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The Effectiveness of Discovery Learning Model on Blood Circulation Topic at Class V Public Elementary School Gugus Garuda Demak on Student Achievement

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Abstract: The discovery learning model is to understand concepts, meanings, and relationships through an intuitive process to finally arrive at a conclusion. Discovery occurs when the individual is primarily involved in the use of his mental processes to discover some concepts and principles. Provide opportunities to develop and advance according to their respective abilities and interests; strengthen and increase self-confidence with the process of self-discovery because learning is student-centered with a very limited teacher role. The learning outcomes of fifth-graders at the Gugus Garuda Demak Elementary School are in the very low category. Almost the average students got a score below the minimum completeness criteria. To improve learning outcomes, the teacher presents an innovative learning model, namely the discovery learning model. This research aims to find out which is more effective in applying the discovery learning model or directly to student learning outcomes in the fifth-grade elementary school blood circulation material. The approach used in this research is pure experimental research. The requirements test consists of a normality test and a homogeneity test. Sample test T-Test. The results of this indicated that the discovery learning model is more effective in improving student learning outcomes in the fifth-grade elementary school blood circulation material compared to direct learning.

Keywords: Effectiveness, discovery learning, blood circulation, learning outcomes

1. Introduction

The Act Number 20 of 2003 concerning the National Education System, Article 3 states that "National education functions to develop capabilities and shape the character and civilization of a dignified nation in the context of educating the nation's life, aiming to develop the potential of students to become human beings who believe and fear God. The Almighty has a noble character, is healthy, knowledgeable, capable, creative, independent, and becomes a democratic and responsible citizen (Ministry of National Education, 2003).

To realize national education, the purpose of science learning is to develop an understanding of various kinds of natural phenomena, concepts, and principles of science that are useful and can be applied in daily life (Hetherington et al., 2020). Thus, fostering a spirit of learning, and improving student learning outcomes, especially in the cognitive aspect. So, that mastery of concepts by students is not only in the form of memorizing several concepts that they have learned, but they are also able to apply the concepts they have in other aspects. This will be achieved if the teacher can develop a learning process that requires active student involvement in it. Thus, students' thinking skills will develop with the problems and challenges they faced (Fahmi et al., 2019).

Students' participation in the learning process will able to eliminate boredom and foster a sense of pleasure in learning and the end, it will have an impact on increasing student learning outcomes. To achieve that, schools and teachers as the main components of education need to manage learning methods by the principles of teaching and learning activities, including 1) student-centered activities; 2) learning through action; 3) independent learning, and learning to cooperate. So, that is expected not to be focused on the teacher, but on how to activate students in their learning (Henri, Johnson, & Nepal, 2017).

The teacher's role and students with a high level of activity in a learning process will greatly assist students in achieving their optimal learning outcomes. According Voet & De Wever (2019) student's with high learning activities have better learning achievements than students with moderate and low learning activities, and students with moderate learning activities have better learning achievements than low ones.

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The results of pre-research interviews with science teachers at elementary schools in the Garuda Cluster, Demak Regency, currently there are still many students who think that science subjects are difficult to understand and boring. Thus, many students have difficulty understanding it. Students have difficulty solving analytical problems related to the ability to solve a problem (Murugayya & Nachiappan, 2022). The results of pre-research interviews with students obtained input that they found it difficult when they had to apply the concepts they knew to problems that were different from the teacher's explanation. These difficulties caused students' daily test scores to be low and below the minimum completeness criteria.

Based on these initial findings and observations of the learning process carried out by teachers, especially science teachers, it was found that students were not active in learning with skills in making understanding or concepts, applying, analyzing, synthesizing, and evaluating. all of these activities are based on the results of observations, experiences, thoughts, considerations, and communication, which will guide in determining attitudes and actions (Rapanta, Garcia-Mila, & Gilabert, 2013). Teachers lecture more and provide exercises or written assignments according to the worksheets used but do not provide opportunities for students to experiment according to their ideas and knowledge, so the learning process becomes less interesting and meaningful because the dominance of the teacher is still very prominent and as a result, students are less active and passive as a listener in science learning.

These problems can be overcome by using models, methods, or approaches that are following the characteristics of the students to be studied. Teachers must be able to choose learning strategies that can support student development in science learning and teachers must also be able to make students construct their understanding and not receive full knowledge from their teacher. Therefore, the researcher tried to use the cooperative learning model of the type of discovery learning (Susanto et al., 2022).

Several previous studies have shown that the discovery learning model can improve learning outcomes as Ate's (2018) research that the discovery learning model can be helped increase student activity in the learned process with students finding information on their own, so that it shows an increase in student learning outcomes both in elementary school and education level in on it. The result of Rosarina, Sudin, & Sujana research (2016) is that by applied the discovery learning model is an alternative to improve student learning outcomes, especially in the material of changing the shape of objects.

Several previous studies concluded that discovery learning and think talk writing models can improve student learning outcomes (Farida & Rozi, 2022). The two learning models are both learning models that involved the active participation of students, so that students are not only objects but also subjects in learning. Therefore, the researchers will focus on trials (experiments) to compare which learning model is more effective in teaching science class V at the Garuda Group Elementary School, Demak Regency.

2. Methodology

The approach used in this research is a quantitative approach with experimental methods. The type of experimental research used is a pure experiment, namely to obtain information which is an estimate for information that can be obtained with actual experiments in circumstances that do not allow to control or manipulation of all relevant variables (Vanderstoep & Johnson, 2008). Before being given treatment, firstly the experimental group was given a pretest, then given treatment used discovery learning and think talk write models. After that was given a post-test. Data collection techniques in this research used tests, the test techniques in this research were used to determine student learning outcomes in science subjects material human circulatory organs. Data analysis includes validity test, reliability test, normality test, homogeneity test, independent sample t-test, and gain index calculation.

3. Results

3.1 Data Description

Based on the SPSS output in Table 1, it can be explained that the pretest value of the experimental class 1, namely class V Public Primary School No. 3 Tuwang, Demak Regency, got a minimum score of 46.7, while the maximum value was 66.7 and the mean or average was 52.7; Standard deviation 5.5293. in the post-test test experimental class 1 has a minimum value of 73.3 while the maximum value of 100, and the average/mean is 90.2 with a standard deviation of 7.7753.

Table 1: Experimental class descriptive statistics

	N	Min.	Max.	Mean	Std. Deviation
Pre-test Experiment 1 (Discovery Learning)	21	46.7	66.7	52.695	5.5293
Post-test Experiment 1 (Discovery Learning)	21	73.3	100.0	90.148	7.7753
Valid N (listwise)	21				

The implementation of learning comes from the Learning Implementation Plan. The contents of the observation sheet are in the form of learning activities carried out by teachers and students during the learning process. The

implementation observation sheet in the form of a checklist (yes/no) for the implementation of teacher and student activities during the learning process, explained that the discovery learning model in experimental class 1 which was carried out in class V Public Primary School No. 3 Pour, Demak Regency was in the good category with a score of 80%. It shows that the stages or syntax of the discovery learning model starting from the preliminary activities, core, and closing activities have been carried out properly.

3.2 Descriptive Statistics of Control Class

Based on Table 2, it can be explained that the control class pretest, namely class V at Public Primary School Undaan Kidul, Demak Regency, got a minimum score of 33.3 while the maximum value was 66.7 and the mean or average was 53.3, the standard deviation was 7.4974. In the post-test test, the control class has a minimum score of 40 while the maximum value is 80, the average/mean is 64.665, and the standard deviation is 10.3987.

Table 2: Control class descriptive statistics

	N	Min.	Max.	Mean	Std. Deviation
Pre-test Control	20	33.3	66.7	53.325	7.4974
Post-test Control	20	40.0	80.0	64.665	10.3987
Valid N (listwise)	20				

3.3 Data Analysis

3.3.1 Validity Test

Validity is a measure that shows the levels of validity or validity of an instrument. An instrument is said to be valid if it can measure what is desired and can reveal data from the variables studied appropriately. The high and low validity of the instrument shows the extent to which the data collected does not deviate from the description of the intended validity (Taherdoost, 2016). Based on the results of the SPSS output, it can be seen that the multiple-choice questions which amounted to 15 questions after the validity test was declared valid and could be used as research instruments.

3.3.2 Reliability Test

The reliability of the instrument or evaluation tool is the determination of the evaluation tool in measuring something from students (Chan & Idris, 2017). An evaluation tool is said to be reliable if the evaluation results are relatively constant if used for different subjects and times.

Table 3: Reliability test

Cronbach's Alpha	N of Items
.833	55

The reliability test used Cronbach Alpha consisted of 15 test items and then the results obtained were analyzed. The value of the reliability coefficient obtained is 0.833, which is greater than 0.60, so it can be concluded that the pretest and posttest questions regarding blood circulation are said to be reliable/consistent. The magnitude of the reliability correlation is in the very high category.

3.3.3 Normality Test

A normality test was conducted to test whether all variables were normally distributed or not. The normality test used the Kolmogorov-Smirnov formula and the Shapiro-Wilk test in calculations used the SPSS 24 program. To find out whether it is normal or not, if sig > 0.05 it is normal, and if sig < 0.05 it can be said to be abnormal. The results of the normality test of the pretest and post-test data on learning outcomes in science learning class V on the blood circulation material in the table above, it appeared that the significance value is greater than 0.05 at the 5% significance level (Schmidt & Finan, 2018). Therefore, the null hypothesis (H0) for each class is accepted. It is concluded that the data in each class comes from a normally distributed population. The assumption of normality is necessary because if the normality is not met, the decision to test the hypothesis (t-test) obtained is invalid.

3.3.4 Homogeneity Test

The homogeneity test is used to measure whether the two classes come from a homogeneous population, meaning that the ability of all students is the same.

Table 4: Homogeneity test results

		Levene Statistic	Df1	Df2	Sig.
Student achievement on blood circulation topic	Based on Mean	.506	2	60	.606
	Based on Median	.648	2	60	.527
	Based on Median and with adjusted df	.648	2	59.519	.527
	Based on trimmed mean	.504	2	60	.607

Based on the results of the SPSS version 24 output, it is known that the results of the significance value (sig) based on the mean are 0.606 > 0.05 at the 5% level, so it can be concluded that the variance of the pretest and post-test data in the experimental class 1, experiment 2 and the control class are same or homogeneous. Thus, one of the requirements of the independent sample t-test is fulfilled.

3.3.5 Average Similarity Test

The average similarity test was carried out to find out whether the two sample classes departed from the same average condition or not.

Table 5: Significant value on pretest and posttest

Categories	Sig. Value	Decision	Description
Pre-test	.964	.964 > 0.05	Experimental and control classes have the same average score or the same initial ability of students
Post-test	.000	.000 < 0.05	Experimental and control classes have different average scores or students' abilities after being treated with different learning models have different abilities

Based on the results of the analysis of the average similarity test of student learning outcomes before learning was carried out in the experimental and control classes using One-Way Anova, it was obtained a significance value of 0.964 > 0.05, so it can be concluded that the two classes (experimental and control), have the same average score or the initial ability of the experimental class students is not better than the control class. While the results of the analysis of the average similarity test of student learning outcomes after learning in the experimental class 1 and experimental class 2 and the control class using One-Way Anova obtained a significant value of learning outcomes of 0.000 < 0.05, it can be concluded that both these classes (experimental and control), have unequal or non-identical (significantly different) means.

3.3.6 Independent Sample T Test

Based on the independent sample t-test, the equal variance assumed obtained a T-count of 8.916 > T-table 2.02269 and a significance level of 0.000 <0.05. These results indicate that there is a difference between discovery learning and direct learning in terms of student learning outcomes in the fifth-grade blood circulation material at Public Elementary School Gugus Garuda Demak. It can be said that student learning outcomes with discovery learning and direct learning are different.

Table 6: T-test results of discovery learning and direct learning

		Levene Statistic		t-test for Equality of Means		
		F	Sig.	t	df	Sig. (2-tailed)
Student achievement on blood circulation topic	Equal variances assumed	1.180	.284	8.916	39	.000
	Equal variances not assumed			8.853	35.152	.000

Based on Table 7, the mean value of the discovery learning model is 90.148 and direct learning is 64.665. This value means that the average learning outcomes of students using the discovery learning model are 90,148 and the results of studying blood circulation materials for students with direct learning are 64,665. Thus, it can be said that the learning outcomes of blood circulation materials among students with discovery learning models are higher than students with direct learning. These results can be concluded that the discovery learning model is more effective in improving the learning outcomes of circulation materials compared to direct learning.

Table 7: Discovery learning and direct learning statistics group

	Class	N	Mean	Std. Deviation	Std. Error Mean
Student achievement on blood circulation topic	Discovery Learning	21	90.148	7.7753	1.6967
	Direct Learning	20	64.665	10.3987	2.3252

4. Result and Discussion

Based on the independent sample t-test test, the equal variance assumed obtained a T-count of 8.916 > T-table 2.02269 and a significance level of 0.000 <0.05. These results indicate that there is a difference between discovery learning and direct learning in terms of student learning outcomes in the fifth-grade blood circulation material at Public Elementary School Gugus Garuda Demak. It can be said that student learning outcomes with discovery learning and direct learning are different.

Based on the results of the Statistic Group, the mean value of the discovery learning model was 90.148 and the direct learning model was 64.665. This value means that the average learning outcomes of students using the discovery learning model are 90,148 and the results of studying blood circulation materials for students with direct learning are 64.665. Thus, it can be said that the learning outcomes of blood circulation materials among students with discovery learning models are higher than students with direct learning. These results can be concluded that the discovery learning model is more effective in improving the learning outcomes of circulation materials compared to direct learning (Amin et al., 2021).

In line with research conducted by Hariawan et al. (2017) that there are significant differences in science learning outcomes between students who learned using the discovery learning model and students who learned using the direct learning model, where the average science learning outcomes used the discovery learning model are higher than those who used the discovery learning model with the average learning outcomes of students who learned using the direct learning model. Likewise, Nurcahyo & Djono (2020) showed that the learning outcomes of students' history who used the Discovery Learning model are higher than the results of students' history learning who used the direct learning model.

The learning process that used the Discovery Learning model puts more emphasis on student's critical thinking skills which are expected to improve the learning outcomes obtained by students (Duran & Dökme, 2016). The discovery learning model prioritizes the investigation process as scientists do in studying principles or concepts. So, students are expected to experience the process of finding out the truth about knowledge for themselves. The statement put forward by Arinawati (2014) is that students will be more aware of the investigation process if they are taught about scientific procedures directly. In line with constructivism, which is an effort to gain understanding and knowledge, students construct or build an understanding of the phenomena encountered by using experience in cognitive structures. The discovery learning model has enormous implications for improving life skills and growing scientific attitudes (Al-Tabany, 2017).

The use of the Discovery Learning model in science learning, especially in the blood circulation material in this study was given because science learning is not just a rote lesson but a lesson that should invite students to be able to solve problems and be able to solve critical problems from each learning process given by educators or teachers.

The results of this research are from Ardianto, Mulyono, & Handayani (2019) shows that the Discovery Learning model assisted by Cabri II Plus 1.4 and teaching aids was more effective in improving student learning outcomes in the triangle and quadrilateral material for Class VII compared to the Think-Talk-Learning model. Write (TTW) with the help of Cabri II Plus 1.4 and props.

Another consistent research was found in the results of Kusuma et al. (2020) which stated that the Discovery Learning model was more effective than the TTW learning model in improving Mathematics Learning Outcomes for Grade 4 Elementary School.

Differences in science learning outcomes on blood circulation material in grade 5 elementary school occur because the experimental group using the Discovery Learning model has several advantages such as students being able to improve skills in solving problems, and students feeling happy. After all, they can find the final results of their initiative. Compared with the experimental class using the TTW learning model.

This is following the opinion of Hosnan (2014) that the main characteristics of learning to find, namely: 1) exploring and solving problems to create, combine, and generalize knowledge; 2) student-centered; 3) activities to combine new knowledge and existing knowledge.

5. Conclusion

Based on the explanation in chapter four of the research entitled The Effectiveness of the Discovery Learning Model on Science Learning Outcomes in Class V Elementary School Blood Circulation, Garuda Demak Elementary School 2021, the following conclusions can be drawn:

The Discovery learning model is more effective in improving student learning outcomes in grade V elementary school blood circulation material compared to direct learning. These results are based on the statistical group, the mean value of the discovery learning model is 90.148 and the direct learning model is 64.665. So it can be said that the learning outcomes of blood circulation materials among students with discovery learning models are higher than students with direct learning.

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