

The Effect of Discovery Learning vs Conventional and Auditorial vs Kinesthetic Learning Styles on Elementary School Students' Mathematics Learning Outcomes

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Abstract: This study aims to determine the effect of Discovery Learning strategies and Learning Styles on Student Learning Outcomes at SD Negeri Solear II, Tangerang Regency - Banten. To measure the achievement of objectives by comparing student learning outcomes between Discovery learning and conventional learning strategies and measuring the influence of student learning styles between auditory and conventional on learning outcomes. This research is experimental research. The population of this study were all fifth-grade students at SDN Solear II Tangerang Regency, totaling 74 students consisting of two classes, with details of 37 students in VA class and 37 students in VB class. The sample in this study were 40 students consisting of VB class as the experimental class and VA class as the control class. The instruments in this study were 5 items in the form of essays which were carried out during the pre-test and post-test as well as instruments to measure students' learning styles. The results of the data analysis found that there was a difference in the average value of improving students' mathematics learning outcomes between the control class and the experimental class, where the control class had an average score of 66.75 and was lower than the experimental class which reached 78.75. This means that there is an influence of Discovery Learning strategies and student learning styles on student mathematics learning outcomes.

Keywords: Discovery Learning, Learning Outcomes, Learning Styles

A. Introduction

Education is currently an indicator of the progress of a country, so that currently countries in the world are competing to advance the quality of their education in order to be able to compete in the global era (Altbach et, at, 2019). Education will shape creative, innovative, broad-minded individuals who have potential and brilliant ideas for themselves in the future. This is in accordance with Law no. 20 of 2003 Article 1 paragraph 1 concerning the National Education System.

Several studies have proven that the Discovery Learning method can influence student learning outcomes. Like the research conducted by (Ardianto, et. al., 2019),

who examined the influence of the Discovery Learning method on the mathematics learning outcomes of Grade VIII students of SMP Negeri 7 Lubuklinggau. This can be seen from the average value of student learning outcomes with the Discovery Learning method, which turns out to have better results than students with conventional learning, such as in the experimental class 79.02 and the control class 62.41.

One of the factors that can improve learning outcomes in the Discovery Learning method is verification because at this stage the discovery process occurs which causes students to be active in learning (Djamas and Ramli, 2019). When students are actively involved in the learning process, students are able to remember longer the concepts of the material being taught. Based on observations made at SDN Solear II, it was found that the learning outcomes achieved by the fifth-grade students were mostly not optimal. The following presents data on the results of the 2018/2019 odd semester daily tests, namely as follows:

Table 1. Odd Semester Daily Test Results for Class V SDN Solear II Academic Year 2018/2019

No	KKM	Score	Class			
			VA Amount	Percentage	VB Amount	Percentage
1		≥ 60	10	27	9	24
2	60	< 60	27	73	28	76
	Total		37	100	37	100

Based on Table 1 above, students who scored above the minimum completeness criteria (KKM), namely with a score of ≥ 60 totaled 19 students out of 74 students or as many as 26%, this means that only 26% of students were able to achieve KKM. Meanwhile, as many as 55 or 74% of students did not reach the KKM. From the above results it can be concluded that the learning outcomes of class V students at SDN Solear II are relatively low.

Adelia and Surya (2017) states that discovery is a mental process in which students are able to assimilate a concept or principle. These mental processes include: the process of observing, the process of digesting, the process of understanding, the process of classifying, the process of making assumptions, the process of explaining, the process of measuring, the process of making conclusions and so on. In other words, if students are actively involved in discovering a basic principle for themselves, then they will understand the concept better, make a lasting impression on their memory and will be able to use it in other contexts. In line with Nbina (2013) states that the discovery method is a teaching method that is arranged in such a way that children acquire knowledge that they did not previously know, not through notification, where some or all of the knowledge is discovered by students themselves with the help of the teacher. Based on the explanation above, in this study the problem formulation was formulated as follows "How do Learning Strategies (Discovery vs.

Conventional) and Learning Styles (Auditorial vs. Kinesthetic) Influence the Learning Outcomes of Mathematics for Elementary School Students?"

B. Methods

The research design can be described in the table below:

Table 2. Research Design

Learning Style (B)	Learning Strategies (A)	
	Discovery Learning (A1)	Conventional (A2)
Auditorial (B1)	A1B1	A2B1
Kinesthetic (B2)	A1B2	A2B2

(Putrawan, 2017)

Note:

- A1 : Group of students who are taught by using the strategy learning Discovery Learning.
- A2 : Groups of students who are taught using the strategy conventional learning.
- B1 : Group of students who have an auditory learning style.
- B2 : Group of students who have a kinesthetic learning style.
- A1B1 : Group of students taught using the strategy Discovery Learning that has a learning style auditory.
- A1B2 : Group of students taught using the strategy learning Discovery Learning and kinesthetic learning styles.
- A2B1 : Group of students taught using a model conventional and auditory learning styles
- A2B2 : Group of students taught using a model conventional and kinesthetic learning style.

The population selected in this study were students of SDN Solear II, and the subjects of the sample were students of class V which consisted of class VA as the control class and class VB as the experimental class. The reason the researcher chose this class was because it had relatively the same basic mathematical ability, meaning that it was not a class that was considered superior. I took 10 students for the auditory learning style and 10 students for the kinesthetic learning style in each class group, both the experimental class and the control class. This is based on the results of the distribution of learning style instruments to students which are then sorted and then counted as much as 27% in the upper group and 27% in the lower group.

Table 3. Giving Treatment Each Class Group

Type	Treatment	
	Discovery Learning	Conventional
Auditorial	10	10
Kinesthetic	10	10
Total	20	20

In collecting data in this study using a test instrument (Marrelli, 2007). Grid Questions to Measure Students' Mathematics Learning Outcomes. The researcher made a grid of questions to measure students' learning outcomes in mathematics, as well as to find out the condition of the indicators of the variables in the study.

Table 4. Grids Instruments Variable Student Mathematics Learning Outcomes (Y)

Indicator	No Question	Category					
		C1	C2	C3	C4	C5	C6
Mention objects around that resemble simple flat shapes	1	√					
Explain the meaning of triangle and rectangle	2		√				
Identify the properties of triangles and rectangles	3	√					
Calculate the circumference of a flat shape	4		√				
Calculate the combined area of a flat shape	5		√				

This Learning Style Scale has been developed based on the independent variable learning style which has three sub-variables, namely Visual, Auditory, and Kinesthetic learning styles. After that, each sub-variable was viewed based on its characteristics which had been described in the Literature Review and then summarized by the researcher into indicators which were then translated into descriptors and finally translated into statement items with positive and negative values. The data contained in this research is both quantitative and qualitative data (Ginsburg et al, 2017). Quantitative data are numbers obtained from the pretest and posttest. For qualitative data, namely questionnaires about student learning styles (Ridlo, 2020). For data collection procedures for the Learning Style variable in this study, the Learning Style Scale used a questionnaire & documentation method.

C. Results and Discussion

The research was conducted in February 2023 at SMAN 1 Sukoharjo, Central Java involving a total sample of 202 individuals from classes X students.

Table 5. Two-Way Anova)
 Tests of Between-Subjects Effects

Dependent Variable: Mathematics Learning Outcomes

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	1802.500 ^a	3	600.833	19.753	.000
Intercept	211702.500	1	211702.500	6.960E3	.000
Learning strategies	1440.000	1	1440.000	47.342	.000
Learning Style	160.000	1	160.000	5.260	.028
Learning strategies * Learning Style	202.500	1	202.500	6.658	.014
Error	1095.000	36	30.417		
Total	214600.000	40			
Corrected Total	2897.500	39			

a. R Squared = ,622 (Adjusted R Squared = ,591)

Table 6. Advanced Tukey Test
 Multiple Comparisons

Tukey HSD Student Mathematics Learning Outcomes

(I) Class	(J) Class	Mean Difference (I-J)	Std. Error	Sig.
Auditorial Experiment	Experimental Kinesthetics	8.500*	2.466	.008
	Auditorial Control	16.500*	2.466	.000
	Kinesthetic Control	16.000*	2.466	.000
Kinesthetic Experiment	Auditorial Experiment	-8.500*	2.466	.008
	Auditorial Control	8.000*	2.466	.013
	Kinesthetic Control	7.500*	2.466	.022
Auditorial Control	Auditorial Experiment	-16.500*	2.466	.000
	Kinesthetic Experiment	-8.000*	2.466	.013
	Kinesthetic Control	-.500	2.466	.997
Kinesthetic Control	Auditorial Experiment	-16.000*	2.466	.000
	Kinesthetic Experiment	-7.500*	2.466	.022
	Auditorial Control	.500	2.466	.997

*. The mean difference is significant at the 0.05 level.

From the results of the two-way ANOVA test and the advanced Tukey test, the results of the study can be concluded as follows.

Based on the results of the study, there was a significant difference in the learning outcomes of students who were taught with Discovery Learning strategies and those who were taught with conventional learning strategies. These results can be seen from

the previously calculated two-way ANOVA test, where the F-count value for the Discovery Learning strategy is $47.3 > 6.11$.

There are differences in mathematics learning outcomes between students who have an auditory learning style who are taught with Discovery Learning strategies and students who have an auditory learning style who are taught with conventional learning strategies (Fadlilah et al, 2020). Based on the results of the advanced Tukey test, it was stated that there were differences in mathematics learning outcomes between students who had an auditory learning style who were taught by Discovery Learning strategies and students who had an auditory learning style who were taught by conventional learning strategies (Putri and Saputro, 2019). This means that H_0 is rejected and H_a is accepted. This is in accordance with the calculated significance value which is smaller than the table significance value. Or $0.000 < 0.05$.

There are differences in mathematics learning outcomes between students who have a kinesthetic learning style who are taught by Discovery Learning strategies and students who have an auditory learning style who are taught by conventional strategies (Malacapay, 2019). Based on the results of the advanced Tukey test, it was stated that there were differences in mathematics learning outcomes between students who had a kinesthetic learning style who were taught by Discovery Learning strategies and students who had an auditory learning style who were taught by conventional learning strategies. This means that H_0 is rejected and H_a is accepted. This is in accordance with the calculated significance value which is smaller than the table significance value or $0.013 < 0.05$.

There are differences in mathematics learning outcomes between students who have a kinesthetic learning style who are taught by Discovery Learning strategies and students who have a kinesthetic learning style who are taught by conventional learning strategies. Based on the results of the advanced Tukey test, it was stated that there were differences in mathematics learning outcomes between students who had a kinesthetic learning style who were taught by Discovery Learning strategies and students who had a kinesthetic learning style who were taught by conventional learning strategies. This means that H_0 is rejected and H_a is accepted. This is in accordance with the calculated significance value which is smaller than the table significance value. Or $0.022 < 0.05$.

There is an interaction between the use of Discovery Learning strategies and student learning styles on student mathematics learning outcomes (Prince and Felder, 2006). From the results of the two-way ANOVA testing above, it can be seen that the F-count value for Discovery Learning strategies and learning styles is 6.65, which means $>$ from the F-table value of 6.11 so that it can be concluded that there is an interaction between Discovery Learning strategies and conventional learning strategies towards student mathematics learning outcomes. In other words, H_0 is rejected and H_a is accepted. This is in accordance with the value of F-count $>$ F-table, namely $6.65 > 6.11$.

D. Conclusion

The mathematics learning outcomes of students who were taught with Discovery Learning strategies and those who were taught with conventional learning strategies had significant differences. These results can be seen from the previously calculated two-way ANOVA test, where the F-count value for the Discovery Learning strategy is $47.34 > 6.11$. There are differences in mathematics learning outcomes between students who have an auditory learning style who are taught by Discovery Learning strategies and students who have an auditory learning style who are taught by conventional learning strategies. There are differences in mathematics learning outcomes between students who have a kinesthetic learning style who are taught by Discovery Learning strategies and students who have an auditory learning style who are taught by conventional learning strategies. There are differences in mathematics learning outcomes between students who have kinesthetic learning styles who are taught by Discovery Learning strategies and students who have kinesthetic learning styles who are taught by conventional learning strategies.

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