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ANALYSIS OF THE IMPLEMENTATION OF THE DISCOVERY LEARNING MODEL ON THE CRITICAL THINKING SKILLS OF ELEMENTARY SCHOOL STUDENTS

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ABSTRAK

Penelitian ini bertujuan untuk menganalisis pengaruh model pembelajaran Discovery Learning terhadap kemampuan berpikir kritis siswa pada mata pelajaran Matematika di kelas IV SDN 2 Sukorejo, Lamongan. Penelitian ini menggunakan metode kuantitatif dengan desain Pre-Experimental Design berbentuk The One Group Pretest-Posttest Design. Data dikumpulkan melalui teknik tes yang telah diuji validitas dan reliabilitasnya. Analisis data dilakukan dengan menghitung Mean, N-Gain, uji normalitas, dan uji hipotesis menggunakan paired sample t-test. Hasil penelitian menunjukkan bahwa rata-rata nilai kemampuan berpikir kritis siswa meningkat dari 38,75 pada pre-test menjadi 81,35 pada post-test, dengan nilai N-Gain sebesar 0,72 yang termasuk kategori tinggi. Data pre-test dan post-test berdistribusi normal dengan nilai signifikansi masing-masing sebesar 0,086 dan 0,105. Selanjutnya, hasil uji statistik parametrik dengan paired sample t-test menunjukkan nilai Sig. (2-tailed) sebesar 0,000. Dengan demikian, dapat disimpulkan bahwa terdapat pengaruh signifikan model pembelajaran Discovery Learning terhadap kemampuan berpikir kritis siswa pada mata pelajaran Matematika di kelas IV SDN 2 Sukorejo, Lamongan. Penelitian ini memberikan bukti empiris bahwa model pembelajaran Discovery Learning efektif dalam meningkatkan kemampuan berpikir kritis siswa, khususnya pada pembelajaran Matematika. Hasil penelitian ini juga dapat dijadikan referensi bagi guru dan peneliti untuk mengimplementasikan model pembelajaran serupa guna meningkatkan keterampilan berpikir kritis siswa Sekolah Dasar.

Keywords:
Discovery Learning Model, Critical Thinking Skills, Mathematic

ABSTRACT

This study aims to analyze the influence of the Discovery Learning learning model on students' critical thinking skills in Mathematics in grade IV of SDN 2 Sukorejo, Lamongan. This study uses a quantitative method with a pre-experimental design in the One Group Pretest-Posttest Design. Data is collected through test techniques that have been tested for validity and reliability. Data analysis was carried out by calculating Mean, N-Gain, normality test, and hypothesis test using paired sample t-test. The results showed that the average score of students' critical thinking ability increased from 38.75 in the pre-test to 81.35 in the post-test, with an N-Gain value of 0.72, which is in the high category. The pre-test and post-test data were normally distributed with significance values of 0.086 and 0.105, respectively. Furthermore, the parametric statistical test results with paired sample t-test showed a Sig. (2-tailed) value of 0.000. Thus, it can be concluded that the Discovery Learning learning model significantly influences students' critical thinking skills in Mathematics in grade IV of SDN 2 Sukorejo, Lamongan. This study provides empirical evidence that the Discovery Learning learning model effectively improves students' critical thinking skills, especially in Mathematics learning. The results of this study can also be used as a reference for teachers and researchers to implement similar learning models to improve the critical thinking skills of elementary school students.

INTRODUCTION

The process of teaching and Learning mathematics requires quality teaching to encourage students' way of thinking. The way of thinking that can be used in the process of

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Learning mathematics is critical thinking, which is one of the essential ways for students to understand (Kartika & Rakhmawati, 2022). Critical thinking is an essential skill in 21st-century Learning. Critical thinking skills include accessing, analyzing, and integrating information that can be learned, practiced, and improved. Other critical thinking skills include communication and information gathering, as well as the ability to recognize, analyze, synthesize, and evaluate information (Fauzan dan Arif Setiawan, 2023).

Critical thinking skills are an individual's ability to gather information and solutions to a problem by asking themselves to collect information about problems that are still being resolved (Dewi et al., 2022). Efforts can be made to improve students' critical thinking skills by implementing a suitable Learning model. The use of an appropriate Learning model can encourage the growth of a sense of enjoyment in students towards the teaching and Learning process, increase students' enthusiasm for doing assignments, improve critical thinking skills, and help students understand lessons (Widyaningrum & Suparni, 2023).

Mathematics education, as one of the components of the Independent Curriculum, a curriculum that promotes self-directed Learning and critical thinking, needs to be implemented effectively and enjoyably so that students feel enthusiastic and easily absorb knowledge. Mathematics education is essential for advancing society in the 21st century. So, it is necessary to apply a suitable learning model. Using an appropriate learning model can encourage the growth of a sense of pleasure in students towards the teaching and learning process (Muna & Fathurrahman, 2023).

Based on the results of observations conducted in class IV SDN 2 Sukorejo Lamongan, information was obtained that 92% of 25 students were in the low critical thinking category, and 8% of students were in the medium category. Students' low essential thinking skills are caused by several factors, including the methods teachers use and working on math problems only done by reasoning. Students are less trained in situations such as testing, questioning, connecting, and evaluating a problem (Wedekaningsih et al., 2019). Based on the problems obtained, the researcher provides a solution using the discovery learning model, which focuses students' attention on understanding basic concepts more thoroughly by encouraging them to actively participate in the learning process. Discovery Learning is a learning model that enables students to learn actively by finding and understanding their teaching concepts (Sunarto & Amalia, 2022). The steps of the Discovery Learning model in this study are (Arif et al., 2023): 1). Providing stimulation, 2). Problem identification (Problem Statement), 3). Data collection, 4). Data processing, 5). Verification, 6). Concluding (Generalization) (Marisya & Sukma, 2020). The advantages are that it can make students actively involved in

learning, improve problem-solving skills, and help them communicate well (Dari & Ahmad, 2020).

The reason for using this model is also based on previous research, such as research by (Safitri & Mediatati, 2021) showed the influence of implementing the Discovery Learning model in science learning on grade IV students' critical thinking skills and learning outcomes. Similarly (Prasasti et al., 2019) demonstrated that implementing the Discovery Learning model in Mathematics learning positively affects grade IV students' critical thinking skills and learning outcomes. Research by (Setyawan & Kristanti, 2021) revealed that the Discovery Learning model impacts science learning and the critical thinking skills of grade IV students. (Wedekaningsih et al., 2019) also showed an improvement in the critical thinking skills of grade IV students by applying the Discovery Learning model to mathematics learning. Furthermore, (Fadila et al., 2021) highlighted that applying the Discovery Learning model in science learning influences the critical thinking skills of grade V students. However, based on previous research, there has been no focus on discussing the influence of the discovery learning model on critical thinking skills in mathematics on the material of measuring area and volume at SDN 2 Sukorejo. This study aims to analyze the Discovery Learning model's influence on students' mathematics critical thinking skills in grade IV of SDN 2 Sukorejo Lamongan.

RESEARCH METHOD

This study uses a quantitative research method, namely research that uses numbers starting from collecting data to concluding results (Hendriyani, 2016)This study uses an experimental method without a control class with a One-Group Pretest-Posttest design. In this design, the test was conducted twice: before and after the Discovery Learning model was applied.

The data of this study were collected using observation techniques to determine the learning atmosphere at SDN 2 Sukorejo. Furthermore, the test technique was used to measure critical thinking skills. The test instrument in this study has met the valid criteria with a significance value of rcount greater than rtable and reliable with a reliability level of 0.709 in the high category.

The research data were analyzed to determine the effect of the discovery learning model on students' critical thinking skills through descriptive statistical analysis in the form of scoring with critical thinking skills categories in Table 1, as well as inferential statistical

analysis in the form of prerequisite tests with normality tests to determine whether the data comes from a normally distributed Population or is in a normal distribution (Hanief & Himawanto, 2017) Furthermore, hypothesis testing with paired sample tests. Meanwhile, the data from the normality test analysis results are interpreted with the criteria of significant value (sig) > 0.05, so the research data is normally distributed (Sudaryono, 2021). The hypothesis test is interpreted if the significance value (Asymp. Sig) <0.05, then Ha is accepted, and Ho is rejected (Ramadhani & Bina, 2021).

Table 1. Categories of critical thinking skills

Interpretation (%)	Category
$81.25 < X \leq 100$	Very high
$71.5 < X \leq 81.25$	Tall
$62.5 < X \leq 71.5$	Currently
$43.75 < X \leq 62.5$	Low
$0 < X \leq 43.75$	Very low

(Karim & Normaya, 2015).

RESULTS AND DISCUSSION

Results

This research was conducted at SDN 2 Sukorejo, where the discovery learning model was implemented to improve the critical thinking skills of grade IV students. The results of the student's critical thinking skills are described in Table 2.

Based on Table 2, the average pretest score is 38.75 in the low category, the average post-test score is 81.35 in the very high category, and the N-gain is 0.72 in the high category. This shows an increase of 42.6 in the average critical thinking ability of Mathematics of grade IV students of SDN 2 Sukorejo. The graph of the difference in pretest and posttest scores is in Figure 1.

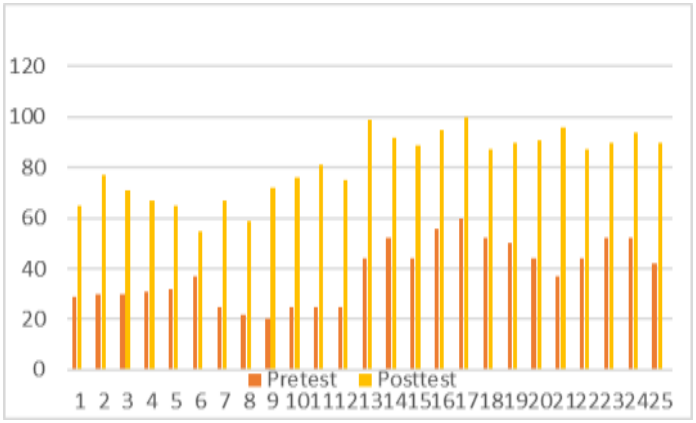

Figure 1. Pretest-posttest diagram of critical thinking skills

Table 2. Pretest-posttest scores of critical thinking skills

No	Pretest	Information	Posttest	Information	N-Gain	information
1	28.75	Very low	65	Currently	0.51	Currently
2	30	Very low	77.5	Tall	0.68	Currently
3	30	Very low	71.25	Tall	0.59	Currently
4	31.25	Very low	67.5	Currently	0.53	Currently
5	32.5	Very low	65	Currently	0.48	Currently
6	37.5	Very low	55	Currently	0.28	Low
7	25	Very low	67.5	Currently	0.57	Currently
8	22.5	Very low	58.75	Currently	0.47	Currently
9	20	Very low	72.5	Tall	0.66	Currently
10	25	Very low	76.25	Tall	0.68	Currently
11	25	Very low	81.25	Tall	0.75	Tall
12	25	Very low	75	Tall	0.67	Currently
13	43.75	Low	98.75	Very high	0.98	Tall
14	52.5	Low	92.5	Very high	0.84	Tall
15	43.75	Low	88.75	Very high	0.80	Tall
16	56.25	Low	95	Very high	0.89	Tall
17	60	Low	100	Very high	1.00	Tall
18	52.5	Low	87.5	Very high	0.74	Tall
19	50	Low	90	Very high	0.80	Tall
20	43.75	Low	91.25	Very high	0.84	Tall
21	37.5	Low	96.25	Very high	0.94	Tall

22	43.75	Low	87.5	Very high	0.78	Tall
23	52.5	Low	90	Very high	0.79	Tall
24	52.5	Low	93.75	Very high	0.87	Tall
25	47.5	Low	90	Very high	0.81	Tall
Amount	968.75		2033.75		17.93	
Mean	38.75	Low	81.35	Very high	0.72	Tall

Furthermore, a prerequisite test was carried out with a normality test to prove the discovery learning model's influence on critical thinking skills, as shown in Table 3.

Table 3. Normality Test Results

Tests of Normality

	Kolmogorov-Smirnov [a]			Shapiro Wilk		
	Statistics	Df	Sig.	Statistics	Df	Sig.
Pre Test	.140	25	.200 *	.930	25	.086
Post Test	.199	25	.115	.934	25	.105

Based on Table 3, the significance value in the Shapiro-Wilk pretest results is 0.086, which means the data is normally distributed, and the posttest results are 0.105, so the significance value is > 0.05, which means the data is normally distributed.

After the data was declared normal, the hypothesis test in this study was parametric (Paired Sample Test), namely with the help of SPSS 26 in Table 5.

Table 4. Hypothesis Testing

Paired Samples Test

		Paired Differences							
					95% Confidence Interval of the Difference				
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper	T	Df	Sig. (2-tailed)
Pair 1	Pre-Test -Post-Test	-34,080	7,041	1,408	-36,986	-31,174	-24.201	24	.000

Based on the calculation results in Table 4, the data obtained are Asymp. Sig. (2-tailed) 0.000 < 0.05 so that Ha is accepted and Ho is rejected, which means there is an influence between the application of the Discovery Learning model on the critical thinking skills of Mathematics in grade IV at SDN 2 Sukorejo.

Discussion

Implementing the discovery learning model in mathematics learning for class IV SDN 2 Sukorejo contains six steps: 1) Stimulation/stimulation, 2). Problem statement/problem identification, 3). Data collection/data collection, 4). Data processing/data processing, 5). Verification/proof, and 6). Generalization/conclusion, at each step of this model, can stimulate students' critical thinking skills (Rhadita et al., 2022).

At the stimulation stage (see Figure 2), the teacher begins learning by asking questions such as "How do you measure the area of cardboard using objects around you such as origami paper and banknotes?" and how do you determine the area using unit squares?", Students read the material as in the student's book then the teacher divides students into five groups and distributes student worksheet (LKPD) as shown in figure 4. Providing interesting stimuli or stimulation in the learning process is very important so that students are stimulated to think, which is the beginning of the formation of critical thinking. Cultivating and improving critical thinking in students is something that can be optimized and learned. Critical thinking is related to how individuals manage their way of thinking based on the stimuli or stimulation they receive (Wibowo et al., 2023).

Figure 2. Stimulation steps

Figure 3. LKPD for measuring area using non-standard units and standard units

At the problem statement/problem identification stage, based on Figure 4, the teacher allows students to identify problems from the questions asked. Students identify the problems that have been given by the teacher together with their groups and compile hypotheses from the questions that have been given in the form of statements. Students who think critically are students who can identify, evaluate, and construct arguments and can solve problems (Firdausi et al., 2021).

Figure 4. Problem statement steps

At the data collection stage, as shown in Figure 5. The teacher provides an opportunity for students to collect information. Students collect as much information as possible about measuring the area of standard and non-standard units to prove whether the hypothesis is true and answer questions to prove the truth of the hypothesis that has been prepared. At this stage, students can collect information and understand it. Which also makes students more active and critical of current problems (Marisya & Sukma, 2020).

Figure 5. Data collection steps

At the data processing stage, as shown in Figure 6, students process data on area measurements using standard and non-standard units with direction from the teacher, then prove the hypothesis by analyzing the data to compile the correct answers. Students and their groups compile concepts that have been understood. This stage can stimulate students' critical thinking skills to solve problems by processing the collected data to prove a concept that exists in the learning environment (Arif & Handayani, 2020; Edi & Rosnawati, 2021).

Figure 6. Data processing steps

At the verification/ proof stage, as shown in Figure 7, the teacher guides students to check the hypothesis carefully. Students, in groups, make presentations in front of the class, and other groups respond to the results of their friends' presentations. This stage is by the critical thinking indicator, namely proof, meaning that students can prove a statement deductively (Prasasti et al., 2019).

Figure 7. Verification steps

At the generalization/drawing conclusions stage (see Figure 8), the teacher guides students to make conclusions about measuring area using standard and non-standard units. Students conclude by making a summary related to the learning material. This stage is one of the characteristics of students' critical thinking, namely being able to draw generalization conclusions from available data with data obtained from the field (Edi & Rosnawati, 2021).

Figure 8. Generalization steps

Based on the analysis of the research conducted at SDN 2 Sukorejo, there is a difference in students' critical thinking skills before implementing the discovery learning model and after implementing the discovery learning model. This can be seen from the difference in the average student's critical thinking skills scores from the pre-test results. The value of 38.75 increased in the post-test, with an average value of 81.35. Then, it was analyzed using SPSS 26 with the parametric test formula (Paired Sample Test) to compare students' initial critical thinking skills with students' final abilities using the discovery learning model. Hence, as the basis for decision-making for the parametric (paired sample) test, the calculation results obtained data Asymp. Sig. (2-tailed) 0.000 <0.05 so that Ha is accepted and Ho is rejected, which means there is an influence between the application of the Discovery Learning model on the critical thinking skills of Mathematics class IV at SDN 2 Sukorejo.

This study's results align with previous research, proving that the discovery learning model can significantly increase critical thinking skills in mathematics learning. Using this model, students are trained to identify a problem or find answers to statements in a procedure and group structure that are clearly explained, stimulating students' critical thinking skills to ask questions and draw conclusions from the experiences gained. Research conducted by (Safitri & Mediatati, 2021)also proved that the discovery learning model can improve students' critical thinking skills in science learning. To hone students' critical thinking skills, an innovative learning model, method, strategy, or approach is needed so that students are interested and motivated to participate in learning, one of which is implementing the discovery learning model. Through this model, students can learn to think critically, analyze, and try to solve the problems they face. In addition, research (Setyawan & Kristanti,

2021)proves that the discovery learning model can improve critical thinking skills in science learning. This learning model is student-centered, where students are brought to a problem or find answers with clear procedures and structures to train the activeness of their critical thinking skills.

CONCLUSION

The study results show that the Discovery Learning learning model influences students' critical thinking skills in grade IV Mathematics learning at SDN 2 Sukorejo Lamongan. Based on the data, the average pretest score was 38.75, and the post-test was 81.35. The data was analyzed using SPSS version 26 with a parametric test (Paired Sample Test) to compare students' initial critical thinking skills with students' final abilities after using the Discovery Learning learning model. Based on the statistical test results, a value (Asymp. Sig) < 0.05, so Ho was rejected, and Ha was accepted. Thus, the Discovery Learning learning model significantly influences students' critical thinking skills. However, this study was limited to a Pre-Experimental design with one group without a control group, so the results could not be generalized. Therefore, further research is recommended to use an experimental design with a control group to make the results more valid and comparable. Further research can also expand the scope by using different subjects and schools to reinforce the findings regarding the effectiveness of this model.

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