

IMPLEMENTATION OF PROBLEM BASED LEARNING (PBL) MODEL TO CRITICAL THINKING SKILLS AND OUTCOMES FOR STUDENT ON RATE REACTION MATERIAL

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ABSTRAK: The purpose of this research are: 1) a difference in students critical thinking skills that learned with Problem Based Learning model and Direct Instruction model; 2) the differences effect in level of critical thinking skills high and low students that learned with Problem Based Learning model and Direct Instruction model on student learning outcomes; and 3) contribution of critical thinking skills to student learning outcomes. The population in this study were all of students class XI IPA at SMAN Medan. The sampling technique is purposive sampling. The samples is two schools at SMAN Medan two classes each other. The research instrument is an objective test results are valid and reliable learning and critical thinking skills test. Data analysis is done by using independent sample T-test, Two Way ANOVA and Linear Regression test in SPSS 21. The results concluded that : 1) there are differences in the average value of the critical thinking skills of students that learned with Problem Based Learning model at 81,00 more than in the Direct Instruction model at 68.65; 2) there are differences in the influence of the critical thinking skills of high and low students that learned with Problem Based Learning model and Direct Instruction model on student learning outcomes ($p = 0.000 < 0.05$); and 3) the students critical thinking skills contribute to the learning outcomes of students about 39.7%.

KEYWORDS: Problem Based Learning, critical thinking, learning outcomes, rate reaction.

1 INTRODUCTION

In the process of learning students are less encouraged to develop the ability to think. In fact, to deal with any problems with either everyone needs a high level thinking skills. The higher level thinking consists of critical thinking and creative thinking. Critical thinking is a mental activity in terms of solving problems, making decisions, analyzing assumptions, evaluating, rational members, and conduct an investigation. While creative thinking is a mental activity that produces original ideas, inventive, and able to implement the ideas [1], [2]. Having regard to learning critical thinking skills is able to give good results on the development of moral, social, cognitive, mental as well as the development of science [3].

During this time, students ability to think critically and systematically developed due to the dominance of conventional teaching approaches and less variatifnya active learning teaching methods. As a result of learning just as the delivery of information. In the conventional learning, students can not fully express the critical questions. The ability to ask and express opinions about given place so that it becomes student not trained. Many students have a good level of memorizing, but less understand and interpret what he has learned. This causes lower student learning outcomes. Teachers still ignores what is called critical thinking skills. In fact, this ability has contributed greatly to the success of learning [4].

Learning paradigm should shift from conventional learning that emphasizes the low level thinking skills toward learning higher order thinking skills, especially critical thinking skills [5].

Chemical materials and critical thinking skills are the two things that can not be separated, because the chemical material is understood through critical thinking and vice versa critical thinking are trained by studying chemistry [6]. In order to be effective classroom learning and students are actively involved in the learning process, to improve student learning, then teachers need to select and implement strategies capable of steering the ideal learning and encouraging students to form their own knowledge. One model of learning that can train students' critical thinking skills is the model of Problem Based Learning (PBL). Problem Based Learning model is a learning model that has a basic

philosophy of constructivism, able to encourage students to construct their own knowledge and practice critical thinking skills, creative and innovative. Rindel and Wheeler can train students' higher order thinking skills [7].

Generally Problem Based Learning consists of five phases: 1) provide an orientation to student issues; 2) organize the students to examine; 3) assisting with the investigation independently and groups; 4) developing and presenting the results; and 5) analyze and evaluate the problem solving process [8]. Problem Based Learning model is suitable for the material reaction rate, because the reaction rate is a complex matter which is a combination of abstract knowledge in the form of rate equation, reaction order requiring a matter of practice, the factors mempengaruhi reaction rate, and the collision theory. The complexity of the material reaction rate requires students to really understand the concept by understanding, problem solving, exercises, and discussions.

Almost all students have high critical thinking skills criteria. This is evidenced as much as 94.87% of the students have skills to ask questions, analyze assumptions, and examine the facts with high criteria as well as 100% of the students have the skills to consider the interpretation of the high criteria [9]. Problem based learning using media eXe Learning 21% higher than the results of student learning without using media eXe Learning can improve learning outcomes chemistry student with an average gain of 0.58 and significantly affect students' activity of 57.4% [10].

Based on the above, the authors are interested in examining the implementation of Problem Based Learning (PBL) model to critical thinking skills and outcomes for students on rate reaction material. The purpose of this research are: 1) a difference in students' critical thinking skills that learned with Problem Based Learning model and Direct Instruction model; 2) the differences effect in level of critical thinking skills high and low students that learned with Problem Based Learning model and Direct Instruction model on student learning outcomes; and 3) contribution of critical thinking skills to student learning outcomes.

2. RESEARCH METHODS

The population in the study were all students of class XI IPA at SMAN Medan Academic Year 2015/2016. Samples are two schools in SMA Medan respectively of two classes. The sampling technique is purposive sampling. The method used in this research is quasi experiment with making treatment provides a of Problem Based Learning (PBL) model for an experimental class and of Direct Instruction (DI) model for an control class. The research instrument is a test of critical thinking skills. Critical thinking skills that are meant in this study refers to the seven indicator are answering questions, using predefined procedures, identify or define criteria for deciding the possible answers, looking for similarities and differences, interpret reality, analyze opinions see equation and differences; and identifying an opinion or assumption.

Data analysis is done by using independent sample T-test, Two Way ANOVA and Linear Regression test in SPSS 21 for windows with significance level of 0.05. This requires the use of analytical techniques that must be met, namely the requirement of normality and homogeneity. Normality test used is the Kolmogorov-Smirnov test and homogeneity test carried out by using test Levene's Test in SPSS 21.0 for Windows.

3. RESULTS AND DISCUSSION

i. Differences in the Average Value of Critical Thinking Skills

The results of hypothesis testing using independent sample T-test, it is known that there are differences in the students critical thinking skills that learned with Problem Based Learning model and Direct Instruction model. The difference in the students critical thinking skills of two class are presented in Table 1.1.

Table 1.1. The results of the average value of critical thinking skills in the classroom experiment (Problem Based Learning model) and grade control (Direct Instruction model).

	Model	N	Mean	Std Deviation	Std.Error Mean
Critical Thinking	Problem Based Learning	72	81.00	7.311	0.861
	Direct Instruction	72	68.65	7.587	0.894

According to Table 1.1, the students that learned with Problem Based Learning model has an average value of students' critical thinking ability level at 81,00 is higher than the students that learned to use of Direct Instruction model which has an average value at 68,65 the reaction rate material. Differences in the average value of the level of critical thinking skills of students that learned Problem Based Learning model and of Direct Instruction model is shown in Figure 1.

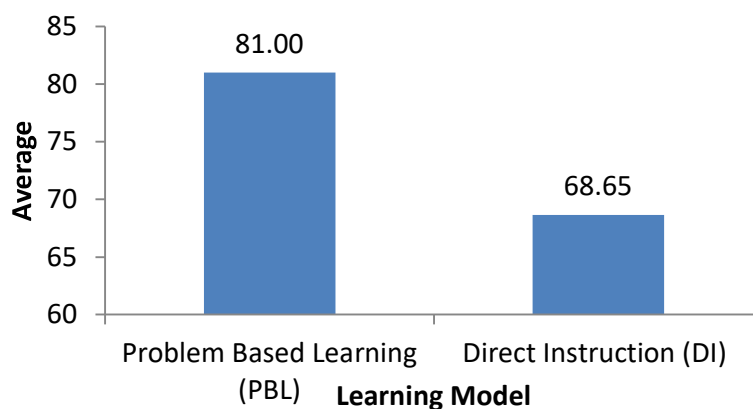


Figure 1. Graph of the average value of critical thinking skills that learned with Problem Based Learning model and Direct Instruction model.

The difference value critical thinking skills cause by during the learning process in the classroom as a whole of Problem Based Learning model makes the students more active in the learning process starting from understanding the problems presented teachers in the form of student worksheets, formulate problems, conduct investigations or lab to solve problems to draw conclusions from the results of lab work that has been done. In addition, students want critical thinking in the process of learning such as asking questions to her if she does not know, do chores or problems well, explaining to friends who do not know and want to pay attention to the teacher's explanations in doing the task. Students who have the skills to ask questions, analyze assumptions showed almost all students have the critical thinking skills of high criteria [9]. Learning Problem Based Learning can improve critical thinking skills [11].

Meanwhile, for the group of students that learned with of Direct Instruction model, during the learning process of students seem less active and less follow the spirit of learning, the teacher's role is dominant, the tasks set by the teacher, there can hardly be done well and quickly get bored and give up when facing difficulties in tasks. Such conditions lead to difficult students will develop their ability in terms of social skills, interpersonal relationships, as well as critical thinking skills. Knowledge truly meaningful when someone starts to look for solutions and knowledge the accompanying [12]. Critical thinking skills students learn to Problem Based Learning model is higher than students who studied with conventional learning models [13], [14].

ii. Differences Influence of Critical Thinking Skills Learning Outcomes

Results of hypothesis testing using Two Way Anova obtained probability value or sig. $0.000 < 0.05$ means that there are significant levels of critical thinking skills of high and low students that learned with Problem Based Learning model and Direct Instruction model on student learning outcomes. The role of critical thinking skills to improve learning outcomes is a form of interest in students to learn. Differences in student learning outcomes at the level of critical thinking skills students are presented in Table 1.2.

Table 1.2. The average yield of N-gain based on the level of critical thinking skills (high and low) on the teaching of chemistry.

Critical thinking skills	Mean	95% Confidence Interval	
		Lower Bound	Upper Bound
High	0.728	0.716	0.741
Low	0.657	0.634	0.681

Based on the tabulation of the data in Table 1.2, shows that students experimental class that learned with of Problem Based Learning model results obtained critical thinking skills high has an average value of N-gain learning outcomes 0.728 higher than the average value of the N-gain learning outcomes which has the ability to think critically low at 0.657. Differences influence the level of critical thinking skills of the students learning results are shown in Figure 2.

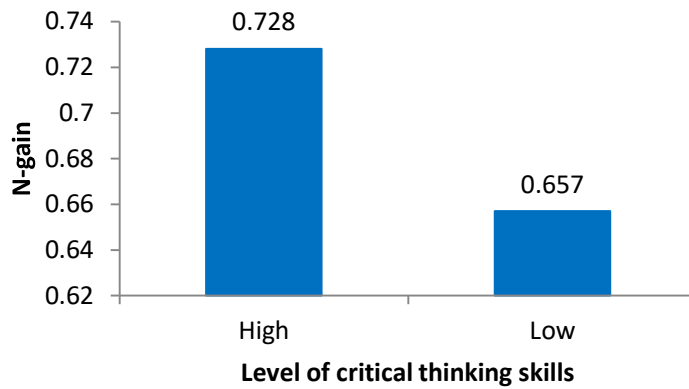


Figure 2. Graph of the average value N-gain based on the level of critical thinking skills student

Exercising critical thinking skills in the classroom can improve students academic ability. Learning Problem Based Learning can improve critical thinking skills [11].

During the learning process, the results of observations conducted showed that students who have high levels of critical thinking skills high seem more active and willing to think critically in the process of learning such as asking questions to her if she does not know, do chores or problems well, provide an explanation to friends who do not know and want to pay attention to the teacher's explanations in doing the task. Students who have the skills to ask questions, analyze assumptions showed almost all students have the critical thinking skills of high criteria [9]. While groups of students who have the ability to think critically low, seemed less active and less follow the spirit of learning, tasks that the teacher also less can be done well and quickly get bored and give up when facing difficulties in tasks.

iii. Critical Thinking Ability contribution to the Learning Outcomes.

The results of hypothesis testing using Linear Regression obtained probability value or sig. $0.000 < 0.05$ means that a significant relationship between students critical thinking skills that learned with the Problem Based Learning model with student learning outcomes. Linear Regression test results can be seen in Table 1.3.

Table 1.3. Summary results of the regression test critical thinking skills with student learning outcomes.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0,630 ^a	0,397	0,389	0,06763

According to Table 1.3, the value of the correlation or relationship (R) is equal to 0.630 and the coefficient of determination (R^2) of 0.397, which means that the level of students' critical thinking skills singly contribute to student learning outcomes by 39.7% while the rest of 60; 3% predicted by other variables.

Their findings have consistently shown the correlation and impact suggests that student learning outcomes are determined by factors of critical thinking skills. connection between critical thinking with cognitive (learning outcomes), reinforced by Halpern opinion stating that: critical thinking is the use of Reviews those cognitive skills or strategies that increase of the probability of a desirable outcome [15]. During the learning process by applying the model PBL, students perform tasks according to their respective roles, so that students can better understand the material as well as critical thinking skills students can berkembang and positive effect on student learning outcomes.

4. CONCLUSION

Based on data processing and discussion of the results of research conducted, it can be concluded that: : 1) there are differences in the average value of the critical thinking skills of students that learned with Problem Based Learning model at 81,00 more than in the Direct Instruction model at 68.65; 2) there are differences in the influence of the critical thinking skills of high and low students that learned with Problem Based Learning model and Direct Instruction model on student learning outcomes ($p = 0.000 < 0.05$); and 3) the students' critical thinking skills contribute to the learning outcomes of students about 39.7%.

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