Improving Critical Thinking Skills Through Discovery Learning: Case Study at SMP Negeri 2 Central Kupang

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Article Info	ABSTRACT (9)
	The aim of this research is to determine the influence of the Discovery Learning model towards the critical thinking skills of grade VII students at SMP Negeri 2 Kupang Tengah. This type of quantitative research uses a quasi experimental method. The research results show that the score of critical thinking skills of the students in experimental classes with an average posttest score of 80.46 higher than the pretest which is 50.04. Meanwhile, in the control class, the average pretest score was 45.21 and the average posttest score was 67.14. The results of the anacova test using the one-way anacova statistical analysis technique with the help of SPSS Version 23 obtained a probability value (sig) of 0.000 < from the set significant value of 0.05. This the null hypothesis which states that there is no influence of the Discovery Learning model on students' critical thinking skills is rejected and the alternative hypothesis which states that there is an influence of the Discovery Learning model on students' critical thinking skills is accepted. The conclusion of this research is that the Discovery Learning model influences the critical thinking skills of grade VII students at UPTD SMP Negeri 2 Kupang.

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1. INTRODUCTION

Critical thinking skills are basic skills in evaluating and deciding on actions. Critical thinking skills are very important to develop in students, especially in the 21st century which is full of competition (Setyawan & Kristanti, 2021; Kusumawati et al., 2022; Wibowo et al., 2024). Critical thinking skills include the ability to access, analyze, synthesize information that can be taught, trained and mastered. Apart from these skills, critical thinking skills also describe other skills such as communication and information skills, as well as the skills to examine, analyze, interpret and evaluate evidence. Therefore, students need critical thinking skills to face the era of digital literacy where information is abundant from various sources and unknown truth. When students have critical thinking skills, they don't just believe in the facts around them without proof, but try to prove that the information is truly valid and can be accounted for. (Saputri, 2020; Satwika et al., 2018). Based on the results of interviews with science teachers at SMP Negeri 2 Kupang Tengah, information was obtained that learning activities at the school had implemented the Merdeka curriculum. Students' critical thinking skills, especially in science subjects, are less prominent among students because teachers only provide direct knowledge to students without giving them the opportunity to actively participate in learning. Many students just sit there listening but do not understand what the teacher is saying. Therefore, to train and improve the students' critical thinking skills, it is necessary to apply a learning model that is able to create an active learning atmosphere for students, foster cooperation between students, and solve problems. Based on this problem, the learning model that is able to improve students' critical thinking skills in learning is the Discovery Learning model.

The Discovery Learning model may enable students to have the opportunity to be actively involved in learning (Setyawan & Kristanti, 2021), guide students to discover for themselves the knowledge they want to convey in learning (Uskono & Natonis, 2024), and students are involved in the process of mental activities through exchanging opinions, discussing, reading for themselves and trying for themselves, so that students can learn independently. (Putri & Prihatnani, 2020). In the learning process with Discovery Learning, the teacher only acts as a guide and facilitator who guide the students to make discoveries about related subjects (Istidah et al., 2022). The purpose of this research is to determine the effectiveness of the Discovery Learning model on critical thinking skills of the students of Class VII SMP Negeri 2 Central Kupang, East Nusa Tenggara Province

2. RESEARCH METHOD

The type of research used is quantitative research with the Quasi Experiment method. (Koy & Kofemnuke, 2024). The sampling technique used was Purposive Sampling (Reski et al., 2023). Purposive sampling is a non-random sampling technique where the researcher determines sampling by determining special characteristics that are in accordance with the research objectives so that it is hoped that they can answer the research problem (Ahmatika, 2023). The design used in this research is a nonequivalent control group design (Fakhriyah, 2014), only in this design the experimental group and control group are not chosen randomly. This research design can be seen as follows:
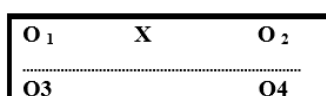
O_1	X	O_2
$O3$		$O4$

Figure 1. *Nonequivalent control group design*

(Sugiyono, 2018)

Information:

O_1 = Pretest in the experimental class
O_2 = Posttest in the experimental class
X = Treatment
O_3 = Pretest in the control class
O_4 = Posttest in the control class

In this research, data was obtained through test techniques. The type of test given is questions in the form of essays or descriptions. Test data was obtained from the results of the initial test (pretest) and final test (posttest). A pretest was given to the two research sample classes to measure the students' initial skills before being given treatment. Posttests were also given to the two sample classes, but these posttests were given to measure the results of the treatment that had been given. Data analysis uses descriptive analysis to determine the average critical thinking skills of students, as well as inferential analysis by carrying out normality tests, homogeneity tests and Anacova tests to determine the effectiveness of learning models on students' critical thinking skills.

3. RESULTS AND DISCUSSION

Analysis of Students' Critical Thinking Skills

Students' critical thinking skills are obtained from giving an initial test (pretest) and final test (posttest) in the form of an essay or description of 10 questions. The initial test (pretest) was carried out to measure the initial skills of experimental class students before the Discovery Learning model was applied and the control class to determine students' skills before being given an independent study guide using each student's preferred learning method regarding the human excretory system material. Meanwhile, the final test is carried out after implementing the Discovery Learning model and the direct learning model to determine the extent of students' skills after participating in learning activities. The following presents a recapitulation of the critical thinking ability test results of students in the experimental class which used the Discovery Learning model and the control class which used the direct learning model in the table below.

Table 1. Recapitulation of Pretest and Posttest scores for students' critical thinking skills using the Discovery Learning Model and Direct Learning Model.

Descriptive statistics	Experimental Class		Control Class	
	Pretest	*Posttest*	*Pretest*	*Posttest*
Number of Samples	28	28	28	28
Average	52.04	80.46	45.21	67.14
Enhancement		28.42		21.93
Completeness Presentation		92.86		39.28
The highest score	76	97	60	78
Lowest Value	32	60	30	50

Posttest result value is greater than the pretest *value.* This can be seen in the average pretest and posttest scores which have increased in the Discovery Learning model from 52.04 to 80.46, while in classes that use direct learning from 45.21 to 67.14. The completeness presentation of students in the Discovery Learning model was 92.86 or 26 students scored above the KKM, and the completeness presentation for classes that used direct learning was 39.28 or 11 students scored above the KKM. The increase in the average score for both learning methods shows effectiveness in improving students' critical thinking skills (Syafitri et al., 2021; Yulianti et al., 2022). However, a more significant increase was seen in the Discovery Learning model with an increase of 28.42 compared to direct learning which only increased by 21.93. This shows that the Discovery Learning model is more effective in improving students' critical thinking skills compared to direct learning. The percentage of achievement of each critical thinking ability indicator can be seen in table 2 below

Table 2. Percentage of Achievement of Students' Critical Thinking Ability

Critical Thinking Indicators	Experimental Class (%)		Control Class (%)	
	Pretest	*Posttest*	*Pretest*	*Posttest*
Interpretation	37.65%	83.99%	37.39%	60.59%
Evaluation	31.43%	62.86%	33.04%	44.29%
Inference	51.07%	71.07%	32.50%	69.64%
Explanation	72.68%	89.82%	62.23%	80.18%

Table 2 above shows that there is a difference in the average achievement percentage of the pretest and posttest for the experimental class and the control class for the four indicators of students' critical thinking skills. The average achievement percentage for each indicator shows an increase after each class is given a different learning model. It can be seen that the critical thinking ability indicators for the experimental class that uses the Discovery Learning model are greater than those for the control class that uses the direct learning model. In line with (Wulandari, 2016, which examined the application of Discovery Learning to class VII students and found that the posttest results of students' critical thinking skills increased significantly compared to the pretest results. This shows that students who learn through the Discovery Learning model experience an increase in their skills to analyze, evaluate and compose arguments after learning. The average posttest score of students is much higher than the pretest score, indicating positive development in critical thinking skills. Meanwhile, (Setyawan & Kristanti, 2021) he revealed that Discovery Learning can help students develop analytical and critical thinking skills. This is caused by the Discovery Learning approach which encourages students to actively search for information, analyze data, and make conclusions based on their own discoveries. Zubaidah (2014), Putri & Prihatnani (2020) concluded that the method not only makes students more critical, but also more creative in solving problems and thinking deeply about the material being studied.

Discovery Learning Model on Students' Critical Thinking Skills

The initial step and measure the effectiveness of the Discovery Learning model is to carry out a Normality test. The Normality Test is a test carried out to determine whether the distribution of the data that has been collected is normal or not (Siak et al., 2023). The results of the normality test of this research data, both pretest data and posttest data, show values greater than 0.05. This value shows that the data in this study is normally distributed (Safitri & Mediatati, 2021). This normality test was carried out using the *Kolmogrov-Sminrov* test with the help of SSPS version 23. A summary of the normality test results can be seen in table 3.

Table 3. Normality test of pretest and posttest data on students' critical thinking skills using the Discovery Learning model and Direct Learning model

	Class	Kolmogorov-Smirnov [a]			Shapiro-Wilk		
		Statistics	Df	Sig.	Statistics	Df	Sig.
critical thinking	experimental pretest	.103	28	,200 [*]	,952	28	,223
	experimental posttest	,178	28	.023	,917	28	,030
	control pretest	,157	28	,074	,942	28	.128
	control posttest	,189	28	.012	,941	28	.116

*. This is a lower bound of the true significance.
a. Lilliefors Significance Correction

Table 3 shows the probability value (sig). in the classes that use the Discovery Learning model, the pretest is 0.200 and the posttest is 0.023, which is greater than the 0.05 significance level. Meanwhile, in classes that use the direct learning model, the probability value (sig.) for the pretest is 0.074 and the posttest is 0.012, where the

value is greater than the 0.05 significance level. So it can be said that the data for both classes is normally distributed. After the data is said to be normal, it is continued with a homogeneity test.

The Homogeneity Test is used to determine whether a data variant from two or more groups is the same or not (Satwika et al., 2018). In this study, the homogeneity test used was the *levene* test with the help of SPSS version 23. The test results can be presented in table 4.

Table 4.6 Homogeneity test of pretest and posttest data on students' critical thinking skills using the Discovery Learning model and Direct Learning model

		Levene Statistics	df1	df2	Sig.
Critical thinking	Based on Mean	3,036	3	108	,032
	Based on Median	2,634	3	108	,054
	Based on Median and with adjusted df	2,634	3	95.142	,054
	Based on trimmed mean	3,159	3	108	.028

From table 4, based on mean*,* it shows that the probability value (sig.) of students' critical thinking skills using the Discovery Learning model and using the direct learning model has a probability value (sig.) of 0.032 which is greater than the significance level of 0.05. This shows that there is no difference in variance between data groups so that the data on students' critical thinking skills is declared homogeneous. Next, an Anacova test was carried out using the one- way Anacova statistical analysis technique with the help of SPSS version 23 with the aim of finding out whether there was an effect of applying the Discovery Learning model on students' critical thinking skills. The calculation results are presented in table 5.

Table 5. Data covariance analysis test of students' thinking skills using the Discovery Learning model and Direct Learning model.

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	2484.446 [a]	1	2484.446	33,841	,000	,385
Intercept	305030.161	1	305030.161	4154.893	,000	,987
Class	2484.446	1	2484.446	33,841	,000	,385
Error	3964.393	54	73,415			
Total	311479,000	56				
Corrected Total	6448.839	55				

R Squared = .385 (Adjusted R Squared = .374)

Based on table 5 above, the significant class value is 0.000. Because the significant value is far below 0.05, it can be concluded that there is an influence of the Discovery Learning model on students' critical thinking skills.

Research that assesses the effectiveness of the Discovery Learning model on students' critical thinking skills often uses various statistical tests to ensure the validity and reliability of the results. The research carried out (Putri & Prihatnani, 2020) used the normality test, homogeneity test, and ANCOVA test to ensure the accuracy of the results. The main findings are: Normality Test**,** The pretest and posttest scores show a normal distribution. Homogeneity Test**,** the variance between the experimental and control groups is homogeneous while the ANCOVA Test**,** after controlling for the pretest, the results show that the experimental group that used Discovery Learning had a significantly higher posttest score than the control group, confirming the effectiveness of this model in improving critical thinking skills.

(Uslan et al., 2024) in his research used three statistical tests to evaluate the effectiveness of Discovery Learning. The research results showed: Normality Test with normal distribution of pretest and posttest scores, Homogeneity of Variance Test between the experimental and homogeneous control groups, and ANCOVA Test : After controlling for pretest scores, the results showed that the group being taught using Discovery Learning had significantly higher posttest scores compared to the control group, indicating the effectiveness of this method in improving critical thinking skills.

Discovery Learning model is cognitive learning that requires teachers to be more creative in creating situations that can make students learn actively to discover their own knowledge (Agnafia, 2018). According to (Ramdani et al., 2020), the process of finding your own knowledge can be done through discussing, reading and trying it yourself, searching for information from various sources independently. (Istidah et al., 2022) conducted research on the implementation of Discovery Learning in class VII and found that this method was effective in improving critical thinking skills. Researchers note that students who learn through Discovery Learning show better skills in analyzing information, compiling arguments, and evaluating results compared to students who

learn through conventional methods. This research emphasizes the importance of a learning environment that supports exploration and experimentation as a major factor in such improvement.

Reski et al.,(2023) in his research stated that Discovery Learning is able to encourage students to be actively involved in the learning process, which in turn improves their critical thinking skills. Students taught using this method are more skilled at making logical conclusions and asking in-depth questions. This research also shows that Discovery Learning can help students develop self-confidence and independence in learning. In general, previous researchers agree that the Discovery Learning model is effective in improving students' critical thinking skills. They found that this method encouraged students' active engagement, independence, and learning motivation, all of which contributed to the development of critical thinking skills. However, researchers also emphasize the importance of thorough preparation and support from teachers to ensure the successful implementation of Discovery Learning. These findings support the argument that Discovery Learning is a useful approach in education, particularly in developing critical thinking skills that are important for academic success and everyday life.

Learning using the Discovery Learning model places more emphasis on students searching for and finding information themselves to answer questions given by the teachers (Riku, 2021). Meanwhile, in the direct learning model, students are not actively involved, so students have difficulty bringing out their best skills (Ningsyih et al., 2016;Oktariani & Ekadiansyah, 2020). In the Discovery Learning model, the teacher does not immediately provide final results or conclusions from the material he has presented, but rather students are given the opportunity to search and discover for themselves so that students' memories of the human excretory system material last a long time. This is in line with an opinion (Ahmatika, 2023), which says that Discovery Learning is a model for developing an active way of learning by discovering it yourself, investigating it yourself, so that the results obtained will be loyal and long-lasting in memory.

4. CONCLUSION

Based on the research results obtained, it can be concluded that the Discovery Learning Model has an influence on the critical thinking skills of class VII students at UPTD SMP Negeri 2 Kupang Tengah. This is proven by the results of the inferential analysis which obtained a probability value (sig.) of $0.000 < 0.05$.

5. ACKNOWLEDGEMENT

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