ENHANCEMENT STUDENT CRITICAL THINKING SKILLS AND LEARNING OUTCOMES USING PROBLEM-BASED LEARNING

by YI Sukestiyarno

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Agapito da Costa Jeronimo
Management Education Faculty, Universitas Negeri Semarang, Indonesia
acjeronimo170861@gmail.com
Joko Sutarto
Economy department in Universitas Negeri Semarang, Indonesia
jokotarto@mail.unnes.ac.id
YL Sukestiyarno
Mathematics department,Universitas Negeri Semarang, Indonesia
sukestiyarno@gmail.com
Rusdarti
Economy department in Universitas Negeri Semarang, Indonesia
rusdarti@gmail.unnes.ac.id

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Abstract: The purpose of this study was to analyze creative thinking skills and learning outcomes through the application of the Problem-Based Learning (PBL) model. The research design was quantitative quasi-experimental with a control class using a pretest-posttest to measure the effectiveness of the application of the PBL model. The study population was junior high school student's grade IX, the sample was taken specifically for students who studied Civic, Citizenship, and Human Rights Education subjects. Research variables are creative thinking skills and learning outcomes. Data taken by observation and tests. The results showed that the PBL method was better at developing critical thinking skills than the conventional method. The PBL method is able to develop critical thinking skills with an average score of 76.82, in the good category; whereas the conventional method was only able to achieve an average score of 59.86, in the sufficient category. Learning scenarios have also improved student learning outcomes in the experimental class more effectively than students in the control class; the average N-Gain in the experimental class reached 60.07% in the quite effective category, while the average N-Gain in the control class was only 40.81%, in the less effective category. Furthermore, the independent test of the test sample found the sig value (2 tailed) of 0.000 <0.05, so there is a significant difference between the two classes. Judging from the influence of the critical thinking skills variable (x) on post-test learning achievement (y), the regression equation is y = 9.481 + 0.545x, and the contribution is 60%. It is concluded that the PBL model with stages: problem presentation, understanding problems, problem analysis, study and implementation, collection, and summary can improve critical thinking skills and student learning outcomes.

Keywords: Enhancement; critical thinking;skills;learing outcomes; problem-based;learing

I. INTRODUCTION

The rapidly growing world and global changes in all aspects of life are so fast that it becomes a challenge for schools in preparing future generations. In addition to providing benefits to human life, changes and developments also cause many problems. Therefore, in modern times, education plays an important role in creating a generation of

nations that is able to keep pace with the development of science and technology. Facing such situations schools, in this case, the teachers, need to develop critical thinking skills of their students.

Critical thinking skills are considered important that a person needs to be able to compete with developments and changes in the new information era today [1], critical thinking skills help someone in solving problems creatively and effectively. However [2] shows that the learning process in Junior High Schools in Dili, Timor-Leste, teachers do not familiarize students with critical and creative thinking to understand and solve problems. Teachers still dominate the learning process. Critical thinking is one manifestation of higher-order thinking [3]. Critical thinking and problem-solving skills lead to the ability to think critically and systemically, especially in the context of problem-solving. A critical thinker must be able to give reasons for the choices he makes; open to differences in decisions and opinions of others; able to answer the question of why such a decision was made; and able to listen to reasons why other people have different opinions decisions and so on. Thinking critically is not something that can be done automatically or can be trained to do automatically [4], meaning that critical thinking needs to be used continuously. Therefore learning activities can facilitate the development of students' critical thinking through an adequate learning approach [5]. Problem-based learning (PBL) is a student-centered learning approach that allows students to work cooperatively in small groups to find common solutions to the situations/problems offered [6]. In small groups, students seem to face real problem-solving situations [7]. Group members should discuss to decide what information they need to identify the situation or problem as a problem they should raise to address, try to understand it, communicate it among themselves, and then they reformulate it in such a way as to address the problem appropriately. Students' critical thinking can be cultivated and developed through their discussion in groups [8].

To define, describe, measure and evaluate the critical thinking process, it is necessary to understand the indicators of critical thinking skills. In this study, we use indicators proposed [9], namely: interpretation, analysis, conclusions, evaluation, explanation and self-regulation, because in each indicator sub-sub-indicators are making it easier to use them. Although theoretically using PBL can help promote students' critical thinking, the findings of previous studies have drawn mixed conclusions. Based on previous research conducted [10] concluded that the implementation of the problem-based learning model showed that students 'learning achievement had increased and the ability to think critically in solving students' problems had also increased significantly. Meanwhile, research by Choi et al. [11] and Kazemi & Ghoraishi [12] show that learning outcomes are not much different between the PBL group and the conventional learning group. Based on the differences in the results of the above research, the problem posed in this research is whether PBL actually shows more effects on the development of students' critical thinking? Thus this study aims to analyze critical thinking skills in solving problems and improving student learning outcomes using PBL.

II. METHOD

The research design was an embedded quase-experimental model through a pretest-posttest control group. The population is 240 grade IX junior high school students in a school in the city of Dili, Timor-Leste. Samples were randomly assigned to take an experimental class that would use PBL, 36 students and 35 students as a control class who would be taught the conventional method. The experimental group will be divided into small groups where each group consists of six students. The groups were divided heterogeneously based on their learning abilities. The scope of the research is learning Civic, Citizenship and Human Rights Education. The research variables were creative thinking skills as the independent variable and learning outcomes as the dependent variable. Critical thinking skills indicators consist of interpretation, analysis, conclusions, evaluation, explanation, and self-regulation. Meanwhile, learning achievement indicators are basic competencies as stated in the curriculum and syllabus.

Data taken by observation and tests. Observations were made during the learning process to record students' critical thinking skills. While the test is carried out to determine learning outcome, data analysis techniques to determine qualitative data, critical thinking skills, using data reduction, and coding and data interpretation of the results of science process skills carried out at each meeting, using a rating scale. Meanwhile, the learning outcomes used the N-Gain score to determine the effectiveness of PBL and the independent sample test to determine differences in learning outcomes between the experimental class and the control class. To find out whether there is an effect of the independent variable on the dependent variable, a regression test will be performed.

Table 1- Critical thinking skills assessment criteria

Range value	Category
81 – 100	Excellent
66 - 80	Good
56 - 65	Good enough
40 - 55	Less

≤ 39	Very less

Source: (Arikunto, 2012)

Meanwhile, the learning outcome data is carried out using the N-gain score or normalized gain, with the following formula:

Information:

$$g = \frac{xm - xn}{100 - xn}$$

g = gain score
xm = posttest score
xn = pretest score

After calculation, the results can be confirmed by normalized Gain criteria. The Gains interpretation criteria are shown in the following table:

Table 2- N-Gain Effectiveness Interpretation Category

Percentage (%)	Category of Interpretation
< 40	Ineffective
40 - 55	less effective
56 – 75	Effective enough
> 76	Effective

III. RESULT AND DISCUSSION

The learning activities in this study are based on the lesson plans that have been developed, which apply problem-based learning applied to grade IX junior high school students who are taking Civic, Citizenship and Human Rights Education subjects. The application of PBL in this study adopts five main stages proposed [14], namely: 1) Presentation of the problem: the teacher offers a problem to each group accompanied by clues where students will learn concepts or content of the cases received. Students are given the freedom to choose other similar cases; 2) Understanding the problem: students in their respective groups discuss the problem to deepen their understanding of the concept and / or content of the problem. This activity can be done outside of class hours in the context of homework; 3) Problem analysis: under the guidance of the teacher, each group reports the group work to analyze with other groups to distinguish various data and information obtained; 4) Study and Implementation: learners are facilitated to obtain appropriate information and solutions that are most likely to be used; 5) Collection and Summary: students record all important information obtained as learning outcomes.

The aspects of critical thinking skills developed in problem-based learning are interpretation, analysis, conclusion, evaluation, explanation and self-regulation which are shown in Table 1 below:

Table 3 - Comparison of the Average Value of Critical Thinking Skills of the experimental class and the control class

No.	CTS Aspects	Experiment class (N=36)		Control class (N=35)	
		CTS Average	Category	CTS Average	Category
1.	Interpretation	77.44	Good	64.48	Enough
2.	Analysis	78.93	Good	61.96	Enough
3.	Conclusion	77.78	Good	64.04	Enough
4.	Evaluation	75.00	Good	63.96	Enough
5.	Explanation	76.79	Good	54.52	Less
6	Self management	65.00	Enough	50.22	Less
	Average	**76.82**	**Good**	**59.86**	**Enough**

The data presented in Table 3 shows that the average value of critical thinking skills is in the good category, which is 76.82. Five aspects of critical thinking skills are in a good category, namely aspects of interpretation, analysis, conclusion, evaluation and explanation; only one aspect is in the sufficient category, namely self-regulation skills. While the average critical thinking skills in the control class group was in the sufficient category, amounting to 59.86. The four aspects of critical thinking skills namely interpretation, analysis, conclusion and evaluation are in the sufficient category; meanwhile, there are two aspects that are in the deficient category, namely aspects of explanation and self-regulation. This shows that the PBL method is better at developing students' critical thinking

skills than conventional learning. The increase in student learning outcomes is measured using a test. The results of the data analysis of the pretest and posttest mean scores of the test results are presented in Table 4.

Table 4- The results of the comparison of the pretest and posttest scores on the learning outcomes of the experimental class and the control class

Class	Results		
	N-Gain Score Average (%)	Minimal	Maximal
Experimental	60.07	42.86	83.33
Control	40.81	16.67	60.00

Based on Table 4, student learning achievement, both in the experimental class and in the control class has increased, but the increase in the experimental class with the PBL method is much higher than in the class with the conventional method. The PBL class had an average N-gain score of 60.07% increase, in the quite effective category, while the increase in the average N-gain score for the conventional method class only reached 40.81 in the less effective category. Furthermore, based on the independent test sample test, it is known that the sig. (2 tailed) of 0.000 <0.05, meaning that there is a significant difference in test results between the experimental class and the control class. Judging from the influence of the critical thinking skills variable (x) on post-test learning achievement (y), the regression equation y = 9.481 + 0.545x, and the contribution is 60%. This means that the struggle to teach students with the PBL method can make students skilled in learning so that it has a positive effect on student learning achievement. Thus it can be concluded that there is a significant difference between the use of the PBL method and the conventional learning method to improve the learning outcomes of grade IX students in Civic, Citizenship and Human Rights Education subjects.

Learning outcomes as shown above are achieved because problem-based learning can enable students to learn while being actively involved with meaningful problems; students are given the opportunity to solve problems in a collaborative atmosphere, create mental models for learning, and form independent learning habits through practice and reflection [15]. The results of this study reaffirm the theory and results of previous research that PBL is truly an effective model for improving critical thinking skills and student learning outcomes. For example, the research result of Sedang & Ferhan [16] Ersoy & Baser [17] revel that PBL has a significant effect on improving critical thinking skills.

Problem-based learning is a learning approach that challenges students as a group to find solutions to real problems presented by the lecturer. This is because the problem-solving process in PBL is closely related to intellectual processes and critical thinking [8]. The intellectual process consists of identifying and analyzing problems, assessing the need for further information and knowledge, considering alternative explanations or solutions, and implementation and evaluation [5]. When a person thinks it involves the ability to identify problems, reason and make decisions about what is important and what alternative solutions are most likely to be implemented.

The success of PBL in developing critical skills and this can be explained as follows: first, because of the awareness that humans are always faced with problems. Dealing with this problem, humans must not be silent but must behave and act to solve it and this requires high-level skills by applying scientific steps [18]; second: because of the role and presence of the teacher as a facilitator and motivator that encourages students to explore and actualize themselves as much as possible. This can enable students to view learning events or problems from various points of view, adapt to changing circumstances and they succeed in developing their perspectives, also be able to think in a unique way and produce new information with a high level of thinking [19]. Third: that in the PBL method students can take responsibility for learning by thinking more flexibly at each stage of learning.

Although in research there has been an increase in critical thinking skills, it must be admitted that the increase has not been maximal. Critical thinking is something that is inherent (ingrained) so that it is not easy to change [20], therefore it requires more time to stimulate and develop critical thinking through the use of PBL. This research is only for one semester. For this reason, we suggest that longer studies should be designed and conducted, at least one year in applying PBL, to further develop critical thinking skills which in turn will have an even greater impact on student learning outcomes.

IV. CONCLUSION

The results showed that the application of problem-based learning in developing students' critical thinking skills was better than conventional learning. In addition, problem-based learning scenarios are more effective in improving student learning outcomes than conventional methods. The PBL model with stages: problem presentation, understanding the problem, problem analysis, study and implementation, collection and summary can

strengthen critical thinking skills and student learning outcomes. This means that using real-life problems in learning, students are encouraged to learn in a different and interesting atmosphere so that they are enthusiastic and actively involved in learning which has an impact on optimizing student learning achievement.

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