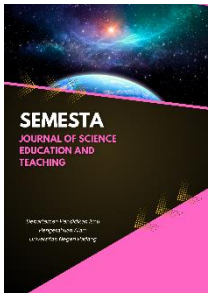

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The Influence of Problem Based Learning Model on Students' Critical Thinking at SMPN 7 Padang

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ABSTRACT

Observations and interviews with science teachers at SMPN 7 Padang revealed that learning that trains students' critical thinking skills has not been implemented optimally. When students gave answers or asked questions related to the material in science learning, they were still hesitant or limited to understand, also scientific attitude towards science learning. The literature states that Problem Based Learning (PBL) model is able to train students' critical thinking skills. PBL shows effective approach to increase students' potential and develop students' critical thinking skills. Therefore, this study was conducted to determine the effect of the Problem Based Learning model on the Critical Thinking Skills of Grade VIII Students at SMP Negeri 7 Padang. This quantitative study used a quasi-experimental design with a pretest-posttest control group design. PBL Model as the independent variable in this study was employed to experimental class, while dependent variable was students' critical thinking skills tested in both experimental and control class. The measurement of students' critical thinking skills consisted of five indicators such as elementary clarification, basic support, inference, advance clarification, and strategy and tactics. The results showed a significant increase in students' critical thinking skills in the experimental group compared to the control group ($p<0.05$). It can be concluded that Problem Based Learning model significantly improve students' critical thinking skills.

Keywords: Project Based Learning, Critical Thinking Skills, Science Learning

Introduction

Learning is defined as a teacher's effort to provide stimulation, guidance, direction, challenges, and support to students so that the learning process can take place. In the 21st century, the learning process is no longer dependent on teachers, but rather student-centered. This aims to help students hone their 21st-century thinking skills, called "4C Skills" introduced by the Partnership Framework in the 21st century, including communication, collaboration, critical thinking, and creativity and innovation (Nabilah, 2020).

The application of appropriate learning models can develop students' skills in learning. One of the basic skills that students must master is critical thinking, with the aim of facilitating their success (Redhana, 2019). The 21st century presents opportunities where knowledge and learning must become the provisions possessed by students in solving problems. Minister of Education and Culture Regulation No. 21 of 2016 concerning the content standards for elementary and secondary education explains that students must be able to understand the concepts and principles of natural science and their relationships and be able to think critically in solving problems in everyday life (Permendikbud, 2016).

A fundamental element in education is the curriculum. According to (Indarta et al., 2022), "The Independent Learning Curriculum is a new initiative from the Ministry of Education, Culture, Research, and Technology of the Republic of Indonesia (Kemdikbudristek RI) which aims to support an innovative and student-centered learning process." Bahri (2017) explains that "The curriculum has a strategic position because in general the curriculum describes the vision, mission, and educational goals of a nation." The Independent Curriculum aims to increase intellectual capacity as well as students' interests and talents. These interests and talents can be developed through learning methods, strategies, and models. Of course, this will have an impact on students.

One of the factors that influences students' abilities is the ability to solve problems and analyze critically, also known as critical thinking. When students are given problems related to learning in class, they will have no difficulty digesting and analyzing the issues that arise in the subject matter. First, it's important to understand that knowledge is a key component before developing critical thinking skills (Ramdani, 2020). Characteristic of critical thinking is reasonable and reflective thinking that is focused on deciding what to believe or do (Ennis, 2011)

One model that facilitates student skills is the PBL model. Literature studies have shown that the PBL model is capable of training students' critical thinking skills. PBL is the most effective approach to enhancing student potential and developing critical thinking skills in the 21st century. This learning model effectively hones students' problem-solving skills through a structured approach, making them more critical in identifying problems in a given situation (Ummah, 2018). Gultom & Adam (2018) stated that the PBL model can improve students' critical thinking skills. The PBL model is said to play an active role in the learning process, especially within the Independent Curriculum (Aryanti, 2023). Through this PBL model, students are expected to be able to analyze and solve problems critically. As students' knowledge increases and they absorb various information to address existing problems, their critical thinking skills will improve as they are trained to solve these problems. (Amin, 2020).

Previous research has shown that one model that supports students' critical thinking is the problem-based learning model. According to Arends (2012), the PBL model is one in which students solve authentic problems with an open mind to enhance their understanding and insight. Frequently honing analytical skills will increase independence and self-confidence.

According to Ariyani (2021), the use of problem-based learning models is highly effective in enhancing students' critical thinking.

From the results of observations and interviews with science teachers at SMPN 7 Padang, it is known that learning that trains students' critical thinking skills has not been implemented optimally. This is known when students give answers or ask questions related to the material in the learning, still hesitant or only limited to understanding. , there is no scientific attitude of students when answering, explaining or asking questions during learning. Learning and abilities that are not optimal will affect the learning scores obtained by students which are also low. From the problems above, researchers see that the low critical thinking skills of students are caused by several factors, one of which is the application of methods or models used in learning is less than optimal in training students' critical thinking skills.

Methods

This research is a quantitative research. This type of research is quasi-experimental research. Creswell explains that experiments are used when wanting to establish the possibility of cause and effect between independent variables and dependent variables. This research has an independent variable, namely the PBL model, while critical thinking skills are the dependent variable. This research was conducted in the odd semester of the 2024/2025 academic year. Class VIII.2 students were the class research subjects. The sample was determined using the Purposive Sampling technique with a total of 32 research samples. The research instruments are: (1) Student response questionnaire, which functions to obtain student responses after PBL learning (2) Test questions, to determine students' critical thinking skills (3) Observation questionnaire for learning implementation (4) Documentation.

The obtained data were then processed through descriptive statistical analysis, inferential statistics, T-tests, and N-Gain tests assisted by Microsoft Excel with a significance level of 0.05 ($p<0.05$). Prerequisite tests were previously conducted, including normality and homogeneity tests. The normality test used the Liliefors test, and the homogeneity test used the F-test.

Results and Discussion

The normality test is used to determine whether the data obtained consists of normally distributed or non-normally distributed data sources. The test used is the Liliefors test, assisted by Microsoft Excel. Data distribution is considered normal if the calculated $L_{count} \leq L_{table}$ with a significance level of 0.05. Table 1 shows that all data are normally distributed because $L_{count} \leq L_{table}$. In opposite, suppose $L_{value} > L_{table}$ determines data do not experience a skeletal distribution (Sudjana, 2016).

Table 1. Normality Test

Class	N	A	L_{count}	L_{table}	
Pretest experiment	32	0,05	0,121	0,155	normal
Pretest control	32	0,05	0,153	0,155	normal
Posttest experiment	32	0,05	0,101	0,155	normal
Posttest control	32	0,05	0,115	0,155	normal

Next, the homogeneity test was used to determine whether the data has similar or different variations. The homogeneity test used was the F test. The results of the F test given in Table 2. It shows that pretest for experimental and control has similar variations, also posttest for experimental and control has similar variations.

Table 2. Homogeneity Test

Data	A	F_{hitung}	F_{tabel}	Conclusion
Pretest	0,05	0,035	1,822	Homogeneous
Posttest	0,05	0,032	1,822	Homogeneous

The assumption of normality and homogeneity of the data leads to parametric test, namely t-test because the research data obtained had normally distributed results and homogeneous variance. Hypothesis testing was used to determine whether the implementation of the PBL model had a significant effect on students' critical thinking skills on eighth-grade students of SMPN 7 Padang.

Based on the results of the t-test analysis in Table 3, it can be seen that the difference between $t_{count} \leq t_{table}$. In the pretest, t_{count} was -3.17≤2.00. So, the result obtained are H_0 accepted and H_a rejected. This shows that there is no difference in students' initial abilities between the experimental class and the control class. Meanwhile, in the posttest $t_{count} > t_{table}$, which is 6.76 > 2.00. So, the result obtained are H_0 rejected and H_a accepted. So, it can be said that there is a difference in students' final abilities between the experimental class and the control class. So, the conclusion from the hypothesis testing is that there is a significant influence of the application of the PBL model on the critical thinking abilities of grade VIII students at SMP Negeri 7 Padang. The results of Utami's (2022) research show that students who apply problem-focused learning methods demonstrate good problem-solving abilities.

Table 3. Hypothesis test results

Data	t_{count}	t_{table}	Analysis	Conclusion
Pretest	-3,17	2,00	$t_{count} < t_{table}$ H_0 accepted H_a rejected	No significance difference
Posttest	6,76	2,00	$t_{hcount} > t_{table}$ H_0 rejected H_a accepted	significance difference

The N-gain test was used to determine improvement level of students' critical thinking skills before and after treatment. The N-gain test also looked at improvements in students' critical thinking skills indicators. The N-gain test was conducted using data analysis in Microsoft Excel and results in Table 4.

Table 4. N-Gain Analysis Results

Class	N-Gain	Category
Experiment	0,69	Medium
Control	0,56	Medium

Data in Table 4 shows the average N-Gain increase for both classes. The experimental class's N-Gain was 0,69, interpreted as a moderate increase. Meanwhile, the control class's N-

Gain was 0,56, interpreted as a moderate increase. It can be concluded that the level of critical thinking in the experimental class was higher than in the control class but in the same category, namely medium. Deeper analysis for each indicator of students' critical thinking skills can be seen in Table 5.

Table 5. N-Gain Test of Critical Thinking Indicator

Indicator	*Pretest*	*Posttest*	N -*Gain*	N-*Gain* (persen)	Class
Elementary clarification (1)	35,41	76,04	0,62	62%	Experiment
Basic Support (2)	19,79	72,19	0,66	66%	
Inference (3)	22,91	83,33	0,78	78%	
Advance Clarification (4)	30,20	86,45	0,80	80%	
Strategy and Tactics (5)	21,87	62,50	0,52	50%	
Elementary clarification (1)	13,54	59,37	0,53	53%	Control
Basic Support (2)	6,250	39,58	0,35	35%	
Inference (3)	9,375	42,70	33,3	33%	
Advance Clarification (4)	31,25	52,08	0,30	33%	
Strategy and Tactics (5)	20,83	47,91	0,34	34%	

The data analysis in Table 5 yields substantial results. In the experimental class, students' critical thinking skills improved significantly compared to the control class. This indicates a positive significant effect of the PBL model on the critical thinking skills of class VIII.2 students at SMPN 7 Padang. The table also shows that the experimental class achieved a higher percentage score on the indicators than the control class.

The first indicator for the experimental class, namely basic clarification, has an n-gain of 0.629, while the control class has 0.530. The second indicator is basic support. In the experimental class, it is 0.662, and the N-Gain in the control class is 0.356. Furthermore, the third indicator, inference in the PBL model treatment class, has an N-Gain of 0.784, and the control class has 33.33. The fourth stage, advanced clarification, the N-Gain for the experimental class is 0.806 and the control class is 0.303.

Then the fifth stage is strategy and tactics, with an average value of 0.520 for the experimental class and 0.342 for the control class. It can be concluded that each critical thinking indicator in the experimental class obtained a higher value than the control class, which means that students in the experimental class experienced a greater increase in critical thinking skills.

The results of this study are in line with the research conducted by Irwan Ridwan Yusuf and Shahnaz Salsabila in 2023 entitled the influence of the Problem Based Learning model on critical thinking skills in ecological material where the results of the analysis of the two data between Pretest and Posttest on students' critical thinking learning outcomes in Ecology subjects, obtained the magnitude of the influence of the Problem Based Learning learning model with a value of 0.557 in the medium category using effect size analysis. This aligns with research by Istiqah et al. (2021), where student and teacher activities were conducted in accordance with the learning tools used in the PBL model. This is supported by research by Umar & Balulu (2020), which found that the PBL model is effective in improving students' critical thinking skills, as evidenced by student responses during learning. Students expressed interest in the PBL model.

Conclusion

Based on the data processing and analysis that has been done, it can be concluded that the implementation of syntax in the learning process with the application of the PBL model was implemented above 97%. This means that the syntax of the PBL model in this study was implemented very well. 2. Furthermore, students' critical thinking skills increased after the application of the Problem Based Learning (PBL) model on the material of the digestive system and excretory system in humans. The results of the students' critical thinking skills test were obtained from the Posttest which fulfilled the hypothesis test, namely tvalue > ttable data were normally distributed and the variance was homogeneous, meaning that the application of the PBL model had an effect on the critical thinking skills of class VIII.2 students of SMPN 7 Padang. Finally, learning through the application of the PBL model to class VIII.2 students of SMP Negeri 7 Padang received student responses. The agree category with a percentage of 62% and the strongly agree category with a percentage of 38%. This means that this model can make students more active in learning and can understand the material better

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