

The Effect of Problem Based Learning Model and Inquiry Learning Model for Students Mathematical Critical Thinking Ability Reviewed from Students Learning Motivation

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Abstract. The goal of this research is to know (1) is students criticism thinking ability that s given learning with problem based learning model is higher than the students that are given inquiry learning model, (2) is there any interaction between learning model and students learning motivation to students critical thinking ability. Kind of this research is quasy experiment. The population in this research is all students of VII Grade students of BudiSatrya Junior High School and the sample is choosen randomly namely VII-3 class (experiment class 1) and VII-4 Class (experiment class 2) each class has 34 students. Instruments used in this research contents of: (1) questionnaire of students learning motivation, and (2) critical thinking ability test. Data analysis is done by 2 lines ANAVA. This research result shows that (1) students criticism thinking ability that s given learning with problem based learning is higher than students that s given learning with inquiry learning, (2) there is interaction between learning model with students learning motivation for students criticism thinking ability.

Key Words: Problem Based Learning Model and Inquiry Learning Model, Students Learning Motivation, Students Critical Thinking Ability

1. Introduction

Studying is an interaction process for a whole situations around of personality. It can be seen as a process that guided to a goal and done process through many experiences. Learning is a looking process, observing process, and understanding something. In attachment of Education and Culture Minister Regulation Number 103 Year 2014, basic concept of learning model is that students are seen as the subject who have an ability to search, cultivate, construct and use knowledge. As in the point of view, learning must in touch with the chance given to the students to construct knowledge in its cognitive process.

One of effort that can be done in learning process in achieving successness in learning activity is by doing learning inovation. Learning inovation that can be done is by using learning models that is a part of teaching-learning strtegy components. The experts arrange learning model based on education principe, psychology theories, sociology, psikiatry, analitical system, or another theory (Rusman, 2012:2).

Joice & Weil (Rusman, 2012:2) said that learning model is a planning or pattern that can be used to form curriculum and long time learning, design learning material, and guiding in or out class learning. Learning model that can be used by the teacher in learning is Problem Based Learning (PBL) and Inquiry Learning (IL).

Problem Based Learning is a learning model that include the students to solve a problem through scientific method steps so the students can learn the knowledge that related with the problem and have a problem to solve a problem. to achieve optimal learning result, learning with PBL is needed to design well, starts from preparation of a problem that is suitable with the curriculum that will be developed at class, appearing students problem equipments needed and the evaluation used.

Beside Problem Based Learning Model, Inquiry Learning Model is also a learning model recommended by the experts. Sani (2014:8) states that Inquiry Learning is a learning that includes the students in forming the question to do an investigation in building knowledge and new meaning.

Inquiry as a learning approach with nature investigation or nature material, in answering a question and doing a discovery through an investigation to get a new understanding. W. Gellu (Damayanti, 2014) defines Inquiry as a series that involve all students ability maximally to search and invest, sistematically, critically, logically, and analytically. So they can formulate their discover full of confidence. In other words, Inquiry is a process to have and get an information by doing observation or experiment to look for an answer or solving a problem to question or problem by using critical and logical thinking ability.

Talking about education, it is not complete if there is no mathematic as one of a must subject thought an school and have a big rule in education world. One of ability must have by a student from mathematic is critical thinking ability. It is in a way with Muchlis opinion (2012:36) that defines that mathematic is needed to give for the students to equip them with logical , analytical, sistematical, critical, and creative thinking and cooperation ability.

Critical thinking ability is a basic to analyze an argument and develop a mind set logically. It is in a way with Einav opinion (2015:455-456) stated that:

Critical thinking is an important ability for contemporer life, next, the function of critical thinking is long life, it can support the students in a regulation of their learning ability and can be used by individual to contribute creative to an occupation they choose, in this research we say that critical thinking based through disposition and ability .

This critical thinking is a Higher Order Thinking Skill (HOTS). Some applications of HOTS is can evaluate a proof, playing logic and look for imaginative alternative from conventional ideas. Ennis (2009:4) said that critical thinking is a reasoning thinking and reflective by emphasizing in decision making about what must be trust or done.

According to Paul and Elder (2007:6)

Critical thinking is the process of analyzing and assessing thinking with a view to improving it. Critical thinking presupposes knowledge of the most basic structures in thinking (the elements of thought) and the most basic intellectual standards for thinking (universal intellectual standards). The key to the creative side of critical thinking (the actual improving of thought) is in restructuring thinking as a result of analyzing and effectively assessing it.

Based on some opinions that have been said above we can conclude that critical thinking is a thinking process and emphasizing decision making that is thought deeper.

Facione (2015:5-6) stated that critical thinking indicators are interpretation, analysis, evaluation, inference, explanation and self regulation. Interpretation is a skill of ability to understand and express the meaning or problem. Analysis is an ability to identify and conclude the relation of statement, question, concept, description

or other form. Evaluation is an ability to be able to access a credibility of statements and able to access logically the relation of statements, description, question or concept. Inference is an ability to identify and get the necessary elements in taking conclusions. Explanation is an ability to firm and give logic reason based on result gotten. While the last indicator, self-regulation is an ability to monitoring someone's cognitive activity, elements used in finishing problem, especially in implying ability in analyzing and evaluating.

Beside the usage of suitable learning model, learning successness is also depend on students learning motivation. Learning motivation is gotten by the students in each learning activity really have important role to increase students learning result and mastered and saved in a long time.

Asrori (2009:183-184) stated that motivation is really needed for learning process at class effectively. Motivation has an important role in learning, in processing in result achievement. A students who has a high motivation, generally, they can get successness on process or output of learning. The appearance of learning motivation in students selves will certain whether they will involve actively on learning process or passive or uncare. These two different condition will produce different learning result also.

Based on the explanation above, so the researcher is interested to do a research about "The Effect of Problem Based Learning Model and Inquiry Learning Model to Students Mathematical Critical Thinking Ability Reviewed by Students Learning Motivation on Budisatrya Junior High School."

2. Method

Population in this research is all VII Grade students of Budisatrya Junior High School 2017/2018 Year Academic contents of 4 classes. The sample of this research is 2 randomly chosen classes of 4 classes, namely VII-3 class as Experiment Class 1 and VII-4 class and Experiment Class 2.

Table 1. Design of Research

Class	Done	Postest
Experiment-1	X ₁	O
Experiment-2	X ₂	O

Note:

X₁ : Problem Based Learning Model

X₂ : Inquiry Learning Model

O : *Post-test*

The instrument used to collect the data in this research is Questionary to measure level of students learning motivation and essay test to measure students critical learning ability. Questionaries given arranges by answer an option of Very Agree (VA), Agree (A), Less Agree (LA), and Not Agree (NA). This research used essay test with the reason, with essay test can be seen students thinking skill and students view through the steps in finishing the question statistic. Analitic that's done by two lines of ANAVA.

3. Research Result

Grouping of students motivation level (low, medium, and high) is formed based on students learning motivation evaluation questionaries. In experiment Class-1, 6 students in high category, 23 students in medium category, and 5 students in low category. While in experiment Class-2, 6 students in high category, 22 students in medium category, and 6 students in low category.

Table 2. Grouping of Students Motivation Level

Class	Students	Students Motivation Level		
		High	Medium	Low
Experiment – 1	34	6	23	5
Experiment – 2	34	6	22	6
Amount	68	12	45	11

First hypothesis test is done to test the students mathematical critical thinking ability that is thought with PBL is higher than the students with Inquiry Model.

Table 3. Average of Critical Thinking Ability of PBL and Inquiry Learning

Learning	Students learning motivation level	Students Critical Thinking Ability	
		Mean (X)	Standart of Deviation (SD)
Problem Based Learning	Low (6)	59	6,51
	Medium (23)	69,34	7,58
	High (5)	83,33	6,055
Inquiry Learning	Low (6)	64,16	10,20
	Medium (22)	66,13	5,96
	High (6)	72,5	6,12

Based on the table above it can be defined the description of students critical thinking ability by using PBL it has mean and standart of deviation, for the low group 59 and 6,5, medium is 69,34 and 7,58, high is 83,8 and 6,005. While for students critical thinking ability with Inquiry Model the standart of deviation, for low is 64, 16 and 70,20, medium is 66,13 and 5,96, and high is 72,5 and 6,12. There are some things that can be concluded with students critical thinking ability, they are:

- 1) For high ability students, the average of critical thinking ability in PBL is higher (83,33), the average of Inquiry model is 72,5
- 2) For medium ability students, the average with PBL is 69,34 and with Inquiry is 66,13
- 3) But for low ability students, the average with PBL is 59 is lower than Inquiry Model 64,16

Table 4. Conclusion of Two Lines ANAVA Test of Students Critical Thinking Ability

Variety Source	Dk	JK	RJK	F	F _{tabel(0,05)}
Learning	1	211,764	211,764	4,299	3,99
Motivation	2	1569,88	784,942	15,93	3,14
Learning*Motivation	2	345,323	172,662	3,505	3,14
Galat	62	3053,909	49,256	-	-
Amount	67	5180,876	-	-	-

Based on the table above it can be known that F on learning factors (PBL and Inquiry) as big as $F_{\text{counting}} = 4,299$ is higher than $F_{\text{table}} = 3,99$ ($4,299 > 3,99$). So it can be concluded that the average of students' critical thinking ability with PBL is higher than Inquiry.

The second Hypothesis test is done to test interaction between mathematic learning with students' learning motivation (high, medium, low) to the students' critical thinking ability. Based on the counting above is gotten, in learning motivation shows that F_{counting}

$F_{\text{table}} = 3,505 > 3,14$, so for the second hypothesis test refused H_0 receive H_a . Namely there is an interaction between learning with PBL to the students' critical thinking ability. More clearer will be presented in the diagram below:

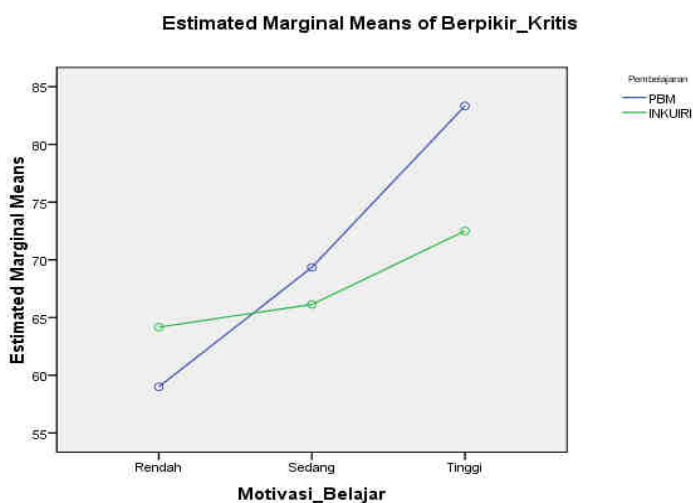


Figure 1. Interaction Between Learning Model with Students' Learning Motivation to Students' Critical Thinking Ability

On the diagram above it can be seen clearly that there is an interaction between learning model with students' learning motivation. So for the students who have medium and high learning motivation is better to use PBL. While for a group who has low learning motivation is better to use Inquiry model.

4. Discussion of Research Result

4.1 Students' Learning Motivation

Questionnaires of learning motivation in this research is used to modify students' motivation group in high, medium, and low group. Grouping motivation also use to answer the question in related with students' critical thinking ability that is given by PBL and Inquiry Model.

Based on learning result, can be gotten the average and basic junction on Experiment Class-1 is 64,56 and 4,992 and Experiment Class-2 is 63,17 and 4,997. It means both classes at all are relative in the same. Based on normality test, there is gotten students' learning motivation questionnaires in experiment class-1 and experiment class-2 distributed normal and based on homogeneity test students' motivation questionnaires is gotten that both sample (Experiment Class-1 and 2) come from a population that has homogen variety. Next, based on different average of students' homogen motivation, there is gotten that motivation level in Experiment Class-1 and 2 have no difference, namely having same motivation grouping in Experiment Class 1 there are 6 students who have

high motivation to study, 23 students have medium motivation to study, and 5 students have low motivation to study. In Experiment class-2 there are 6 students who have high motivation to study, 22 students who have medium motivation to study and 6 students have low motivation to study.

4.2 Students Critical Thinking Ability

The average of Post-test score of students critical thinking ability that have PBL and Inquiry Model each of them is 70,44 and 66,91. The accounting result of two lines ANAVA based on the analysis $F_{\text{counting}} = 4,299$ while $F_{\text{table}} = 3,99$. Because $F_{\text{counting}} > F_{\text{table}}$, so H_0 is refused dan H_a is received.

If we see the total average score of each indicator of PBL class is 13,69 while in Inquiry is 6,69. It means PBL class is higher than Inquiry class. It's same with Noer's research result (2009) in her research found that there is significant difference between the quality of critical thinking ability improvement who have learning with PBL. The improvement of critical learning by PBL infactly showed by Newell and Simon's research (1972) that shows that PBL train the students ability to analyze, critic, and metacognitive. Supported by Shepered (1998) who shows that PBL improves critical thinking significantly.

4.3 Interaction between learning Model with Students Learning Motivation for Students Critical Learning Ability

Based on research result it's seen that the average of the students critical learning ability by using PBL namely high (83,33), medium (69,34). It's higher if it's compared with the students by using Inquiry Model namely high (72,5), medium (66,31) but it's oposite with the low group (59) is lower than critical thinking ability by using Inquiry Model in low group (64,16). So it's gotten the cutting in low group. It can be concluded that the interaction of learning or students learning ability (high, medium, low) to the students critical thinking ability.

Things that make their's interaction between learning with students learning motivation level for students critical learning ability give an influent to the students critical thinking ability. This shows that students critical thinking ability is not just influenced by the learning model but also students learning motivation.

5. Conclusion

Based on the discovery that had stated in the previous part, we can take some conclusions related with learning factors, they are:

1. Critical thinking ability with PBL is higer than Inquiry Model
2. There is an interaction between learning with learning motivation with students critical learning ability.

6. Suggestion

6.1. For The Mathematics Teachers

- a. It's suggested to the next teacher to plan the learning first, especially enough time in implementation and prepare the learning design better more.
- b. Teachers guide the students to participate actively in learning so that they can solve the problem given

- c. Teachers can give more attention to the group that face a problem often and active in attaining and give motivation, for example, remind the goal and function of the learning achieve again.

6. 2. For The Next Researchers

- a. The next researchers do the next research with many samples and manage some school in some different location.
- b. The next researchers review another variable, for example, problem solving ability, reasoning and communication, mathematical connection, mathematical communication, learning quality, activities quality, students responds, etc.
- c. The researchers design learning tools and observe instruments effectively and efficiently by paying attention to the character of approach or implied learning model.

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