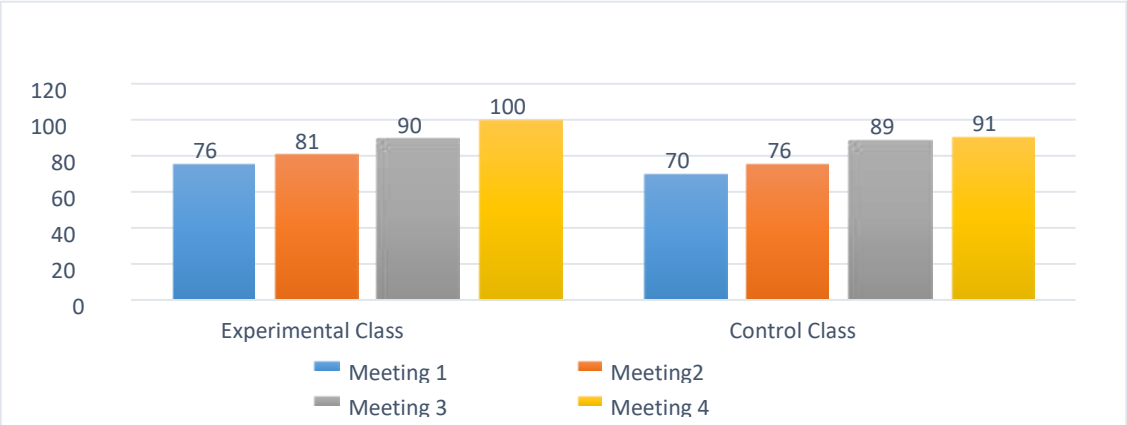
		Critical Thinking	Learning Interests
Critical Thinking	Pearson Correlation 181 81	1	,478**
	Sig. (2-tailed)		,000
	Sum of Squares and Cross-products	1,419	53,170
	Covariance	,018	,665
	N	81	8
Learning Interests	Pearson Correlation 181 81	,478**	1
	Sig. (2-tailed)	,000	
	Sum of Squares and Cross-products	53,170	8707,147
	Covariance	,665	108,839
	N	81	81

In the table above, the correlation coefficient is 0.478 which is greater than the t table, so Ha is accepted and is included in the category of a strong relationship in the degree of closeness of the relationship in the correlation. Judging from its significance, it also has a result of 0.000 <0.05, so Ha is accepted, meaning that there is a significant relationship between critical thinking skills and students' learning interests.

Based on the results of observations of teachers and students, it can be concluded that there is an increase in teacher and student activity during the mathematics learning process with the mastery learning and conventional models as seen in the following image:

The increase in teacher and student activities can be seen in the following image:

Figure 2. Recapitulation of Percentage Results of Experimental and Control Class Observations



DISCUSSION

According to Mariotti (2009) initial ability refers to the information to be learned that students already know from all previous learning outcomes and individual experiences. According to Dick, Johnson, and Carey (2015) initial ability is a set of skills that students must have before they follow a new learning process. That is why initial ability needs to be known first before learning begins.

Based on table 3 above, from the three hypotheses it can be concluded that in high, medium and low initial mathematical abilities, the increase in critical mathematical thinking skills of students who use mastery learning models and produce videoscribe products is better than students who receive conventional learning. This is in line with Mulyono (2008) who stated that learning success will produce higher scores after controlling students' initial abilities.

Furthermore, the learning interest of those who receive mastery learning with videoscribe has a higher scale of learning interest compared to students who use conventional learning. This is in line with Mulyono (2018) who stated that students who learn mathematics using learning models and applications can produce higher returns on the value of mathematics learning outcomes of students who learn using models and facilitators for students.

Figure 2 above shows that the activities of teachers and students in the control and experimental classes have been running and implemented very well and meet the ideal quality. There was an increase in the initial meeting and subsequent meetings until the final meeting was relatively the same. This shows that there are changes made by students receiving the learning provided by the teacher. When viewed from the overall description of the observation data on the activities of teachers and students, the percentage obtained is included in the good category. Thus, the implementation of learning with the mastery learning and conventional models is in accordance with the learning plan that has been prepared. This is in line with Slavin (1987) who stated that the extraordinary positive effect of mastery learning on student achievement, and hypothesized that mastery learning-based learning will be able to produce "2-sigma" (2 standard deviations), namely increased achievement and interest in learning.

Based on the results of the general interview, learning with the mastery learning model and the videoscribe application is quite interesting, it looks ordinary when read at a glance but it turns out that when understood little by little the questions are not questions that are usually found. While conventional learning methods mostly consider it interesting, because they study geometric shapes that are commonly found in everyday life, geometric shapes that exist in everyday life. They are interested in being able to calculate directly how much area, circumference, volume and other things about the geometric shapes are in the application. For the level of difficulty experienced by the experimental class and the control class, each has almost the same difficulty, namely they answer almost all questions as difficult. To do it, it also takes a long time to really understand the meaning of the questions. The thing that makes it difficult is that many of the new questions are not like usual, connecting one geometric formula with another geometric formula, determining the distance from a point to a plane, determining the distance from a line to a plane, but for the learning process they really enjoy the learning process in the videoscribe application and can produce their own learning products in the form of videoscribe. This is in line with Pamungkas (2018) who concluded that the videoscribe product developed was included in the good and feasible category according to expert assessments.

CONCLUSION AND RECOMMENDATIONS

The use of the videoscribe application through the mastery learning model has been proven to have an influence and improve the critical mathematical thinking skills and learning interests of SMK students with multimedia expertise. The videoscribe application is feasible and is classified as good to be applied in learning, especially in geometry material. Therefore, it is recommended that teachers use learning applications that are in accordance with students' learning interests assisted by learning models or approaches that are in accordance with class conditions in order to improve students' critical thinking skills and learning interests.

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