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THE INFLUENCE OF *PBL MODEL* AND CRITICAL THINKING SKILLS ON MATHEMATICS LEARNING OUTCOMES OF GRADE V ELEMENTARY SCHOOL STUDENTS IN KELEKAR DISTRICT, MUARA ENIM REGENCY

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ABSTRACT
This study aims to analyze the influence of PBL model and critical thinking skills on mathematics learning outcomes. This research is a quantitative research with a quasi-experimental method. The population in this study is grade V elementary school students in Kelekar district, while the sample was taken using the Cluster random sampling technique, the number of samples taken was 40 consisting of the Experimental class (class V SDN 3 Kelekar) and the Control class (class V SDN 1 Kelekar). Data was obtained using learning outcome instruments and critical thinking skills instruments. The data analysis technique used a separate test of independent sample T and Anova 2 paths. The results of the study with the independent sample T differential test showed that the significance value (2-tailed) was 0.003 meaning it was smaller than 0.05, and t count was 3.200 greater than the t table which was 2.715 which means that there was a difference in the average learning outcomes of students who studied using the PBL model and students who studied using the conventional model, the results of the two-path anova test showed that significance value = 0.015 < 0.05 means that there is an interaction between the PBL model and critical thinking skills on mathematics learning outcomes together. This study proves that there is an influence of the PBL model and critical thinking skills on the mathematics learning outcomes of grade V elementary school students in Kelekar district.

INTRODUCTIONS

Education is very important to support the development of the country. Education must be able to produce students to become active, intelligent, and able to respond to the challenges of the times. The quality of education is very closely related to the learning process that occurs in the classroom. The learning process is directed to involve

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students fully and actively (student center) so as to help students in building concepts and constructing ideas independently.

Mathematics is one of the important lessons in elementary school. Mathematics learning activities must be arranged to generate activity, activeness, independence and systematic thinking skills. Currently, there are still many elementary school teachers who teach mathematics using the conventional method, which only emphasizes the memorization process, thus limiting students to think critically. This critical thinking skill is important for every student to be able to solve all the problems that exist around them. Critical thinking requires accuracy in making a decision through procedural steps so that it is able to analyze, test, and evaluate evidence carried out in a conscious state. Critical thinking skills according to Ennis (in Rohmah et al., 2022) It is a thought process with the aim of making sensible decisions about what to do and what to believe.

Experience and critical thinking skills can be gained from a simple problem that they experience in daily life. Although critical thinking competencies have many benefits and are needed in the era of globalization, in implementation, especially in learning in elementary schools, this critical thinking competency is still a concern for teachers because it is not optimal for students' critical thinking, especially in mathematics learning. "Critical thinking is difficult and not easy to automatically. To develop, it requires practice and effort"Which means that critical thinking is difficult and not easy automatically. To grow, it requires practice and effort (Hairun et al., 2020)

To be able to overcome teacher-centered learning so that it can train students' critical thinking skills so that it affects students' mathematics learning outcomes, there needs to be a wrong solution The only learning model that is able to integrate students with problems is the learning model Problem Based Learning (PBL). Learning model PBL is a model that encourages students to be more active to develop a problem-solving competency and be able to solve problems from the real world. This is in accordance with the opinion Eka Putra & Iswantir (2021) "PBL is a learning model that focuses on student centers. PBL Model is closely related to problem that occur in real life and learning that emphasizes the activity of inquiry in solving these problem"PBL is a student-centered learning model or Student Center. PBL is related to those in real life and focuses on emphasizing problem-solving activities. With models PBL Students construct the knowledge they have or with the new knowledge they gain during the learning process.

As previous research conducted by Melinda & Rahmawati, (2021) that states that learning by the Problem Based Learning proven to be able to have a considerable influence to help students' critical thinking skills on the interaction between spaces in Southeast Asian countries, research conducted by Shrimp (2019) and research conducted by Ejin (2017) which states that there are differences in the critical thinking skills of students who use PBL and students who do not use PBL.

Based on this background, this study aims to analyze the influence of PBL learning models and critical thinking skills on mathematics learning outcomes of grade V students in Kelekar district. It is hoped that the implementation of PBL can affect students' critical thinking skills so that it can have a positive influence on students' mathematical learning outcomes.

RESEARCH METHOD

This research is a quantitative research. The research method uses a quasi-experimental method. which emphasizes the application or treatment of two different learning groups. The treatment provided is in the form of using the Problem Based Learning model strategy. The learning group that uses the Problem Based Learning model is called the experimental class and the learning group that uses the conventional learning model is called the control class. Each group is divided into two categories based on the level of critical thinking skills possessed by students, namely students who have high critical thinking skills and students who have low critical thinking skills.

The research design used is a 2x2 factorial design. In this study, the grouping is through two implementations, namely by using the Problem Based Learning model and critical thinking skills called factors or main effects and differences in each treatment called levels. In this study, there are 2 levels of learning strategies, namely (A1) the learning group using the Problem Based Learning model and (A2) the learning group using the conventional learning model. For the critical thinking skill factor, there are also two levels, namely students who have high critical thinking skills (B1) and students who have low critical thinking skills (B2).

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Table 1 2x2 Research Design

Critical thinking skills (B)	Learning model (A)	
	Problem Based Learning Model (A1)	Conventional Model (A2)
Height (B1)	A1B1	A2B1
Low (B2)	A1B2	A2B2

The population of this study is grade V elementary school students in Kelekar District. The sample of this study amounted to 40 students which consisted of 2 classes of 20 students in the experimental class (grade V students of SDN 3 Kelekar) and 20 students in the control class (students of grade V of SDN 1 Kelekar). The technique used in sampling uses the cluster random sampling technique.

Steps in collecting the first prepare lesson plans for both learning in experimental and control classes, furthermore, provide initial tests for both critical thinking ability tests and mathematics learning outcomes in experimental classes and opposite classes, and implement learning models PBL in the Experiment class, give the final test in each class and the final test is corrected and analyzed according to the technique that has been determined.

The way to collect data is by using research instruments. The instruments used in this study are using learning outcome instruments and critical thinking skill instruments. Before the devices are used, a validity and feasibility test is carried out. The results of the valocity test of the value of learning outcome instruments and critical thinking skill instruments, the significance of the indigo is below 0.05 so that the learning outcome instruments totaling 20 are declared valid. Reliability test results for value learning outcomes Cronbach's Alpha is 0.949, If ≥ 0.70, then the question item can be said to be reliable r_{11}according to the opinion Salmina and Adyansyah (2017: 45).

Technique The data analysis was used using independent sample T and 2-path anava different tests. Different tests Independent sample t is to measure whether there is an average difference between 2 independent groups that are not paired with the intention of the two groups of random data from different subjects, in this case to test whether there is a difference in the average learning outcomes of mathematics in class A (the class that applies the learning model Problem Based Learning) and average mathematics learning outcomes in class B (classes with conventional learning models). The two-track anova test is to compare the difference in average learning outcomes between groups that have been divided between variables Independent. Variable Independent from this study is a PBL and critical thinking skills. Before conducting data analysis, a prerequisite test for analysis was carried out, namely the normality test and the homogeneity test.

RESULT AND DISCUSSION

Result

Based on the data from the instrument test, learning outcomes were both in the experimental class and in the kotrol class with average learning outcomes that had differences.

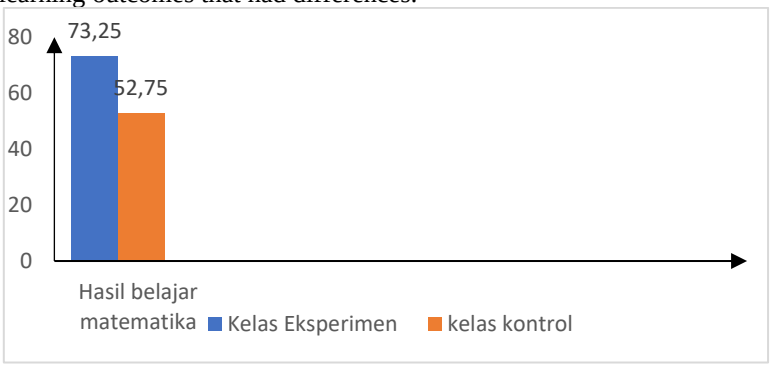

Figure 1 Graph of the average learning outcomes of the experimental and control classes

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The difference in average learning outcomes is seen from the average learning outcomes in the experimental class, which is 73.25 while the average learning outcomes in the control class is 52.75. Before the data is analyzed, a normality test is carried out with the help of SPSS version 21. Normality testing using the SPSS application version 21 with a significance level of 5%. The normality test aims to find out whether the data is normal or not. The basis for decision-making is that if the significance value is > 0.05, then the data is normally distributed, while if the significance value is < 0.05, then the data is not normally distributed

Table 2 Normality Test Results

		Mathematics learning outcomes	Critical thinking skills
N		40	40
Normal Parameters$^{a.b}$	Mean	63.13	54.80
	Std. Deviatio	17.309	12.032
	Absolution	.129	.130
Most Extreme Diffrernces	Positive	.121	.130
	Negative	-.129	-.103
Kologorov-Smirnov Z		.818	.822
Asymp.Sig. (2-tailed		.515	.508

Based on the table, for the critical thinking skill variable, the significance value is 0.508 and greater than 0.05, the distribution of critical thinking skill variables is normal. As for the mathematics learning outcome variable, the significance value is 0.515 and greater than 0.05, so it can be concluded that the distribution of mathematics learning outcome variables is normal.

The homogeneity test used is the statistical levene test. The basis for decision-making is that if the significance value is > 0.05, then the data is homogeneous, while if the significance value is < 0.05, then the data is not homogeneous.

Table 3 Homogeneity Test Results

Test of Homogeneity of Variances			
Result			
Living Statistic	df1	df2	Sig.
2.756	1	38	.105

Based on the results of the homogeneous test above, the significance value is 0.105 which means it is greater than 0.05, so it can be concluded that the population data is homogeneous. After the normality test and homogeneity test were carried out, a data analysis test was carried out to test the hypothesis with a different test independent sample T.

Table 4 Results of Independent Sample T Differential Test.

		Levene's t-Test for Equality of Variances		- Test for Equality of means						
		F	Sig	t	Df	Sig. (2-tailed)	Mean Differences	Std. Differences Error	95% convidence Interval of the Difference	
									Lower	Upper
Result	Equal variaces assumed	2.756	.105	3.200	38	0.03	15.750	4.921	5.787	25.713

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Equal variaces not assumed	3.200	36.214	0.03	15.750	4.921	5.771	25.729

Based on the results of the differential test Independent sample t The significance value (2-tailed) is 0.003 meaning it is smaller than 0.05, and t count is 3.200 greater than t table which is 2.715 so it can be concluded that there is a difference in the average learning outcomes of mathematics in class A (classes with model enforcing PBL) with the average mathematics learning outcomes of class B (classes with the application of conventional models). So the mathematics learning outcomes of grade V students who use the model PBL better than the mathematics learning outcomes of grade V students who use the conventional model.

For mathematics learning outcomes of students who have high critical skills with mathematics learning outcomes of students who have low critical skills.

Table 5 Results of Independent Sample T Differential Test.

		Levene's t-Test for Equality of Variances		**- Test for Equality of means**						
		F	Sig	t	Df	Sig. (2-tailed)	Mean Differences	Std. Differences Error	**95% convidence Interval of the Difference** Lower	**Upper**
Result	Equal variaces assumed	.018	.895	5.140	38	0.00	20.750	4.037	12.577	**28.923**
	Equal variaces not assumed			5.140	37.304	0.00	20.750	4.037	12.572	**28.928**

By Results of the Difference Test Independent sample t Showing that the significance value (2-tailed) is 0.000 < 0.05 and the T count is 5.140 greater than the T table, which is 2.715, then there is a difference in the mathematics learning outcomes of students who have high critical skills and the mathematics learning outcomes of students who have low critical skills. So it can be concluded that the mathematics learning outcomes of grade V students who have high critical thinking skills are better than the mathematics learning outcomes of grade V students who have low critical thinking skills.

To determine the interaction between the learning model and critical thinking skills, a two-path anova test was carried out.

Table 6 2-lane anova test results

Source	Type III Sum of Squares	Df	Means Square	F	Sig.
Corroted Model	10713.242	25	428.542	6.180	.000
Intercept	124785.557	1	124785.557	1799.483	.000
Think	7579.412	21	360.924	5.205	.001
Class	408.004	1	408.004	5.884	.029
Think *class	1028.220	3	342.740	4.943	.015
Error	970.833	14	69.345		
Total	171075.000	40			

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Correted Total	11684.375	39

Based on the results of the anova test for Class * Thinking significance value = 0.015 < 0.05 means that there is an interaction between the learning model Problem Based Learning with critical thinking skills to influence mathematics learning outcomes together. So then a follow-up test was carried out by Tukey.

Table 7 Tukey Test Results

Post HOCK	(J) POST HOCK	Mean difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
	AIB2	30.00	6.818	.001	12.92	47.08
A1B1	A2B1	20.00	6.718	.046	.98	39.72
	A2B2	55.00	6 171	.000	36.89	73.11
	A1B1	-30.00	5.818	.001	-47.08	-12.92
A1B2	A2B1	-10.00	6.718	.0472	-29.72	9.72
	A2B2	25.00	6.171	.007	6.89	43.11
	AIB1	-20.00	6.718	.046	-39.72	-28
A2B1	A1B2	10.00	6.718	.471	-9.72	29.72
	A2B2	35.00	7.026	.001	14.38	55.62
	A1B1	55.00	6.171	.000	-73.11	-36.89
A2B2	A1B2	-25.00	6.171	.007	-43.11	-6.89
	A2B1	-35.00	7.026	.001	-55.62	-14.38

Based on the data from the calculation above, the significance value A1B1 against A2B1 is 0.046 < 0.05 meaning there is a difference in the learning outcomes of mathematics in grade V of elementary school for students who have high critical thinking skills between those who use Problem Based Learning with a conventional model, where the mathematics learning outcomes of grade V students who have high critical thinking skills using the model PBL better than the mathematics learning outcomes of grade V students who have high critical thinking skills using conventional models.

While the significance value A1B2 against A2B2 is 0.007 < 0.05 meaning there is a difference in the learning outcomes of mathematics in grade V elementary school who have low thinking skills between those who use the model Problem Based Learning with the conventional model, where the mathematics learning outcomes of grade V students who have low critical thinking skills by using the Problem Based Learning better than the mathematics learning outcomes of grade V students who have low critical thinking skills using conventional models.

Discussion

Differences in mathematics learning outcomes of grade V elementary school students who use the learning model Problem Based Learning and mathematics learning outcomes of grade V elementary school students using conventional learning models.

Based on the calculation of the results of the independent sample test, the significance value (2-tailed) is 0.003, meaning it is less than 0.05, so it can be concluded that there is a difference between the average learning outcomes of mathematics in class A (classes with the implementation of the PBL model) and the average learning outcomes of mathematics in class B (classes with the implementation of conventional models).

Learning with models Problem Based Learning can keep students actively engaged and interested in learning. This is in accordance with Slameto's opinion (in Kurniawan et al., 2018) which states that one of the external factors of student success in learning is the use of learning models. Based on the calculation results, it is shown that students who use the learning model Problem Based Learning obtained an average score of 73.25 in mathematics learning

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outcomes. Meanwhile, mathematics learning outcomes. Students who use conventional learning methods only get an average score of 52.75.

The difference in mathematics learning outcomes of elementary school students in grade V who have high critical thinking skills and in class V who have low critical thinking skills

From the test results Independent Sample T-Test shows that the significance value of 0.000 is smaller than 0.05 so that it can be concluded that there is a difference in the learning outcomes of grade V students who have high critical thinking skills and the learning outcomes of students who have low critical thinking skills. Students who have high critical thinking skills have an average mathematics learning outcome of 75.5 while the average mathematics learning outcome of students who have critical thinking skills is 48.25. So the learning outcomes of mathematics in class V who think critically are high is better than the mathematics learning outcomes of class V who think critically low. This is in accordance with research Nurfitriyanti et al., (2020) which states that Critical thinking skills can also improve math learning outcomes.

The effect of the interaction between the Problem Based Learning learning model and critical thinking skills on the mathematics learning outcomes of grade V in elementary school.

Based on the two-way Anova test, the value of the F calculation is 4.943 greater than the F of the table, which is 3.2, this shows that there is an influence of interaction between the learning model Problem Based Learning and critical thinking skills together on the learning outcomes of mathematics in grade V of elementary school. In addition, based on the significance value of 0.015 < 0.05, this proves that there is an influence of interaction between learning models Problem Based Learning and critical thinking skills together on the learning outcomes of mathematics in grade V of elementary school.

Learning model Problem Based Learning is the learning process considered the most significant to develop students' critical thinking skills and student learning outcomes. This is because learning Problem Based Learning The problem presented is having contact with the real world. This is in line with Noer's research (August, 2017) By presenting problem-based learning, it will improve students' critical thinking skills and is in line with the research conducted by Oktavianingrum et al. (2020) which states that critical thinking skills in mathematics learning can be developed with a learning model Problem Based Learning.

Each student's thinking skills can be stimulated simultaneously through the question of a problem so that it is able to improve thinking skills broadly. Students are able to describe data or infer so that they become facts that demand further analysis, not just for knowledge. This is very evident when students are more active in learning, they try to find answers to problems, conclude and present the results of the analysis, and reflect on the results of the analysis.

This will certainly affect the mathematics learning outcomes of grade V students. These interactions have a positive impact. These findings are in accordance with research conducted by Saparuddin et al., (2021) which states that learning outcomes and students' critical thinking skills have a positive relationship after being taught using the learning model Problem Based Learning

The difference in mathematics learning outcomes in grade V for students who have high critical thinking skills using Problem Based Learning and the learning outcomes of mathematics in grade V for students who have high critical thinking skills in the conventional model

Strong critical thinking skills create active mathematics learning so that it will facilitate the formation of knowledge that makes it easier for students to find solutions to a problem in their lives. Students who think critically highly tend to be active and have broad thinking skills, of course, it will improve student learning outcomes.

With a strategy Problem Based Learning In learning that produces higher problem-solving skills and also causes learning outcomes for students who have high critical thinking skills, the learning outcomes are higher compared to the learning outcomes of students who have high critical thinking skills, the learning outcomes are higher using conventional learning strategies. This can be seen from the average learning outcomes of students who have high thinking skills with the model PBL is 90 while the learning outcomes of students who have high thinking skills with the conventional model are 70.

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Differences in mathematics learning outcomes in grade V elementary school who have low thinking skills using the model Problem Based Learning with mathematics learning outcomes in grade V elementary school who have low thinking skills using conventional models

Test results Tukey whose value is significant A1B2 against A2B2 is 0.007 < 0.05 where there is a difference in the learning outcomes of mathematics in grade V elementary school students who have low thinking skills between those who use the model Problem Based Learning with conventional models.

The difference in mathematics learning outcomes in grade V elementary school students who have low thinking skills between those who use the model Problem Based Learning with the conventional model, it can also be seen from the average learning outcomes of low-skilled students using the model PBL is 60 while the average learning outcomes of low-skilled students using the conventional model is 35.

Students who have low critical thinking skills when taught using the model PBL The learning outcomes are higher than students who have low critical thinking skills when taught using conventional models.

CONCLUSION

Based on the analysis of statistical data, the results of the research and the discussion on it, it can be concluded that the learning model Problem Based Learning It puts a dent in the mathematics learning outcomes. There is a positive influence of interaction between learning models Problem Based Learning and critical thinking skills on the mathematics learning outcomes of grade V elementary school students in Kelekar sub-district

Although the results of the study show that the Problem Based Learning has a positive influence on the mathematics learning outcomes of grade V students in Kelekar District, but this research has limitations, including teachers need to monitor the activities of student groups in solving problems in order to increase student activity.

For future research, it is recommended to be carried out with a deeper and wider scope so that students have a more in-depth experience and it is also hoped that in addition to the cognitive aspect, focus more on affective and psychomotor aspects which will certainly have a more impact on students so as to have a holistic impact on the influence of the model Problem Based Leaning in improving the quality of learning

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