The Implementation of Problem Based Learning toward Students' Reasoning Ability and Geography Learning Motivation

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M Ruhimat*, E Ningrum and B Wijayanto

Department of Geography Education, Universitas Pendidikan Indonesia, Bandung, Indonesia

*mamatruhimat@upi.edu

Abstract. This research based on the importance of the students reasoning ability should be possessed. One of the learning models are conceptually possible can improve the reasoning ability is the problem based learning model. This research aims to determine the implementation of problem based learning toward students reasoning ability, viewed by students learning motivation on chapter contamination, destruction and risk the environment in class XI Social Senior High School 2 Semarang, Central Java, Indonesia. Learning motivation of this research is the moderator variable with consideration that motivation is one of the factors that are conceptually influence a learning results. This research is a quasi-experimental with factorial design 3x2. The technique of data collection was done with ability reasoning test, motivation questionnaire, and observation of learning. Technique of data analysis using statistical T test and ANOVA with SPSS version 20.0 for windows. The results showed that 1) there are differences in students reasoning ability of students in the class that use and do not use the problem based learning model, 2 there is an increased geography learning motivation significantly after using problem based learning, 3) there was no interaction between the learning motivation toward students reasoning ability.

1. Introduction

The quality of learning process involves a wide range of learning inputs such as learners, learning models, learning resources, school facilities and other administrative supports. Effective learning will determine the ability of learners to learn. In fact, in the learning process, there are some teachers still use traditional way and do not require the potential development of the learners. To get a good quality of learning, it must be involving active learners. The importance of learning does not obtain by the learners if the teachers only use the lecture method [1]. The Learners should be given the opportunity to interact with others. Based on the preliminary observation, it shows that the teaching and learning process in the classroom tend to use teacher centered model and focus on the mastery of the lesson. This paradigm need to be changed to use student centered model in teaching learning process.

The learning paradigm changes should be applied to all subjects, especially for geography. Based on preliminary observations, the process of learning geography in several high schools in Semarang tend to use lecture learning model, assignments are often in the form of a summary and instructional media used were less varied. Geography learning should be more emphasis on the problems and the fact found in the environment in order to make the students aware to the phenomena occurred in their

lives. The students are required to have high-order thinking skills in response to the situation by oriented problems happened in their surroundings.

One kind of scientific model in learning is the Problem Based Learning (PBL). Studies in geography related to the problems in human life and the environment. This is in line with the characteristics of PBL that make the students able to learn through real-world efforts to resolve the real world problem. One of the alternative models or methods that enable the development of thinking skills of learners (reasoning, communication, and connection) is a problem-based learning [2]. Problem-based learning allows students to be engaged in solving real-world problems, higher order thinking skills, and motivate students in learning activities.

The scientific learning process includes several activities, for example, asking questions, making observations, reasoning, doing experiment and networking [1]. Based on the preliminary observation done by the researcher to geography teachers of Senior high school in Semarang, it shows that the assessment of learning geography focused on the students learning outcomes. Teachers pay less attention in assessing students' learning process. Potential learners can basically be seen from the learning process of students that is the ability of reasoning which is a kind of activity in scientific learning.

Reasoning ability is one of the factors that can affect students' success in studying. Which argues that the ability to process information through reasoning and rational thinking is an important ability that should be owned by the students [1]. The ability to think can be done if it has a concept and supported by intelligence reasoning. It means that reasoning and problem solving skills is suitable to the characteristics of PBL [3].

The effectiveness of learning is not only influenced by the model used by the teacher, but also student's motivation which is an important factor in achieving the learning purposes. In learning activity, motivation can be said as a whole driving force in self-learners to study [4].

Motivation is a very important factor in all kind of activities, including learning activities. However, in Indonesia, students' motivation in studying geography is still low. Kristanti reports that students' motivation to learn geography and social sciences are still low [5]. Based on the observation of researcher did in the learning process, there are three indicators that show this problem: the lack of bravery to express their opinions to others, the lack of desire to achieve optimal learning results, and the lack of enthusiasm in learning IPS-Geography.

This paper aims to analyze the implementation of problem based learning toward students' reasoning ability in environment lesson. The theory underlying this study is the sociocultural theory in problem based learning. Then, this research also discusses the problem-based learning in improving the thinking skills, reasoning ability which is part of high-order thinking, motivation in learning geography, as well as the implementation of problem based learning toward reasoning ability and learning motivation.

2. Methods

This research was conducted by using quasi experimental research and based on literature study. The data collection was got from the result of reasoning ability and learning motivation in eleventh grade social students in Semarang senior high school No.2, Central Java, Indonesia. Students' reasoning ability data was collected from the written test, while students' learning motivation data was got from motivation questionnaire in learning geography. Research design used in this study is 3x2 factorial designs.

There were two instruments used in this research; they were written test and questionnaire. Written test was designed in multiple choices adapted from Marzano indicators to measure students' reasoning ability. Questionnaire was used to measure the level of students 'motivation based on Sardiman indicators and students' responses to problem-based learning. Instruments learning motivation questionnaire was analyzed by using Likert scale analysis. The data was analyzed by calculating the average score of the students.

This quasi-experimental research used two groups, namely experimental class which used problem based learning, and control class which used textual discussion. The increasing of students' reasoning ability by paying attention to their learning motivation in teaching learning process which used problem-based learning method can be determined by using a normalized gain. Two different test averages were analyzed by using SPSS version 20.

Table 1. Classification N-Gain Normalized

N-Gain	Interpretation
N-Gain > 0,70	High
0,30 ≤ N-Gain ≤ 0,70	Middle
N-Gain < 0,30	Low

Source: [14]

3. Results and Discussion

3.1. Sociocultural Theory in Problem Based Learning

Problem-based learning is a renewal in learning process by optimizing students' thinking skills through a systematic process of group work. Learners are given the opportunity to expand issues on the material to be studied. Issues raised on the learning activity stimulate the students to learn based on their background knowledge and experience they already have to form the new knowledge and experiences.

Problem-based learning is described as constructivist learning model which is based on the assumption that learning is a product of cognitive and social interactions that come from the environment. The sociocultural theory Vygotsky is also a constructivist theory but more emphasis on the social environment as a facilitator of the development and learning [6]. Sociocultural theory is based on learning as a construction of knowledge between the students and their community. Vygotsky believes that social interactions with others creates the development of new ideas and enhance the intellectual development of the students.

The interaction of students with the environment will help them in studying. In order to get an understanding of the lesson, sociocultural learning theory of Vygotsky shows that the students try to link their background knowledge with new knowledge and then build a new understanding. Vygotsky believes that social interaction with others will stimulate the formation of new ideas. The problem-based learning is associated with this case because PBL link the new information with cognitive structures owned by the students through learning activities in social interaction with others [2].

Related to the sociocultural theory, problem-based learning in geography raised environmental issues that have a direct impact to the learners. Problem-solving solutions can be done in real learning experience of learners. Media used by teachers, both teaching materials and instructional media should be relevant to the issue so that the learning will be more contextual.

3.2. Problem Based Learning to Improve Thinking Skills

Problem-based learning is a learning method that can improve students' reasoning ability. This is in line with Walker & Leary which argue that learners with study by using PBL prompted to revisit the problem to fix their reasoning process [7]. Problem-based learning trains the students to think critically and actively involved in learning so that students will think scientifically and developed an understanding to the relevant issues.

Problem-based learning is not designed to help teachers to provide as much information to the students, but to help them to develop their ability to think, either solving problems or reasoning abilities. Teachers are expected to prepare a learning device, both media and resources. The importance of students' high-order thinking skills make problem-based learning become the suitable method to be applied in all learning subjects.

Students' response to problem-based learning that applied to teaching learning process is needed to know the response of learners towards the lesson.

Table 2. Students' Response toward PBL as a Learning Method

No.	Statements	Score	Percentage (%)
1	Problem-based learning is an interesting learning	104	81.25
2	I'm easier to understand the material geography through problem-based learning	97	75.78
3	Tasks in problem-based learning is more creative and not boring	102	79.69
4	There are more information and knowledge I get through problem-based learning in learning environmental preservation.	98	76.56
5	Problem-based learning changes my perception about geography as the difficult subject to the easy and fun learning	89	69.53
6	Problem-based learning helps me to reduce the habit of memorizing lesson in learning geography	95	74.22
7	Problem-based learning helps me get meaningful learning experiences	98	76.56

Source: Research finding (2016).

Table 2 above shows that the students are interested in problem-based learning model, because the task given in problem-based learning is more creative and not boring. Problem-based learning provides learning experiences to the students well, so it changes students' perception about geography as a difficult subject to easier and enjoyable subject.

3.3. Reasoning Ability as a part of High-Order Thinking

Reasoning is a high-order thinking skill that must be achieved by the students to solve the problems that exist in everyday life. The problem-based learning aims to design a high-order learner to think in a problem-oriented situation [8]. High-order thinking skill included the ability of reasoning and problem-solving skills. The features of problem-based learning are important to improve students who learn contextually, elaborate students' knowledge through social interaction, and emphasize on meta-cognitive reasoning and self-learning [9].

Marzano, Ennis, and Bloom are some experts who develop a reasoning framework. Reasoning indicators developed by Marzano are comparing, classifying, making induction, make deduction, analyze errors, build support, abstraction, and analyze perspectives. Bloom categorizes reasoning abilities into a High Order Thinking Skills (HOTS), which includes the ability to analyze (C4), the ability to evaluate (C5), and the ability to create (C6). Indicators reasoning ability include clarification, basic, conclusions and evaluation [6].

Problem-based learning makes students are able to work independently to gather the information they need. The information obtained is then brought to their group work in solving the problems. Students' response to problem-based learning in solving the problems presented in Table 3.

Table 3. Students' Response toward PBL in Problem Solving

No.	Statements	Score	Pecentage (%)
1	Problem-based learning helps me to solve real-world problems	91	71.09
2	Problem-based learning helps improve my reasoning ability	106	82.81
3	Problem-based learning helps me in developing thinking skills	106	82.81
4	Problem-based learning helps me in working together to solve environmental problems	92	71.88
5	I am pleased with the opportunity to ask questions	102	79.69
6	I am happy to have a product to solve environmental problems	94	73.44

Source: Reasearch finding (2016).

Based on table 3 above, it can be seen that the learners feel that PBL help them to improve their reasoning ability and develop their ability to think with a percentage of 82.81%. Students' response on other students' work become fun activity for students because they can ask questions and criticize the solutions to problems that other learners prepared. The response of students to the problem based learning in order to solve real-world problems only get a percentage of 71.09%. It means that the awareness of students to solve environmental problems is low.

3.4. Motivation in Learning Geography

In learning activities, motivation can be defined as the overall driving force in self-learners who lead learning activities, which ensures the continuity of learning activities and giving direction on learning activities, so that the objectives can be achieved by studying. "Motivation is an essential condition of learning" [4]. Student' achievement will be optimal if there is a proper motivation. The more precise motivation given, the more successful will students' achieved.

Learning motivation is one of the things which need to achieve in teaching learning process, especially in geography. There are several ways the teachers do to motivate learners in learning geography is as follows [10]:

- Well organized and systematic presentation study by the teacher.
- Use a variety of teaching methods.
- Use of the practice and feedback, i.e. knowledge of the results.
- Conducive learning environment including a classroom setting, the availability of teaching and learning resources, the relationship between students, etc.
- Teacher's personality, such as knowledge, skills, ideas, attitudes and perceptions.
- The characteristics of motivation which indicates a person has a strong motivation is as follows [4]:
- Focus in finishing the task (working continuously for a long time, never stopped before finishing the task).
- Doesn't easy to give up and satisfied with their achievement.
- Interested in the various problems.
- Working independently.
- Quickly bored with routine tasks (things that are mechanical and repetitive, and less of creativity less creative).
- Stick with their own arguments.
- Not easy to let go on what they believe.
- Interested in finding and solving problems.

Learning activities will work well if the students are diligently working on assignments, able to solve the problems and obstacles autonomously. The students are expected to keep their arguments if it is believed and quite rational. They must be responsive to the issues and think about the solution of the problem.

Geography as one of the subjects taught in senior high school has a role in forming the students' personality. There are five pedagogical contributions in teaching geography to help the formation of students' personality is as follows [11].

- Students understand the range of social problems, as a result of environmental differences.
- Students appreciate the fact, understanding and geographic ties.
- Students are aware of the available natural resources that need to be explored and exploited.
- Students appreciate the economic conditions and cultural interdependence among regions.
- Students see on their own by seeing what other nations have.

Motivation has a very important role in learning activities, since it is one of the factors that determine the intensity of students' effort and students' reasoning ability in learning. Motivation has a close relationship with students' objectives in learning. The purpose is something to be achieved by an act according to the needs of individuals. Motivation arises from a person because the objectives concerning the matter of necessity. Motivation can give directions and activities related to the formulation of objectives. Objective which received well by the learners is a very important motivational tool. Motivation can be a driving effort in getting learning achievement.

3.5. The Implementation of Problem Based Learning toward Students' Reasoning Ability in Term of Learning Motivation.

The implementation of problem-based learning on students' reasoning ability attention to the learning motivation is explained by discusses: 1) students' reasoning ability in problem-based learning; 2)

Students' learning motivation in problem-based learning; 3) learning interaction with students' learning motivation toward their reasoning ability.

3.5.1. Students' reasoning ability in problem-based learning. Students' reasoning ability in geography between experimental class which using problem-based learning and control class which using textual discussion method were tested by using independent-samples t test.

Table 4. Independent Sample T Test Result in the Second Meeting

Data	T	df	Sig. (2-tailed)
N-Gain experimental and control class	4.837	64	0.000

Source: Data analysis (2016).

The test results which used SPSS 20.0 on t-table show that t value is 4.837 with a degree of freedom (df) 64 and sig. (2-tailed) 0.000 with the significance level α= 0.05. It can be seen that the sig. (2-tailed) is smaller than α or 0.05> 0,000. The comparison of n-gain in the second meeting of experimental and control can be seen in Figure 1 below.

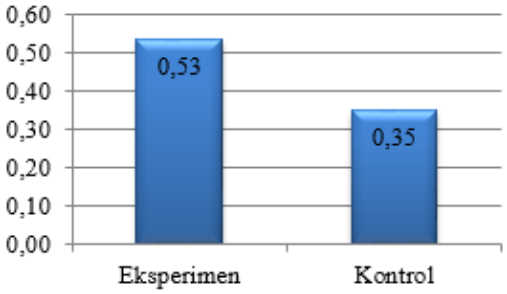

Figure 1. The Comparison of N-Gain Values of Experimental and Control class in Second Meeting

Related to the findings of Afcariono, PBL can increase students' high-order thinking skills since the students are more interested and understand the problems from the fact in their surroundings. PBL is designed to improve high-order thinking skills, including the reasoning ability [12].

3.5.2. Students' learning motivation in problem-based learning. Factorial design in this study divides students' learning motivation into three categories: high, medium, and low. The results of students' learning motivation questionnaire in experimental class which taught by using PBL can be seen on the table 5 below:

Table 5. Distribution Data of Students' Learning Motivation in Experimental Class before Learning

No.	Motivation	Frequency	Percentage (%)
1	High	9	28.12
2	Middle	23	71.88
3	Low	0	0
	Total	32	100

Source: Research finding (2016).

Table 6. Distribution Data of Students' Learning Motivation in Experimental Class after Learning

No.	Motivation	Frequency	Percentage (%)
1	High	25	78.13
2	Middle	7	21.88
3	Low	0	0
	Total	32	100

Source: Research finding (2016).

Students' learning motivation data is got from the questionnaire which distributed before and after the treatment.

Table 7. Paired-Sample T Test Motivation Before and After Learning Process in Experimental Class

Data	Mean	SD	t	df	Sig. (2-tailed)
Motivation 1 and 2 Experimental class	-5.42594	4.22970	-7.257	31	0.000

Source: Data analysis (2016).

Based on the analysis of learning motivation before and after learning by using PBL, it is known there were differences in students' learning motivation in geography by using this method. The finding is related to Wati statement which argues that PBL is expected to increase learning motivation as well as active learners in the learning process since the students interested in solving the problems happened in their environment [13].

3.5.3. Interaction of learning motivation toward students' reasoning ability. The calculation of the interaction between PBL and learning motivation in geography is taken from the value of normalized gain in experimental and control class. Statistical anaylisis used to see the interaction between them is analysis of variance (ANOVA).

Table 8. Analysis of Variance Hypothesis 5 in Second Meeting

Tests of Between-Subjects Effects					
Dependent Variable: N Gain					
Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	0.592[a]	3	0.197	7.577	0.000
Intercept	9.443	1	9.443	362.880	0.000
Motivation	7.105E-007	1	7.105E-007	0.000	0.996
Class	0.473	1	0.473	18.170	0.000
Motivation * Class	0.001	1	00.001	0.046	0.831
Error	1.613	62	450.026		
Total	14.374	66			
Corrected Total	2.205	65			

Source: Data analysis (2016).

Students' reasoning ability are not affected by learning motivation, however, it is more influenced by the learning process. It can be seen from the significant value on the table 4:34 is 0,000, which means that the significant value of the class (learning) is smaller than 0.05. Adjusted R Squared value is 0.233, which means that two independent variables and their interactions are able to explain the variability of the dependent variable 23.3%. Plot result interaction between motivation in learning geography and models are presented in the following graph in figure 2:

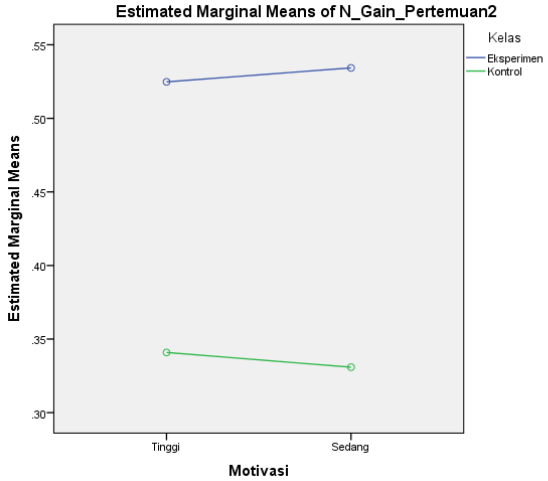

Figure 2. Interaction between Learning Motivation and Learning Process in Second Meeting Toward Reasoning Ability

The figure shows that the mean of students' reasoning ability with high and middle motivation in experimental class is higher than high motivation students in control class. Four conditions (experimental- high motivated, experimental- middle motivated, control- high motivated, control-middle motivated) did not differ significantly in influencing the improvement of students' reasoning ability. It can be seen from the sig. class value 0,000 which less than 0.05. It means that there is no interaction between learning method and learning motivation since learning method is not depend on high and low motivation that the students' have.

Moreover, it was found that there is no interaction between students' learning motivation and students' reasoning ability. It is because the effectiveness of learning does not depend on students' learning motivation. Reasoning skills for highly and middle motivated students in experimental class is higher than high-middle motivated students in control class. Students' reasoning ability are not significantly affected by students' learning motivation, however, it is influenced by the method used in teaching learning process.

4. Conclusions

Problem-based learning in geography raised the environmental issues which have direct impacts to the students. The solution of the problem found by the students can be based on their personal experience. Media used by teachers, both teaching materials and instructional media should be relevant to the issue so that the learning will be more contextual.

It is found the differences between students' reasoning ability in experimental class who taught by PBL with the students who taught by textual discussion. Problem based learning method is more successful in increasing students' reasoning ability than textual discussion method. Problem-based learning trains the students to solve environmental problems that occur around them. The role of environmental issues in a problem-based learning can improve their reasoning ability.

Geography teachers can raise the problems that exist in their local environment in the learning material, so the students can find the solutions of the problems since they are directly interact with those problems. Students' learning motivation in this study do not significantly influenced and there is no interaction with students' reasoning ability. It is possible that there are other factors that can affect the increases of students' reasoning ability, such as the interests and concerns, attitudes and habits, persistence, and psychological factors. Hopefully, the next researchers can use other factors that affect students' reasoning as moderator variables in the research that has not been discussed in this study.

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