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The Effectiveness of Video-Assisted Flipped Classroom Learning Model Implementation in Integral Calculus

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Abstract

This study aimed to determine the effectiveness of applying video-assisted flipped classroom learning models in integral calculus courses. The effectiveness of learning in this study was measured based on the achievement of learning outcomes, student activities during learning, and student responses. This study was a pre-experimental study with a purposive sampling technique. The data collection method used two tests, observation sheets, and two questionnaires. Data analysis techniques were conducted by using statistical and inferential descriptive analysis. The results of the analysis showed: (1) the score of student learning outcomes has increased reaching a minimum completeness score of 70 with an average score of student learning outcomes in posttest 1 and posttest 2 of 75.28 and 78.09, (2) the average student activity is in the very active category, and (3) the average percentage of student response questionnaires on two response questionnaires, namely student response to the implementation of mathematics learning is amounted to 88%, and student response to instructional video media is amounted to84%. In general, it can be concluded that the video-assisted flipped classroom learning model is effective to be applied in mathematics learning.

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Keywords: Effectiveness, Video Media in Learning, Flipped Classroom.

1. Introduction

In the last few decades, major developments of information and communication technology has a great impact on every aspects of our lives, especially in learning that completely change the education patterns. The development of information and communication technology-based education needs to be thought seriously by various parties, one of which is educator. Educators are no longer the main actors in the class, but rather provide opportunities for students to actively and creatively express their opinions. Educational innovations are carried out to achieve the maximum learning outcomes. One of the processes in making innovative learning is the involvement of an educator to build a variety of skills, including the skills in choosing learning models and making appropriate learning media[1]. In

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overcoming this, educators are required to be able to choose the right learning model in order to keep abreast of developments in information and communication technology.

One learning model that is relevant to the developments of information and communication technology is flipped classroom model. Flipped classroom is a learning model using instructional video media introduced by Wolff and Chan [2]. According to Wolff & Chan [2], the flipped classroom model is the process of learning, in which the students have required reading or lectures videos at home before or after class begins. The teaching and learning activities in the classroom is used for discussions, problem-solving, questions and answers, work assignments or teaching materials about problems that the students do not understand. Therefore, the use of instructional video media can improve the quality of learning outcomes.

This flipped classroom model is applied by using the instructional video media. The use of video media is an intermediary tool in the learning process that relies on the sense of seeing and hearing. According to Riyana [3], instructional video media is a medium that presents audio and visuals with learning messages that contain concepts, principles, procedures, and theories of application of knowledge, to help the students in understanding the learning material. Therefore, this media can help educators in the process of knowledge transfer. The use of video media in learning can increase students' interest, because they can listen and see the illustration about the material simultaneously.

Several studies relating to video-assisted flipped classroom learning have been conducted [4]-[8]. Saputra & Mujib [6] examined the effectiveness of the flipped classroom model using mathematics learning videos. This study shows that the flipped classroom model by using learning videos is effective to be applied in mathematics learning. Ario & Asra [7] examined the development of learning video in integral material by applying the flipped classroom model. This study showed that the presence of instructional video media provides an increase in student learning outcomes.

This study examined the implementation of video-assisted flipped classroom learning models in mathematics learning. This study aimed to determine the effectiveness of applying video-assisted flipped classroom learning models that focus on student learning outcomes, activities, and responses. The subjects of this study were students of class 2018. Subjects were given math problems to reveal student learning outcomes. The mathematical problem given is a matter of area of plane figures and volume of the solid of revolution.

2. Methods

This study was a pre-experimental study with One-Shot Case Study Design. Illustration of the One-Shot Case Study Design is presented in Table 1.

Table 1. One-Shot case study design

Treatment	***Posttest***
X	O

with:

X = Treatment, applying the video-assisted flipped classroom learning model.
O = Posttest, test conducted after treatment.

This study was conducted at a university in Makassar. The sample in this study consisted of 32 students taken by using purposive sampling technique. There were two types of variables in this study, namely the independent variable and the dependent variable. The independent variable in this study was learning by using the flipped classroom model. While the dependent variable in this study were student learning outcomes, student activities, and student responses.

Data collection techniques were done by conducting tests, observations, and questionnaires. The instruments used in this study consisted of: (1) student achievement test, namely posttest 1 and posttest 2, (2) observation sheet of student activities, (3) questionnaire to measure the implementation of mathematics learning and questionnaire to measure instructional video media. The instruments were validated by two experts.

Analysis of the data used in this study were descriptive statistical analysis and inferential statistical analysis. Descriptive statistical analysis was used to describe each research variable, namely the value of posttest, activity, and

response. Inferential statistical analysis was used to test the posttest hypothesis. However, the prerequisite test was previously carried out, namely the normality test by using the Kolmogorov-Smirnov test.

The hypothesis in this study were the average student learning outcomes (posttest 1 and posttest 2) after the implementation of video-assisted flipped classroom learning models was greater than 70 and classical completeness was greater than 70%. Whereas student activities during the learning process took place more than 60%, and the average response of students after the implementation of video-assisted flipped classroom learning models was greater than 80%.

3. Results and Discussion

The study was conducted with 4 meetings, 2 meetings with the administration of video-assisted flipped classroom learning models, and 2 meetings with the administration of posttest. Posttest was the final test given after learning was carried out. Meanwhile, during the learning process, it was conducted the admission filling of the observation sheet of student activities. While the student response questionnaires were filled by students after learning was carried out through the Learning Management System (LMS) of Universitas Negeri Makassar.

3.1. Student Learning Outcomes

3.1.1. Descriptive Statistical Analysis

The data obtained in this study were data about the student mathematics learning outcomes. Student learning outcomes are based on applying video-assisted flipped classroom models. From the learning outcomes of data processing based on the results of the posttest 1 and posttest 2, it was obtained a recapitulation of student learning outcomes data which can be seen in Table 2.

Table 2. Statistical descriptive of posttest

Statistics	*Posttest 1*	*Posttest 2*
Size (n)	32	32
Maximum (X_{maks})	93	100
Minimum (X_{min})	65	63
Range ($\mathcal{R}$)	28	37
Mean ($\bar{x}$)	75.280	78.090
Deviation Standart (s)	5.721	8.723
Variance (s^2)	32.725	76.088

Based on the student learning outcomes in Posttest 1, it shows that the average score is amounted to 75.28 from an ideal score of 100 with a standard deviation of 5.721, which indicates that the student's score is above the given completeness criteria, which is more than 70. While based on the student learning outcomes in Posttest 2, it shows that the average score is amounted to 78.09 from an ideal score of 68 with a standard deviation of 8.723, which indicates that the student's score is above the given completeness criteria, which is more than 70. The average score indicates that student learning outcomes have reached the given completeness criteria. The percentage of scores obtained by students can be seen in Table 3.

Table 3. Percentage score of student completeness degrees

Completeness Degrees (DP)	Frequency		Category
	Posttest 1	*Posttest 2*	
86%≤ DP ≤100%	1	4	Very high
71%≤ DP <86%	24	24	High
56%≤ DP <71%	7	4	Low
41%≤ DP <56%	0	0	Very low

In Table 3, the results show that with 32 students, the learning outcomes tests of classes that use video-assisted flipped classroom learning models reached score more than 70 or belong to high categories. So, the number of students who get scores according to the given provisions is amounted to 78% of students for Posttest 1 and 88% of students for Posttest 2. Both students learning outcomes have met the effectiveness criteria.

Table 4. Classical completeness

Test	Mastery	Frequency		Percentage
		Complete	Not Complete	
Posttest 1	70	29	3	91%
Posttest 2		30	2	94%

Table 4 shows that descriptively, the number of students experiencing mastery learning, both from the results of posttest 1 and posttest 2 were 29 students and 30 students, or by 91% and 94%. Based on student learning outcomes, about 70% students who have a score of 70 have met the criteria. Thus, classically classical completeness has occurred or in other words has met the criteria of effectiveness.

3.1.2. Inferential Statistical Analysis

The normality test results of the posttest 1 and posttest 2 can be seen in Table 5, showing that the learning outcomes of posttest 1 and posttest 2 obtained p-value of 0.087 and 0.122 for the Kolmogorov-Smirnov normality test, with $p - value > \alpha = 0{,}05$. The result shows that the learning outcome data came from a normally distributed population.

Table 5. The normality test results of the posttest 1 and posttest 2

The normality test			
	Kolmogorov-Smirnov		
	Statistic	Df	Sig.
Posttest 1	0,145	32	0,087
Posttest 2	0,139	32	0,122

Table 6. The one sample t test result of the posttest

Test Value = 70			
	t	df	Sig. (2-tailed)
Posttest 1	5,222	31	0,0001
Posttest 2	5,249	31	0,0001

Based on hypothesis test results in Table 6, it can be seen that student learning outcomes show that p(Sig.(2-tailed) = 0,0001, then p-value $= \frac{1}{2}(0{,}0001)$ = 0,00005, because p-value = 0,00005 $< \alpha = 0{,}05$. This means that the average score of learning outcomes using video-assisted flipped classroom learning models is more than the completeness set at 70. Thus, after the video-assisted flipped classroom models was conducted, inferentially, the student learning outcomes have reached the given completeness.

Table 7. The Z test of classical completeness

Classical completeness	Z_{hitung}	Z_{tabel}
Posttest 1	2,59	1,96
Posttest 2	2,96	1,96

In Table 7, it can be seen that Z_{count} for classical completeness data is amounted to 2.59 and 2.96, which is greater than Z_{table} amounted to 1.96 with $\alpha = 0{,}05$. It can be concluded that, the minimum classical completeness percentage of students is greater or more than 70%, after using video-assisted flipped classroom learning models. Thus, student learning outcomes after using the video-assisted flipped classroom learning model inferentially achieve the classical completeness.

3.2. Student Activity

Table 8. Student Activity Score in Learning in Class.

No.	The observed aspect	Meeting		Mean	Percentage
		1	2		
1	Participate in carrying out the tasks assigned in the group.	4	4	4	100%
2	Participate in solving problems given in groups.	3	3	3	75%
3	Try to find various information needed for problem solving.	4	2	3	75%
4	Carry out group discussions in accordance with the instructions of the lecturer.	4	4	4	100%
5	One group stands up to explain the results obtained from group discussions.	4	4	4	100%
6	Assess the ability of self in solving problems.	3	3	3	75%
7	Do not cheat the work of a friend.	4	4	4	100%
8	Being active during the learning process.	4	3	3.5	88%
	Mean	3.75	3.38	3.56	89%
	Percentage	94%	84%	89%	

The results of observations of student activities show that the aspects observed in video-assisted flipped classroom learning models are in the very active category. Where the average score for all meetings is about 89%. Thus, the results of observations of student activities in terms of indicators have met the effectiveness criteria that can be seen in Table 8.

Furthermore, based on qualitative analysis, this learning teaches students to mutually accept and provide information obtained, provide mutual support and respect the opinions of others, but there are still students who are less active and motivated in learning activities. However, most students showed enthusiasm, attention, sincerity, skills, activeness, and confidence in the implementation of video-assisted flipped classroom learning models. This can affect the completeness of student learning.

3.3. Student Response

Student responses on the two student responses questionnaire in the learning model of video-assisted flipped classrooms, namely student responses to the implementation of mathematics learning and student responses to instructional video media were in the good category.

The results of the student response questionnaires to the implementation of mathematics learning can be seen in Table 9 and Table 10. In the effectiveness criteria, the student response is effective if it reaches more than 80% or belong to the good categories. So that, there are 88% of students in that category. Student responses to the implementation of learning mathematics in terms of indicators have met the effectiveness criteria.

Table 9. Descriptive statistics of student responses to the implementation of learning mathematics

Statistics	Value
Size (n)	32
Maximum (X_{maks})	100
Minimum (X_{min})	64
Range ($\mathcal{R}$)	36
Mean ($\bar{x}$)	86,09
Deviation Standart (s)	10,322
Variance (s^2)	106,539

While the student responses to instructional video media are in the minimum of good categories. The results of student response questionnaires can be seen in Table 11 and Table 12. In the effectiveness criteria, student response is effective if it reaches more than 80% or belong to the good category. So that, the number of students in that category

is amounted to 84% of students. Student responses to instructional video media in terms of indicator have met the effectiveness criteria.

Table 10. Frequency distribution and percentage of student responses to the implementation of learning mathematics

Percentage Interval (P)	Frequency	Category
81%≤ P ≤100%	17	Very well
61%≤ P ≤80%	11	Well
41%≤ P ≤60%	4	Enough
21%≤ P ≤40%	0	Less
0%≤ P ≤20%	0	Very little

Table 11. Descriptive statistics of student responses to instructional video media

Statistics	Value
Size (n)	32
Maximum (X_{maks})	68
Minimum (X_{min})	38
Range ($\mathcal{R}$)	55,09
Mean ($\bar{x}$)	8,153
Deviation Standart (s)	66,475

Table 12. Frequency distribution and percentage of student responses to instructional video media

Percentage Interval (P)	Frequency	Category
81%≤ P ≤100%	13	Very well
61%≤ P ≤80%	14	Well
41%≤ P ≤60%	4	Enough
21%≤ P ≤40%	1	Less
0%≤ P ≤20%	0	Very little

4. Conclusion

The results showed that the implementation of video-assisted flipped classroom learning models in mathematics learning in terms of aspects of learning outcomes, student activities during learning, and student responses after learning is effective to be applied in mathematics learning. Descriptions of the video-assisted flipped classroom learning models effectiveness are as follows:

1. Learning outcomes obtained the effectiveness criteria greater than 70 and classical completeness greater than 70%. The results showed that the average learning outcomes achieved in posttest 1 and posttest 2 were 75.28 and 78.09, from a minimum score of 70. As many as 91% and 94% students in posttest 1 and posttest 2 achieved individual completeness, meaning that mastery learning outcomes were classically achieved.
2. Student activities obtained the effectiveness criteria greater than 60%. The results showed that the average percentage of student activity was 89% or in the very active category.
3. Student responses obtained the effectiveness criteria greater than 80%. The results showed that the implementation of video-assisted flipped classroom learning models for students received an excellent category of 88% in the student responses questionnaire to the implementation of mathematics learning. Likewise, the student response questionnaire to the instructional video media was in the excellent category at 84%.

Referring to the results of this study, further study can be developed, because there are still some interesting things that can be investigated. The implementation of video-assisted flipped classroom learning models can be applied as a learning model to measure other variables besides learning outcomes. In addition, it can be applied to other learning materials as further study in this study, because this study is limited to two materials, namely the area of plane figures and the volume of solid of revolution.

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