



The Effectiveness of Flipped Classroom to Improve Students' Concept Understanding and Self Efficacy during the Covid-19 Pandemic

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Abstract

The purpose of this study is to analyze the effectiveness of flipped classrooms during the covid-19 pandemic to improve understanding of students' concepts and self efficacy, especially in circulatory system materials. This type of research is a quoration of experiments using non-equivalent control group design. The population is all students of grade XI Mipa SMA N 4 Pekalongan school year 2020/2021. Sampling in this study used purposive sampling technique with selected class XI Mipa 3 and 4. In experimental classes they implement flipped classroom learning while control classes implement non-flipped classroom learning using video conference and assignment methods. Data collection there are two techniques namely test and non-test. The results showed that understanding of student concepts increased after the application of flipped classroom in learning. Students understand the concept from 13% to 55%. Results N of moderate category experiment class gain 51.43% and high 45.71% while medium category control class 29.40% and high 35.30%. Classical completion of experimental class learning is 85%. Mann Whitney's test results showed Asymp's value. Sig. (2-tailed) 0.038 < 0.05 so it known that there is a significant difference between the average posttest results of the experimental class and the control class. Self efficacy of students before treatment category is quite high to high by 42.86%. After the treatment of flipped classrooms became 71.43%. The results of the paired sample t-test showed the Asymp value. Sig. (2-tailed) 0.000 < 0.05, so it known that there is a significant difference after treatment. Based on these results, it can be concluded that flipped classroom is effective to improve student's understanding of concepts and self efficacy in circulatory system materials.

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INTRODUCTION

Concept is very important, especially in the learning process. The concept is one of the initial knowledges that students must have because the concept is the basic knowledge for formulating principles (Astuti, 2017). Understanding the concept is also defined as the ability of students to capture the meaning or concept (material) studied (Hanif, Ibrohim, & Rohman, 2016). Understanding concepts is very important for students, especially in biology lessons. This aims so that students do not find it difficult to learn concepts in biological materials, because there is a connection between one concept and another. Understanding the concept becomes one of the keys to success in studying science including Biology, so it does not have to memorize but simply by understanding the concept (Elisa, Mardiyah, & Ariaji, 2017). In addition to understanding the concept, in the learning process it is expected that students have self efficacy because it will affect their confidence level to achieve learning goals, do tasks, and complete tasks well (Wafi, Rachmawati, & Hartadiyati, 2016).

The results of initial analysis in high school students in Grades 11 and 12 stated that biology is a difficult lesson because of a lot of memorization. Students still consider that biology is a lesson to be memorized. As for the observations in January 2020 at SMA Negeri 4 pekalongan through interviews, the teacher revealed that the material considered difficult by some students is the circulatory system. In addition, the teacher also said that the formative evaluation value of 40% of students has not been completed. Information from the Education Assessment Center of the Ministry of Education and Culture of the Republic of Indonesia in 2019, that the absorption of circulatory system material is 46.93%. This figure is relatively low from the minimum absorption of greater than equal to 55%. This is partly due to the low understanding of the concept of students in the circulatory system material.

Thus, the selection and application of learning models especially in the right biology is very important. In accordance with the Circular letter of the Minister of Education and Culture No. 4 of 2020 concerning the Implementation of Education Policy in the Emergency Period of the Spread of Coronavirus Disease (Covid-19), one of them is to emphasize online learning. One learning model that is relevant enough to be applied in the framework of online learning is the flipped classroom learning model. With a few modifications related to the technical learning given to learners, flipped classroom can be applied (Setiadi, 2020). This model can involve students more actively to be able to learn independently and develop their abilities and lead to improved understanding of concepts and self efficacy.

Flipped classroom is a flipped learning model of the learning model that teachers usually apply in the classroom. Teachers in the classroom usually teach materials with a specific model by involving all activities taking place in the classroom during lesson hours. Next, give homework as a follow-up. However, in flipped classroom the material is first given outside of lesson hours to students in the form of learning videos that must be watched and understood and recorded what is not understood from the video, as well as the provision of material in the form of documents (asynchronous learning). On the contrary, classroom learning sessions, especially during the covid-19 pandemic, are through virtual classrooms with synchronous discussions and work on tasks during lesson hours. Based on research conducted by Rindaningsih (2018) shows that flipped classroom learning models have a strong influence in honing students' skills and making students have a high awareness and responsibility in participating in learning activities. McCarthy (2016) also stated the results of research that using flipped classrooms can help students to learn independently by encouraging them to adjust to their new learning experience.

Based on the background, it needs to be studied in depth about the effectiveness of flipped classroom models during the covid-19 pandemic to improve students' concept understanding and self efficacy in circulatory system materials.

RESEARCH METHODS

This research was conducted at SMA N 4 Pekalongan Semester Gasal School Year 2020/2021. The research population is all students of grade XI Mipa SMA N 4 Pekalongan which consists of five classes. Sampling in this study used purposive sampling techniques. The samples used were two classes, class XI Mipa 3 and XI Mipa 4 with characteristic considerations and teachers who taught the same. It is known

that both classes are homogeneous, then it is determined class XI Mipa 3 as an experimental class implements flipped classroom learning through Ms. Teams with asynchronous and virtual classroom during class hours, while grade XI Mipa 4 as a control class implements non-flipped learning with video conference and assignment methods. Data in the study included pretest and posttest results and student self efficacy scale. The data were analyzed with descriptive quantitative percentages and two average difference tests (Mann Whitney test).

RESULT AND DISCUSSION

Cognitive Learning Outcomes

The results of cognitive learning of experimental classes and control classes can be seen in table 1

Table 1 Student Pretest and Posttest Grades

	Eksperimental Class		Control Class	
	<i>Pretest</i>	<i>Posttest</i>	<i>Pretest</i>	<i>Posttest</i>
Highest score	52	100	72	100
Lowest score	4	20	16	16
Average score	26,40	79,31	40,71	64,94

Based on table 1, the experiment class had a higher average of 79.31 compared to the control class of 64.94. This suggests that the experimental class is superior.

Improved learning outcomes (N-Gain)

Improvement of student learning outcomes (N-Gain) is known by using calculations of pretest and posttest grades.

Table 2 Improvement of Learning Outcomes (N-Gain)

Class	<i>N-Gain</i>	Category	Frequency	Percentage (%)
Eksperimental	< 0,3	Low	1	2,86
	0,3 < N-gain > 0,7	Moderate	18	51,43
	>0,3	High	16	45,71
Control	< 0,3	Low	12	35,30
	0,3 < N-gain > 0,7	Moderate	10	29,40
	>0,3	High	12	35,30

Based on table 2, it is known that the increase in learning outcomes (N-Gain) of experimental class students was 94% with a moderate category of 31.43 and a high of 62.86. The result was greater than the control class which had an N-Gain of 64.61% with a moderate category of 29.41% and a high of 35.20%.

Flipped classrooms provide deliberately structured time to share information and discuss ideas with their peers (Maddox, 2018). According to Erdemir & Eksi (2019) the advantages of implementing flipped classrooms include more discussions in the classroom, practical ways to achieve certain materials, raising awareness of students' learning, feeling motivated and confident, a fun student-centered learning environment, and a collaborative learning atmosphere. From the statement, flipped classroom can be an alternative learning model that can be applied during the covid-19 pandemic. All activities can be done online and the provision of materials outside of lesson hours can save time so that learning is more effective.

Normality and Homogeneity Test Results

Table 3 Normality Test Results

<i>A</i>	Data Posttest score	Number of samples	Sig. (2-tailed)
0,05	Experimental class	35	0,008
	Control class	34	0,160

Normality test conducted with Statistical Product and Service Solution (SPSS) software version 24. The data is normally distributed if the value of Asymp. Sig. (2-tailed) > 0.05. Based on the table it can be concluded that the data obtained distributed is not normal for the experiment class and is distributed normally for the control class. Furthermore, homogeneity test is carried out on the data.

Table 4 Homogeneity Test Results

<i>Test of homogeneity of variances</i>			
Levene statistic	df1	df2	Sig
	1	67	.000

Based on the homogeneity test results it is known that the data is not homogeneous. To find out the average posttest value of the experimental class and control class whether there is a significant difference due to the difference in treatment or not, the next test uses the Mann Whitney non parametric test.

Mann Whitney Test Results

Table 5 Mann Whitney Test Results

<i>Test Statistics^a</i>	
	Posttest score
Mann-Whitney U	423,000
Wilcoxon W	1018,000
Z	-2,076
Asymp. Sig. (2-tailed)	,038

Mann Whitney's test results showed Asymp's value. Sig. (2-tailed) 0.038 < 0.05, so it can be concluded that there is a significant difference between the posttest average score of the experiment class and the control class.

Classical Student Learning Skills

The results of classical completeness calculations in experimental classes and control classes on circulatory system materials are presented in table 6.

Table 6 Posttest Value Classical Finality Calculation Results

Class	Complete (%)	Not complete (%)	Classical completeness criteria
Experimental	85	15	Complete
Control	52	48	Not complete

Based on the calculation of classical completion, it can be known that in the experimental class the classic completeness criteria becomes complete, which is 85% of the previous unfinished. The classic completion criteria control class has not been completed because only 52% of students are completed. Learning using flipped classrooms is said to be effective because more than 75% of students meet the minimum standards that have been set.

Data of Understanding Student Concepts Circulatory System Material

This type of question can reveal students' ability to understand more details, which ones already understand the concept, do not understand the concept, do not understand the concept and misconceptions (Cheung & Yang, 2018). The results of the analysis are presented in table 7.

Table 7 Data Understanding Student Concepts on Circulatory System Materials

Class	Percentage Understanding the concept (%)	
	Pre test	Post test
Experimental	13	55
Control	27	54

Based on the results of the analysis of students' concept understanding, the experimental class increased from 13% to 55% of students understood the concept. In line with Apriyanah's statement (2018) which revealed that flipped classroom learning models have a good influence in understanding concepts and can improve students' concept mastery skills. When using a flipped classroom model, students build their own knowledge derived from the initial knowledge gained through video materials and summary materials provided by the teacher before class learning takes place (asynchronous). Furthermore, during virtual classroom learning, students will compare their knowledge with new knowledge through discussion and clarification activities by the teacher.

Students who are given video materials are better at mastery than without video (Bishop, 2013). In line with the results of research Gustilo et al. (2015) that the use of video in an active learning environment facilitated by teachers shows better student achievement. In addition, in flipped classrooms there is a special time to share information and discuss ideas with their peers. From the results of the study, it is supported that the videos provided for students can make students more interested in learning and make it easier for students to understand a subject matter.

The theory of learning that supports the flipped classroom model is constructivism (Aldosari, 2020). Referring to piaget's theory of individual learning and Vygotsky's collaborative learning theory. A person will actively build his or her knowledge by comparing newly knowledge with knowledge that has been learned before. Flipped classroom is also supported by the theory of learning social constructivism (Collaborative Learning) from Vygotsky. This theory of learning explains that knowledge must be built and constructed together. This theory supports flipped classroom learning models because in the process of flipped classroom learning maximizes interaction with each other by forming discussion groups.

Self Efficacy

The results of self efficacy calculation before and after learning are presented in table 8 and self efficacy is reviewed from each aspect presented in table 9.

Table 8 Results of Self Efficacy Calculation of Students

Category	Eksperimental Class		Control Class	
	Pretest	Posttest	Pretest	Posttest
	Percentage (%)	Percentage (%)	Percentage (%)	Percentage (%)
Low	-	-	-	-
Moderate	57,14	28,57	56,00	50,00
Quite high	31,43	60	35,00	32,30
High	11,43	11,43	6,00	14,70
Very high	-	-	3,00	3,00

Based on the results of self efficacy recapitulation the students of the experimental class experienced an increase. Initially, students in the self efficacy category were quite high to a high of 42.86% after learning using flipped classroom to 71.43%. Learning is said to be effective if the student's self efficacy category is high enough to be more than equal to 50%. The results of the paired sample t-test showed the Asymp value. Sig. (2-tailed) 0.000 <0.05, so it known that there is a significant difference after treatment.

Table 9 Results of Self Efficacy Calculation of Each Aspect.

Aspect	Eksperimental		Control	
	Score	Category	Score	Category
Magnitude	66,25	Quite high	62,48	Moderate
Generality	71,50	Quite high	70,86	Quite high
Strength	71,62	Quite high	70,95	Quite high

From table 10. it appears that the score of each aspect of self efficacy in the experimental class is higher than the control class. This indicates that students in the experimental class had higher self efficacy than the control class. The application of flipped classroom provides a student learning experience where in the learning syntax students are required to learn the material first before the class begins either by reading or watching the learning video. Thus, students will gain learning experience and feel more confident in their abilities during class learning (Aldosari, 2020).

Flipped classroom learning will make students confident and confident in their abilities. Students have learned the material before class, so it will be easier to do the task given. In addition, during flipped classroom learning students also discuss in groups to better master the material by exchanging opinions with each other. This makes students feel like they want to succeed too when they know that other groups have understood the material. Students also took the initiative to ask questions through chat features to researchers when they were not familiar with the material being discussed. Thus, the student's self efficacy increases due to social encouragement and from the emotional state of the student. In line with research conducted by Apriyanah (2018) which states that flipped classroom models are effective to improve students' self efficacy.

Students can be successful in improving concept understanding by using flipped classroom learning models because they are influenced by a good learning experience, as evidenced by seeing higher posttest results of experimental classes than posttest control classes. The increase in self efficacy in this study was due to the use of flipped classroom learning models giving students flexibility in learning learning materials before classes started and there was plenty of time for discussions with teachers and friends. This is in line with Bandura's socio-cognitive theory (1997) which says that self efficacy is a construct that is dynamic and can be developed through the existence of (1) experiences of self-success, (2) the success of others, (3) positive feedback, and (4) individual emotional state. The four sources of self efficacy can be developed through the learning process with a flipped classroom model which has two main components, namely direct instruction outside the classroom and active learning / collaborative learning in the classroom (Aldosari, 2020).

CONCLUSION

Based on the results of research and discussion, it can be concluded that the application of flipped classroom during the covid-19 pandemic is effective to improve the understanding of students' concepts and self efficacy in circulatory system materials. The effectiveness of this model is supported by the large number of time available for students to discuss and is demonstrated by the difference in medium and high category N-Gain in higher experimental classes compared to control classes.

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