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Flipped Classroom and Discovery Models Effect on Science Learning Outcomes Grade V Elementary School Students

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Abstract: In this study aims to analyze the effect of flipped classrooms and discovery models on students' science learning outcomes. Using the research instrument composed of test items and an observation checklist, data were gathered from 370 grade 5 students from the ten public elementary schools in the cluster. Wijaya Kusuma, Karangtengah, Demak to assess their knowledge and science process skills in 5th-grade elementary school learning and analyze the data using the homogeneity and normality prerequisite tests. and to analyze the hypothesis test using t-test and F-test using SPSS 25. The conclusions of the study are 1) The effect of the Flipped Classroom learning model on Learning Outcomes the Sig. is 0.006 smaller than < probability 0.05, t-count of 3.098 is greater than t-table > 2.086, 2) the effect of the Discovery model on Learning Outcomes the Sig. is 0.005 less than < probability 0.05, the t value is calculated of 3.160 is greater than t-table > 2.080, 3) Calculated F-value 94.918 > F-table 3.23. So as the basis for decision-making in the F test, it can be concluded that the hypothesis is accepted in other words, the flipped classroom and discovery models simultaneously affect learning outcomes.

Keywords: Discovery, flipped classroom, learning outcomes

1. Introduction

Developments in the era of globalization, especially technology and information, have an impact on developments in all aspects of life, especially in the field of education. Education is one of the ways governments can do to prepare human resources to have high competitiveness with the current coronavirus pandemic in the 21st century (Ardianti, Pratiwi, & Kanzunnudin, 2017). Technological development should be accompanied by an increase in the quality of learning. Lecturers can improve their academic skills by integrating information and communication technology into their learning to improve the quality of their learning (Ulya, 2021). During the pandemic, learning must continue, both online and blended learning. learning must be carried out efficiently, and develop an active, creative, character, critical and meaningful attitude for students. To develop this, learning is needed that combines online and offline learning and learning that activates students with their own understanding of concepts. The application of the 2013 syllabus requires teachers and students to shift their thinking and thinking skills from low-order thinking skills (LOTS) to higher-order thinking skills (HOTS) (Renita Prera, 2019). HOTS learning is focused and purposeful, has a high degree of self-confidence, is highly involved in independent activities, has a high attitude towards independence, uses past mistakes as future learning, learns, and works alone (Bintoro & Sumaji, 2021). Teachers have a duty to encourage students to express ideas and opinions and creative thinking in solving problems given so that the ability to think creative students can develop optimally (Purwaningrum, 2016). This is contrary to what happened in learning in the Wijaya Kusuma cluster. Most teachers' teaching method is still teacher-centered fewer active students, rote learning, and do not use media so that students feel bored. So, student learning outcomes are still much below the minimum criteria completeness. One way to overcome this is to use a learning model.

Harun et al. (2021) argues, that when choosing the right learning mode, attention must be paid to the situation of the students, the nature of the materials, the media facilities available, and the situation of the teachers themselves. The appropriate learning models are flipped classrooms and discovery. This learning guides teachers to be more innovative and creative in activating students and guides students in finding their own learning concepts. education is not only the process of increasing cognitive competence only, but the process of psychomotor improvement and affect through the discovery of values for form human beings who are not only intelligent but also polite and civilized (Masfuah & Pratiwi, 2018).

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This study was conducted to determine the analyze the effect of the flipped classroom and discovery model on the science learning outcomes of fifth-grade students on Human Respiratory Organs in the Wijayakusuma Cluster, Karangtengah District.

2. Literature Review

Technology can be used to help teachers create interesting media that introduces students to topics they bring to the classroom. Educational content technology can also help teachers prepare students to become independent learners (Wijayatiningsih, 2019). According to Abeysekera & Dawson (2015), the concept of flipped learning is to 1) move most of the messaging curriculum out of the classroom, 2) use classroom time for active social learning activities, 3) require students to engage in pre-and/or after-school activities to get the most out of the classroom operation. Dewi (2021) Flipped classroom is face-to-face learning face to face virtual to deliver material Cognitive must be done through activities sync using the google meet app or zoom meeting. According to Setren et al. (2019) essentially, the flipped classroom takes the lesson/homework model and reverses it so that students engage with content typically presented in class by educators outside of class time and actively learn in class when teacher guidance is critical. In addition, learning develops students' creative and critical thinking by finding the concept of learning material that is studied with the discovery model. This is in line with the results of research by Rudyanto (2014) that with discovery learning there is a significant influence between the character of curiosity and communication skills on students' creative thinking abilities. By communicating the results of class assessment to students, it is expected that students will be encouraged to be more enthusiastic about becoming independent learners (Kurniadi & Purwaningrum, 2018).

After students learn through discovery learning, we find that students write well and are concise and to the point. They also express mathematical language coherently and fluently. This event proves that the students' self-learning ability has developed significantly. Students are interested in learning mathematics. They develop mathematical thinking, especially creative thinking (Trung, 2014). The learning model used by the teacher in learning greatly determines student learning outcomes.

Learning outcomes are positive changes in behavior and abilities possessed by students from an interaction of learning and teaching actions in the form of intellectual learning outcomes, cognitive strategies, attitudes and values, verbal innovations, and motor learning outcomes (Wahyudi, 2015). In line with research from Fan, Xiao, & Su (2015) state understands how students learn and develop different designs for course activities. Design different teaching strategies to encourage students to integrate different learning styles. The importance of multimedia interactive teaching aids Meaningful and appropriate material design. Learning motivation presents significantly positive effects on learning effect in learning achievement. Learning motivation shows remarkably positive effects on learning harvest in learning achievement (Chen, 2017).

3. Methodology

This study uses an experimental research design, namely a pre-test and post-test control group design. This method involves a flipped classroom and discovery learning model which is used to measure the effect of learning outcomes. The population framework of this research is three hundred and seventy (370) grade 5 students from ten (10) public elementary schools in the Wijayakusuma cluster, Karangtengah sub-district, Demak district. The researcher used purposive sampling. The sample in this study was the class of Public Elementary School No. 5A Kedunguter as the experimental class of the flipped classroom model, class 5 of Public Elementary School No. 1 Sampang, as the experimental class of the discovery model. Meanwhile, Public Elementary School No. 1, 5B Dukun was the control class. To conduct the research, permission was approved by the division supervisor and the elementary school principal.

The research instrument is a test, observation, and data collection techniques used are documentation, observation, and written tests. Data analysis includes instrument test (validity and reliability test) data description, analysis prerequisite test (normality and homogeneity test) hypothesis testing using t-test and F-test performed using SPSS 25 program for windows.

4. Findings and Discussion

The following are the results of data collection in determining the effect of the flipped classroom and discovery learning model on learning outcomes.

a = constant number of unstandardized coefficients. In this case, the value is 56.569. This number is a constant number which means that the effect of the Flipped Classroom (X) learning model on Learning Outcomes (Y) has a consistent value of 56.569.

b = number of regression coefficients. The value is 0.437. This figure implies that for every 1% addition of Flipped Classroom (X) posttest scores, learning outcomes (Y) will increase by 0.437. If the regression coefficient value is positive (+), then it can be said that the Flipped Classroom Model (X) has a positive effect on learning outcomes (Y).

Table 1 - Result of the effect of the flipped classroom learning model on learning outcomes.

ANOVA[a]						
	Model	**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
1	Regression	825.413	1	825.413	9.598	.006[b]
	Residual	1720.042	20	86.002		
a. Dependent Variable: Learning Outcomes						
b. Predictors: (Constant), Flipped Classroom						

Based on Table 2, it is known that the significance value (Sig.) of 0.006 is smaller than < probability 0.05, so it can be concluded that H0 is rejected, and Ha is accepted, which means that there is a positive effect of the Flipped Classroom (X) model on Learning Outcomes (Y).

Table 2 - Hypothesis test.

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	56.569	9.244		6.119	.000
	Flipped Classroom	.437	.141	.569	3.098	.006
a. Dependent Variable: Learning Outcomes						

Table 3 - Result of the effect of the discovery learning model on learning outcomes.

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1008.810	1	1008.810	9.985	.005[b]
	Residual	2121.624	21	101.030		
	Total	3130.435	22			
a. Dependent Variable: Learning Outcomes						
b. Predictors: (Constant), Discovery						

Based on Table 4, it is known that the t-count value is 3.098 and the t-table value is 2.086. Because the t-count value of 3.098 is greater than > 2.086, it can be concluded that H0 is rejected and Ha is accepted, which means that there is an effect of the Flipped Classroom model on learning outcomes.

Table 4 - t-count.

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	46.857	10.157		4.613	.000
	Discovery	.495	.157	.568	3.160	.005
a. Dependent Variable: Learning Outcomes						

The value of the regression coefficient is positive (+), and it can be said that the Flipped Classroom (X) model has a positive effect on learning outcomes (Y). So, the regression equation is Y = 46,857 0,495 X. Based on the output above, it is known that the significance value (Sig.) of 0.005 is smaller than < probability 0.05, so it can be concluded that H0 is rejected and Ha is accepted, which means that, there is a positive effect of the Discovery model (X) on Learning Outcomes (Y). Based on the output above, it is known that the calculated t value is 3.160 and the t table value is 2.080. Because the t-count value of 3.160 is greater than > 2.080, it can be concluded that H0 is rejected and Ha is accepted, which means that "There is an Effect of the Discovery Model (X) on learning outcomes (Y)".

Table 5 - Results of the effect of flipped classroom and discovery learning models on learning outcomes.

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1133.176	2	566.588	94.918	.000[b]
	Residual	113.415	19	5.969		

	Total	1246.591	21			
a. Dependent Variable: Learning Outcomes						
b. Predictors: (Constant), Discovery, Flipped Classroom						

Based on the comparison of F-value calculate with F-table. Based on the SPSS Output Table above, it is known that the calculated F value is 94.918 because the calculated F value is 94.918 > F-table 3.23 (F table attached). So as the basis for decision-making in the F test, it can be concluded that the hypothesis is accepted in other words, the Flipped Classroom (X1) and discovery (X2) models simultaneously affect learning outcomes (Y).

Table 6 - Model summary.

Model	R	R Square	Adjusted R Square	Std. Error
1	.953[a]	.909	.899	2.44320
Predictors: (Constant), Discovery, Flipped Classroom				

Based on the output above, it is known that the R Square value is 0.909, this means that the influence of the X1 variable, namely the Flipped Classroom model, and X2, namely the simultaneous discovery model (together) on the Y variable is 90.9% supporting research from this research are:

Research conducted by Yulietri & Mulyoto (2015) found there is learning using the flipped classroom model using the discovery learning model on student achievement. If it is seen from the average value of student learning achievement, it can be concluded that students with the model with an average value of 71.56 have better learning achievement than students who use the discovery learning model with an average value of 58.67. The Flipped Classroom and Project Based Learning Model were integrated with the website so the student could easily access the learning material. The models contributed an interesting, effective, student-centered learning process. Besides, they also improve the student's ability and enthusiasm to solve the problem of daily life (Andrini, Pratama, & Maduretno, 2018).

Flipped classroom proved to be a positive learning experience for students. As the classroom continues to modernize, pedagogical approaches such as the flipped classroom should be considered for many lecture-style courses taught in the animal sciences (Mortensen & Nicholson, 2015). In line with this research, Juniantari, Pujawan, & Widhiasih (2018) the understanding of mathematical concepts of students who take part in learning with the flipped classroom approach is higher than the understanding of mathematical concepts of students who take part in conventional learning. In other words, the flipped classroom approach has a positive effect on students' understanding of mathematical concepts. The flipped classroom learning model can also develop students to think critically. This is in accordance with research from a) the average of using flipped classrooms was 3.67 (good category) and (b) the average of students' critical mathematical thinking abilitybeforeusingflippedclassroomlearningmodelwas50.53(fair category) and after using 88.40 (very good category). Furthermore, based on inferential statistics by using pair of sample t-tests (SPSS version 22), the result showed the significant value was less than 0.05 (.000 <0.05). It means using flipped classroom learning model was effective on students' critical mathematical thinking ability of Public Secondary School No. 1 Angkola.

Flipped classrooms are effective in improving the ability of critical thinking, science learning outcomes, and student motivation, there is a positive influence between learning motivation and critical thinking skills and student learning outcomes science. This is in line with research from Kurnianto, Wiyanto, & Haryani (2020) state the analysis result of the average difference test showed that Asymp. Sig. (2-tailed) of 0.000 and result of single line regression Asymp. Sig. (2-tailed) of .000 (sig <0.05). The results showed that Model Flipped Classroom learning is effective in improving the ability of critical thinking, science learning outcomes, and student motivation, there is a positive influence between learning motivation and critical thinking skills and student learning outcomes science. In addition to the flipped classroom model, the discovery learning model can also increase creativity and student learning outcomes. Fulgueras & Bautista (2020) argue the flipped classroom approach enhances students' critical thinking and reading comprehension levels as the research by Irawan & Ruslan (2019) concludes that there is a significant effect of the discovery learning model on social studies learning. Student learning outcomes of class VII Public Secondary School Al-Azhar Medan (F count = 306,594; P = 0.000). There is a significant effect of interest in learning on social studies learning outcomes in grade VII Public Secondary School Al-Azhar Medan VII (Count = 69.071; P = .000). There is a significant interaction between the Discovery Learning model and social learning interest. Social studies learning outcomes for seventh-grade students at Public Secondary School Al-Azhar Medan (F count = 5.288; P = .012). In line with previous research, the research conducted by Simamora & Saragih (2019) in Improving Students' Mathematical Problem-Solving Ability and Self-Efficacy through Guided Discovery Learning in Local Culture Context is very relevant. This is due to the activeness of students and the integration of local cultural materials in learning so that learning outcomes are more visible than in previous research. In addition, the discover learning model can also improve the ability of analogy, this is in accordance with the results of research from Maarif (2016) the improvement of the students' analogical ability using the discovery learning method is considered better than the expository group.

5. Conclusions and Recommendations

The conclusion of this study is that there is an effect of the Flipped Classroom learning model on the science learning outcomes of the Human Respiratory Organ theme in fifth-grade students of elementary school Gugus Wijayakusuma, Karangtengah District, Demak Regency. proven by the significance value (Sig.) of 0.006 is smaller than < probability 0.05, and the t-count value of 3.098 is greater than > 2.086, so it can be concluded that H0 is rejected and Ha is accepted, which means that there is an effect of the Flipped Classroom model (X) on learning outcomes (Y)". The significance value (Sig.) of 0.005 is smaller than < probability 0.05, and the t-count value of 3.160 is greater than > 2.080, it can be concluded that H0 is rejected, and Ha is accepted, which means that there is an effect of the Flipped classroom and discovery learning models on learning outcomes. The calculated F-value is 94.918 > F-table 3.23. So as the basis for decision-making in the F-test, it can be concluded that the hypothesis is accepted in other words the Flipped Classroom and discovery models simultaneously affect learning outcomes.

Moreover, teachers should use the flipped classroom and discovery learning models in improving student learning outcomes in science material for human respiratory organs because students are more ready to accept learning, and can understand their own concepts so that they train students to be creative and think critically.

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Conflict of Interest

The authors declare no conflicts of interest.

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