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The Effect of Problem-Based Learning Assisted by Peer Tutoring on Student's Critical Thinking Ability

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Abstract: The application of problem-based learning in the classroom often encounters obstacles, especially when teaching higher-order reasoning skills such as thinking. B. Critical thinking skills. To overcome this obstacle, we attempted to use peer mentors in this study. The purpose of this study is to analyze the effect of the Problem Based Learning learning model assisted by Peer Tutoring on students' critical thinking skills. The research method used is a quantitative method with the type of experimental research designed by the Nonequivalent Control Group Design. Sources of data are fifth-grade students and teachers in the Teuku Umar Cluster, Purwodadi District, Grobogan Regency in the 2021/2022 school year. Data collection was carried out using observations and tests which were analyzed using parametric statistical techniques with prerequisite tests. Hypothesis testing uses t-test to test the effect of the independent variables partially on the dependent variable. The increasing influence of the Problem Based Learning learning model assisted by Peer Tutoring on critical thinking skills can be seen by using N-gain. Based on the results of the analysis using the t-test, the results of t-count were -9.0339 and t-table of 1.6725. From the interpretation of the data, it can be concluded that t-count < t-table, there is a significant difference between the average critical thinking ability of students in the control class and students in the experimental class with the N-gain test result of 0.40 in the medium category. Thus, it can be concluded that Problem Based Learning assisted by Peer Tutoring has a significant effect on students' critical thinking skills.

Keywords: Effect, problem-based learning, peer tutoring, critical thinking ability

1. Introduction

Learning in the 21st century requires students to have several high-level thinking skills, one of which is the ability to think critically which is focused on making decisions, analyzing, and evaluating a problem that can be accounted for. Indicators of critical thinking skills that exist in the five groups of thinking skills, namely: 1) Providing simple explanations; 2) Building basic skills; 3) Summing up; 4) Providing further explanation; and 5) Regulating strategies and techniques (Nadarajah & Sivakumaran, 2021). In addition to improving students' critical thinking skills, the independence of students in learning is also a concern. Independence is one of the important characteristics and must be cultivated for students, especially in facing the era of globalization which is full of competitiveness as it is today.

But in reality, in the learning process, students only work on questions that are remembered and explained, not yet at the analyzing stage so that it has an impact on students' low critical thinking skills (Mulyanto, Gunahardi, & Indriayu, 2018). Especially with the current pandemic situation, online learning for too long causes a decrease in the enthusiasm of students in thinking. Students tend to think practically by looking for answers to the tasks given by utilizing the Google application or relying on the role of parents and people around to complete the tasks given. For this reason, a breakthrough is needed that can boost the motivation of students to be enthusiastic about returning to school with a pattern of adapting to new habits with a limited face-to-face learning system (Riyanto, Kuat, & Tentama, 2020).

One of the learning models that can improve students' critical thinking skills is the Problem Based Learning model. In problem-based learning or Problem-Based Learning involves students solving problems through the stages of the scientific method so that students can learn knowledge related to the problem and at the same time have the skills to solve problems (Mufida, Rosbiono, & Sopandi, 2021).

The Problem Based Learning model in reality takes a long time to able to grow students' critical thinking skills because several things affect the relationship of the Problem Based Learning model with critical thinking skills, such as age, gender, academic achievement, and the background of students as well as teachers (Masek & Yamin, 2010). For this

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reason, other alternatives are needed to overcome this problem. One of them is the use of tutors so that learning takes place effectively. The Peer Tutoring method is a learning method that empowers one student who has more abilities than other friends and is tasked with delivering material to the group with a certain agreement to create a cooperative group (Arjanggi & Suprihatin, 2010).

Peer Tutoring in the Problem Based Learning model is an alternative that can be used to improve student's critical thinking skills. Students can practice their critical thinking skills by solving and analyzing and proving the problems that have been given with the help of Peer Tutoring who have a higher understanding (Nasihah, Supeno, & Lesmono, 2020). Retnawati et al. (2018) states that in the Problem Based Learning model, the focus of learning is on the chosen problem so that students do not only learn concepts related to the problem but the scientific method to solve the problem. Students also get a lot of information from their peers, besides that students do not feel awkward if there are things they don't understand. An in-depth understanding of the material being studied can be done by studying with peers (tutors).

After the researchers made observations on limited face-to-face learning activities carried out by fifth-grade teachers as well as interviews with several teachers and students in Dabin IV, Purwodadi District, Grobogan Regency on Wednesday to Saturday 18-21 August 2021, it can be concluded that critical thinking skills The number of students is still low, this is due to the length of online learning during the ongoing Covid-19 pandemic. So that there is no direct learning interaction. Learning is done online from home. In a situation like this, it is not possible for children to interact with friends and teachers let alone to work together directly (face to face).

The results of the initial observations that the researchers made on the transition of learning patterns during the online pandemic period, now the learning pattern is starting to enter a new phase, namely with limited face-to-face learning, with the hope that critical thinking skills can be trained by giving problems to students during learning so that they can interact with each other. exchange ideas and collaborate with peers (tutors) to solve the problems given (Cianciolo, Kidd, & Murray, 2016). So, it is necessary to have alternative learning patterns that can improve students' critical thinking skills in elementary schools through Problem Based Learning models assisted by Peer Tutoring.

This is in line with the research conducted by Munawaroh, Pantiwati, & Rofieq (2015) with the results of the study that the use of learning journals in Class Wide Peer Tutoring learning influences the critical thinking ability of photosynthetic material in class VIII Junior High School Muhammadiyah in Malang Regency. Haryanti's (2017) research results also show that the PBL model can develop students' critical thinking skills. The Problem Based Learning (PBL) model has an effect or benefit in improving students' critical thinking skills (Muhamad et al., 2021).

Based on some of the research results above, it can be concluded that there are differences and similarities between the Problem Based Learning model and the Peer Tutoring method in influencing the improvement of students' critical thinking skills. It's just that in the research above, the increase in students' critical thinking skills is only influenced by the application of the Problem Based Learning, or only by the Peer Tutoring method. so that the research that the researcher will do is a combination of Problem Based Learning models assisted by the Peer Tutoring method. With the hope that the combination of the two will have more influence on students' critical thinking skills.

1.1 Research Objectives

The objectives of this study are 1) to analyze the effect of Problem-Based Learning assisted by Peer Tutoring on the critical thinking skills of fifth-grade elementary school students in the Teuku Umar Group, Purwodadi District, Grobogan Regency; and 2) to analyze the effect of Problem Based Learning assisted by Peer Tutoring on the learning independence of fifth-grade elementary school students in the Teuku Umar Cluster, Purwodadi District, Grobogan Regency.

2. Methodology

2.1 Research Design

This type of research uses experimental research. Azwar (2007) experimental research is research conducted to examine the possibility of cause and effect between independent and dependent variables by using an experimental group with treatment by comparing the effects (results) with one or more control groups that are not treated. Experimental research is also used to find the effect of the independent variable/treatment/certain treatment on the dependent variable/outcome/output under controlled conditions (Tarsito, 2014).

The data collection technique used in this experimental research uses observation for independent learning of students in the research group, namely the trial group, the experimental group where the experimental group uses the Problem Based Learning model assisted by peer tutoring and the control group uses conventional learning models and tests used to measure students' critical thinking skills which are carried out on the pre-test and post-test in solving problems (Kolesnikova, 2016).

2.2 Research Respondents

The research population used in this study were all fifth-grade students in the Teuku Umar Cluster, Purwodadi District, Grobogan Regency. Consists of 6 schools with several fifth-grade students totaling 149 students. The samples in this

study were 30 grade 5 students, from Public Primary School No. 4 Ngembak as the control class and 28 students from Public Primary School No. 2 Cingkrong as the experimental class.

3. Findings

3.1 Knowledge

The research data was obtained from the pre-test and post-test scores in each class in this study. Data on students' initial critical thinking abilities were obtained from pre-test scores, and post-test scores were used to determine students' critical thinking skills after being given treatment. The data obtained were sourced from the control class and the experimental class by applying the Problem Based Learning model assisted by Peer Tutoring, namely:

Table 1: Description of research result data

Data Analysis	Critical Thinking Ability			
	Control Class		Experiment Class	
	Pree Test	Post Test	Pree Test	Post Test
Mean	64,67	65,33	67,32	80,36
Median	65,00	65,00	65,00	80,00
Standard Deviation	6,42	6,29	7,76	6,37
Varian Value	41,26	39,54	60,15	40,61
Lowest Score	55,00	55,00	55,00	70,00
Highest Score	75,00	75,00	85,00	95,00

Information: Sources of data obtained and processed from the analysis of the author's research results (2022)

Based on the table above, the following results were obtained in the control class with a sample of 30 students from Public Primary School No. 4 Ngembak, the average value of the pre-test of critical thinking skills was 64.66. The maximum score obtained was 75 and the lowest score was 55. The average post-test score was 65.33. The maximum score obtained was 75 and the lowest score was 55. Meanwhile, in the experimental class with a sample of 28 students from Public Primary School No. 2 Cingkrong, the average pre-test score for critical thinking skills was 67.32. The maximum score obtained was 85 and the lowest score was 55. The average post-test score was 80.36. The maximum value that can be obtained is 95 and the lowest value is 70.

In testing the results of the study, the Independent Sample T-Test was carried out. The basis for decision making the Sample T-Test to determine the difference between critical thinking skills in the control class and the experimental class, the t-Test: Two-Sample Assuming Equal Variances was carried out. For more details, consider the following Table 2.

Table 2: Post-test analysis of critical thinking ability in the control class with the experiment class

t-Test: Two-Sample Assuming Equal Variances		
	Control Class	Experiment Class
Mean	65.33333333	80.40714286
Variance	39.54022989	40.60846561
Observations	30	28
Pooled Variance	40.05527211	
Hypothesized Mean Difference	0	
Df	56	
t Stat	-9.033912336	
P(T<=t) one-tail	7.94796E-13	
t Critical one-tail	1.672522303	
P(T<=t) two-tail	1.58959E-12	
t Critical two-tail	2.003240719	

Information: Sources of data obtained and processed from the analysis of the author's research results (2022).

Performing the analysis can be explained by the steps, namely calculating the standard deviation (S2) from the standard deviation of the control class (6.29) and the experimental class (6.37). The control class variance is 39.54 and the experimental class is 40.60 with 56 degrees of freedom (df). Then calculate t-count. Calculation of t-count results

obtained -9.0339. Next compare with t-table. The number of control class (n1) and experimental class (n2) is 58, so (n1+ n2) – 2 = 56. Significant level a = 5% (0.05), then t-table is 1.6725 so that the value is that t-count < t-table.

From the table and data interpretation, it can be concluded that because t-count < t-table, there is a significant difference between the average critical thinking ability of the control class students and the average critical thinking ability of the experimental class students or the class that received treatment using.

In addition to calculating the average critical thinking ability of experimental class students after using the Problem Based Learning model assisted by Peer Tutoring, an analysis was also carried out, namely calculating the standard deviation and the value of the variance, then also carried out an N-gain analysis by comparing the average pre-test results and post-test experimental class. The results obtained an N-Gain Score of critical thinking skills of 0.40 in the medium category with the category of the effectiveness of the estimated N-Gain of 40% in the quite effective category.

4. Discussion

Analysis of the research results to determine the effect of the Problem Based Learning model assisted by Peer Tutoring in improving critical thinking skills and independent learning can be discussed in Table 4.

Table 4: Comparison of critical thinking ability results control class and experiment class

Comparison	Control Class	Experiment Class
Critical thinking average	65,33	80,36
Highest Score	75	95
Lowest Score	55	70

Information: Sources of data obtained and processed from the analysis of the author's research results (2022)

To calculate the effectiveness analysis, the t-test (Two-Sample Assuming Equal Variances) was used. It was obtained that the significance result (Sig. 2-tailed) the pretest and post-test scores of the experimental class was 0.000 because the value of sig.0.000 < 0.05 then Ho was rejected so that it accepted H1 which means that there is a significant difference between the average initial critical thinking ability (pretest) and final critical thinking skills (posttest) in the experimental class. Based on these results, there is an increase in students' critical thinking skills after being given treatment using the Problem Based Learning model assisted by Peer Tutoring.

The results of data testing show that the average value of the achievement of the experimental class is greater than the value of the control class. In line with this, Dita et al. (2021) states that the Problem Based Learning model can improve critical thinking, and analytical skills, and be able to solve complex problems in the context of real life by creating a culture of thinking. This is by the views of Ennis (1996) in Afrizon, Ratnawulan, & Fauzi (2012) that critical thinking is a process that expresses goals that are equipped with firm reasons for a belief and activities that have been carried out.

Abidin et al. (2021) explains that there are several advantages of the Problem Based Learning model, namely: 1) being able to develop learning motivation; 2) encouraging to be able to think at a higher level; 3) encouraging optimizing their metacognitive abilities, and 4) make learning meaningful to encourage students to have high self-confidence and be able to learn independently.

This is in line with Dariyo in Sunarty (2015) who argues that independence is a spirit to behave better and have self-confidence, responsibility, discipline, and manage the mind in reviewing various problems faced to make decisions and dare to take risks from their decisions. The central role of the teacher in learning activities can be transferred to peers/tutors in the classroom. According to Arikunto in Diana, Seok, & Tiwiyanti (2021) sometimes it is easier for a student to accept information given by a classmate or other friend (Peer Tutoring) because there is no reluctance or shame to ask questions, and the teacher can ask for help from the children who explain.

By comparing the results in this study with previous studies, it is concluded that the Problem Based Learning model assisted by Peer Tutoring can improve the critical thinking skills of fifth-grade elementary school students. These results are in line with previous studies, where certain learning models and methods can improve students' critical thinking skills.

5. Conclusions and Recommendations

Based on the results of the research, the conclusions obtained are that there is a significant effect on the use of the Problem Based Learning model assisted by Peer Tutoring to improve the critical thinking skills of Class V Elementary School students in the Teuku Umar Cluster, Purwodadi District, Grobogan Regency. Based on the calculation of t-count, the result is -9.0339 and t-table is 1.6725 with a significant level of a = 5% (0.05), so the value is that t-count < t-table. With a significant difference between the average critical thinking ability of control class students and the average critical thinking ability of experimental class students or classes receiving treatment using the Problem Based Learning model assisted by Peer Tutoring, then Ha is accepted and H_0 is rejected. The N-gain value obtained by comparing the average pre-test and post-test critical thinking skills obtained the results of g = 0.40 in the medium category so there was indeed an increase.

The suggestions that can be submitted are as follows: 1) educational personnel, must have the will to always innovate in developing various educational innovations including applying various models or learning methods that are useful in learning as well as other media that are more innovative, feasible and effective. adapted to the learning objectives to be achieved, the characteristics of students, as well as facilities and infrastructure that support learning activities; 2) Teachers must follow the development of increasingly complex information and communication technology to be able to apply models, methods, or other learning media that are relevant to learning objectives; 3) As educators, teachers must be able to determine appropriate strategies in learning to improve students' critical thinking skills; and 4) it is advisable to conduct further research to obtain valid data regarding the effect of Problem Based Learning model assisted by Peer Tutoring in learning activities.

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