

## Effectiveness of problem-based learning model in empowering creative thinking ability of elementary school students

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### Abstract

This study aimed at determining the effectiveness of the Problem Based Learning (PBL) model in empowering the creative thinking skills of elementary school students in Pagergunung Ulujami Pemalang in social studies (IPS) learning. The research population was all fifth graders of the elementary school in Pagergunung Ulujami, Pemalang Regency, the sample of this study was taken using quasi-experimental, while data collection technique used pre-test and post-test techniques on students' creative thinking abilities. Meanwhile, the statistical test analysis technique used the proportion test and the difference between the two proportions. The results showed a significance level of 5%. The conclusions of the study are: (1) PBL model is effective in the aspect of students' creative thinking abilities, but less effective in the aspect of problem-solving abilities in IPS learning, (2) PBL model is more effective than conventional learning in both students' creative thinking and problem-solving ability.

**Keywords:** Problem Based Learning, Creative Thinking, Social Studies

### INTRODUCTION

Social Studies (IPS) is a scientific discipline studying various aspects of human life and the social environment. Its learning is carried out by adjusting the developments that occur regionally, nationally, and globally.

This condition aims to make IPS learning able to help students live effectively and productively in their social environment (Rasimin, 2020).

Generally, IPS learning problems are dominated by using the lecture method, so that it is considered boring and impacting on reducing learning motivation for students. IPS learning positions the teacher as a very dominant learning resource in addition to the limited use of other learning resources. In addition, the weaknesses of IPS learning also emphasize cognitive abilities at low levels, so that the thinking skills of high-level students experience less development (Gunawan, 2013). This condition causes students to think less actively and only learn and memorize the material being taught without knowing the meaning of new knowledge that is being taught or studied.

In essence, learning is a process of interaction with all situations in the environment as a guide for future behavior. This is where the role and function of the teacher are very dominant in helping students to be active in the learning process. In principle, the learning strategy is an effort, strategy, method, and approach carried out in the process of teaching and learning activities to be able to achieve the goals that have been planned. (Glender, 2011). With the learning strategy used, a teacher will be able to convey learning material so that it makes it easier for students to receive and understand the content of the subject matter.

Learning strategies are grouped into four types: (1) directive learning strategies, namely learning oriented towards mastering the material used by the teacher when teaching so that students understand more quickly; (2) Mediative learning strategies, namely the rational process of problem-solving,

or decision making by thinking critically and inductively; (3) Generative strategies, namely learning strategies that encourage students to learn creatively to produce new and useful thoughts, for example, problem-solving strategies: and (4) Collaborative learning strategies, namely learning to form groups by combining thoughts to complete assignments. (Supardan, 2015; Rasimin, 2017).

There are several learning models that can be used in IPS learning, including: (1) a topic-based integration model, namely a learning model by taking one topic and then linking it to various disciplines; (2) a general potential-based integration, namely a learning model by developing IPS material based on the potential in the surrounding area; and (3) problem-based integration model or Problem Based Learning (PBL), namely learning using real problems and providing solutions. (Rojuli, 2016; Rasimin, 2016).

PBL is a learning model that makes problems as a reference for gaining important knowledge and helps make students accustomed to solving real problems faced in everyday life. The main focus in implementing the PBL model is identifying learning issues to solve problems. The more real the problems that are used as learning materials, the better the influence of students' thinking abilities at a high level. In addition, the PBL model can also facilitate students in constructing their knowledge both independently and in groups (Amir, 2016). The advantage of PBL lies in designing the problem because the problems given are expected to provide stimulation to trigger students to learn well.

The learning process is considered good when meeting the following characteristics: (1) having authenticity as in the work field; (2) built by taking

into account previous knowledge; (3) building metacognitive and constructive thinking; and (4) increasing interest and motivation in learning (Ulger, 2018; Strobel, 2008; Runco, 2014; Cropley, 2001). The aim of this study was to determine the effectiveness of the implementation of the PBL model to empower elementary school students' creative thinking skills. Creative thinking skills in IPS learning are needed, especially in dealing with and solving daily problems.

## **METHODS**

The method used in this study was a quasi-experimental approach. Data collection was done by using pre-test and post-test to empower elementary school students' creative thinking abilities. While the analysis technique used a statistical test with a test of the proportion and the difference between the two proportions (Moleong, 2006: 4). The research design was a pre-test post-test group with the following design: O1-X-O2 represented the pre-test, treatment, and observation groups.

### **Instrument**

In measuring creative thinking ability, the form of creative thinking by Torrance was used in this research. Torrance's creative thinking test measures flexibility, fluency, authenticity, and elaboration. The creative thinking test was given to the research class, both the experimental class and the control class, both in pre-test and post-test. The total score of creative thinking skills was obtained from the average score of the four aspects of creative thinking. The creative thinking score test was added to the average of the other five subscale scores to calculate the overall creative thinking

ability score (Aslan, 2001). All test instruments had been analyzed and tested including their validity and reliability.

When conducting the experimental test, elementary school students were divided into two treatment classes in the learning model, namely the PBL class and the conventional model class which was dominated by various lecture methods. Before and after treatment, students were given a pre-test and post-test to measure creative thinking skills. The research design is visualized in Table 1.

Table 1. *Research Design*

Research Classes		Learning Strategies	
Experiment Class	X1	PBL Model	Y1
Control Class	X2	Conventional lecture)	(Varied Y2

### Population and Sample

The sample of this research was all fifth graders of the elementary school in Pagergunung Ulujami, Pemalang Regency, consisting of 50 students divided into 2 classes. Determination of the treatment class using the intact group technique by first testing the equality of the treatment class using the basis of student report cards.

### Procedures

Students' creative thinking skills were measured using an essay test in the form of problem giving. The quality of students' creative thinking skills was assessed using the creative thinking skills rubric which refers to aspects of fluency, flexibility, originality, and elaboration when students solve problems (Piawa, 2010). The instrument in the form of a test and a rubric for creative

thinking skills were developed by the researcher. The validity of the test and the rubric of creative thinking skills were tested on students of the above class to calculate the validity and reliability of the questions, as well as the accuracy of open-ended problems and the accuracy of aspects of creative thinking. The results of the instrument trial stated that the creative thinking skills test and rubric were in the valid category and were suitable for use in data collection.

### **Data Analysis**

The hypothesis of this study is that there is an effective integration of the PBL model on students' creative thinking abilities compared to conventional classrooms. The statistical test analysis used the proportion test and the difference between the two proportions. The data normality test using the Kolmogorov Smirnov test showed the results of the pre-test data for creative thinking skills of  $p = .216$  and the post-test of  $p = .145$ , greater than  $.050$ , so it can be concluded that the data does not deviate from the normal distribution. The homogeneity test of variance using Levene's test showed the results of the pre-test data for creative thinking skills of  $p = .068$  and the post-test of  $p = .131$  greater than  $.050$ , so it could be concluded that the variance between groups of data was homogeneous. The significance test used the sample paired t-test. Statistical calculations used the SPSS version 16.0 program at the  $.050$  level of significance.

### **Steps of PBL Model**

Non-routine problems are given to students as a pre-test and a post-test. Each student completes the test in about 30 minutes. During PBL learning, heterogeneous groups of students were given non-routine problems

developed by the researcher and validated both by experts and tested before being used in research. The problems developed by researchers refer to the applicable curriculum and focus on students' daily environments. Problem-solving by the next students is seen as its fluency, flexibility, authenticity, and elaboration.

According to Arends (2008), there are 5 steps in the PBL model, namely: (1) orienting students to problems; (2) organizing students to research; (3) assisting independent and group investigations; (4) developing and presenting the work; (5) analyzing and evaluating the problem-solving process. The five phases are integrated into the non-routine problems given to students in classroom learning.

### **Scenario of PBL Model in Solving Problem**

The PBL model is learning by using problems as a focus for developing problem-solving skills, materials, and self-regulation (Hmelo-Silver, 2004; Serafino & Cicchelli, 2005, Egen and Kauchak, 2012). PBL is a learning model that uses real students' daily problems to empower their creative thinking skills, as well as to obtain essential knowledge and concepts from IPS subject matter. The PBL model bases students' thinking patterns on cognitive theory including constructivism learning theory. In constructivism theory, the ability to think creatively can be seen from the ability of students to solve problems. The ability to solve student problems is empowered if students do it themselves, discover, and transfer the complexity of their knowledge.

Arends (2008) states that there are 5 (five) phases of PBL, namely (1) orienting students to problems; (2) organize students to research; (3) assisting

independent and group investigations; (4) develop and present the work; (5) analyze and evaluate the problem-solving process. Problems given to students are problems related to the real world that exist in the daily lives of students. The ability of individual students is demanded to be adequate, but in the learning process in PBL students can work together with others to understand the problems that are solved. The decisions that students take are made individually. The role of the teacher in PBL is as a facilitator in the learning process.

### **Roles of Teachers as Facilitators in The Implementation Of PBL Model**

The roles of the teacher in the PBL model are as follow: (1) as a facilitator in learning, (2) providing training for students to solve problems, (3) conducting mediation when students obtain information, gain access to information sources, develop information relationships (Tan; 2003). Barret and Moore stated that the teacher as a facilitator in the PBL model has the following roles: (1) to support students in accepting the problems given to be studied and to facilitate students when creating a challenging learning environment, (2) facilitate the learning process with PBL, (3) to become a listener active, observes the learning process, records any difficulties faced by students, (4) provides directions and instructions during the learning process, (5) provides stimulus to students so that students can enter the creative thinking stage, (6) challenges students to connect theory with problems in real life, (8) facilitates sharing of ideas and discussions between students, (9) provides targets for students to solve any given problem with full responsibility (10) facilitates students to reflect on their learning

activities, development of their abilities, and their performance in teamwork, (11) facilitating students to do review problems that have been resolved.

The teacher as a facilitator in the PBL model plays a role as a facilitator who has the role of empowering students to have the ability to think creatively, building habits of solving problems by supporting students to think reflective, critical, and creative (Rusman (2014; Chan, 2013; Nargundar, et al. 2014) The teacher has a role in the PBL model as (1) providing students with creative thinking tools, (2) facilitating cooperation between students when solving given problems, and (3) implementing PBL models in learning.

## RESULT

The results of the SPSS in the section of Leven's Test for Equality of Variance showed a value of  $0.113 > 0.05$ , which means that the data variance of the control group and the experimental group was homogeneous. The interpretation of the Independent Sample Test results table is guided by the values contained in the "Equal variances assumed" table. The basis for decision making, namely: (1) If the value of Sig (2-tailed)  $> 0.05$  then  $H_0$  is accepted and  $H_a$  is rejected, which means that there is no average difference in students' thinking skills between the control class and the experimental class; (2) If the Sig (2-tailed) value  $< 0.05$  then  $H_0$  is rejected and  $H_a$  is accepted, which means that there is a difference in the average thinking skills of students between the control class and the experimental class.

The SPSS results showed that the Sig. (2-Tailed) =  $0.006 < 0.05$ , thus it was decided that  $H_0$  was rejected and  $H_a$  was accepted, meaning that there

was a significant difference in the average thinking skills between the control class and the experimental class. Then the t count is -2.897 (negative), meaning that group 2 or the experimental group is better than group 1 or the control group. More details can be seen in Table 2 and Table 3 below.

Table 2. Statistical test results (Independent Sample t-test)

**Uji Statistik (Independent Sample t-test)  
(Menguji nilai Postes Kontrol dan Postes Eksperimen)**

Group Statistics					
	Kelas	N	Mean	Std. Deviation	Std. Error Mean
Keterampilan Berpikir	Kelas Kontrol	25	71,7200	5,59404	1,11881
	Kelas Eksperimen	25	76,0400	4,92849	,98570

Table 3. Statistical test results (Independent Sample t-test)

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Keterampilan Berpikir	Equal variances assumed	2,601	,113	-2,897	48	,006	-4,32000	1,49108	-7,31803	-1,32197
	Equal variances not assumed			-2,897	47,250	,006	-4,32000	1,49108	-7,31926	-1,32074

Furthermore, it will be tested whether there is a significant improvement in the experimental class score. The test used was Paired Samples Test.

Table 4. Paired Sample T-Test

(Testing the value of the Pretest Experiment with Posttest Experiment)

Paired Samples Statistics					
		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	pretes_eksperimen	68,9600	25	4,85180	,97036
	postes_eksperimen	76,0400	25	4,92849	,98570

The results in Table 4 showed a summary of the results of the descriptive statistics of the two samples studied, the Pre-test and Post-test values. The

pre-test value obtained an average of 68.96 learning outcomes. As for the Post-test score, it was obtained an average of 78.04. The number of respondents was 25 students. The second output showed the results of the Paired Samples Test. The hypothesis is as follows: (1)  $H_0$  = There is no average difference between pre-test and post-test thinking skills, which means that there is no effect of using the model in improving students' thinking skills, (2)  $H_a$  = there is an average difference between thinking skills in Pre-test and Post-test, which means that there is an effect of using the model in improving students' thinking skills.

Guidelines for decision making in the Paired Sample T-Test are as follows: (1) If the Sig. (2-tailed)  $< 0.05$ , then  $H_0$  is rejected and  $H_a$  is accepted, (2) Conversely, if the value of Sig. (2-tailed)  $> 0.05$ , then  $H_0$  is accepted and  $H_a$  is rejected. The second result showed that Sig (2-tailed)  $0.000 < 0.05$ . Therefore,  $H_0$  is rejected and  $H_a$  is accepted. That is, there is a difference in the average thinking skills of students during the Pre-test and Post-test. In other words, there is an effect of using the models in improving students' thinking skills.

## DISCUSSION

The results showed that the PBL model was more effective and significant in empowering the creative thinking skills of students in IPS subjects. This is supported by the results of research by Cheung (2011) and also researches of (Chan, 2013; Nargundar, et al., 2014; Yoon, et al., 2014; Wiguna, 2018) in various educational disciplines. The PBL model can be said to have a significant effect on students' creative thinking skills in the IPS subject.

Empowerment of students' creative thinking abilities can be optimized because the provision of non-routine problems related to students' daily lives includes aspects in the PBL model such as group collaboration, motivation from teachers and friends, teacher scaffolding, and student learning environments. For example, the learning environment could be optimized with more student-centered learning in the PBL model than in conventional classrooms. Pithers and Soden (2000) stated that student-centered learning is more effective at empowering creative thinking skills. Galfoord, et al (2015) stated that the PBL model can help students adapt to their learning environment. In addition, the results of other studies showed that students' creative thinking abilities can be optimal when there is support and motivation from the teacher (Sarsani, 2007). Therefore, motivation and form of teacher support during the learning process are needed.

Solving non-routine problems in the PBL model requires more effort in the creative thinking stage and when students design solutions than in traditional learning. Siegler (1989) shows that the most effective method for developing creative thinking skills is by solving new problems. In addition, according to Siegler, when solving non-routine problems, students will set the solution mechanism, but these non-routine problems will result in new developments in their cognitive processes. Solving non-routine problems related to students' daily lives requires an open mindset that results in different thoughts. An important factor in instilling creative thinking is the readiness and openness of students to new experiences (Florida, 2014). Hmelo, Silver, and Barrows (2006) state that students who learn using the PBL model will be better able to apply their knowledge than students who

learn using conventional models. Open learning activities in the PBL model can play an important role in developing students' creative thinking abilities (Rasimin, 2020). The PBL model can be very effective in developing creative thinking skills in IPS lessons when students are given non-routine problems as open problems related to students' daily worlds. Students solve non-routine problems given by linking the clues in problems with everyday life. The same thing was also given by Brandt et al. (2013) who emphasized that non-routine problems create learning together with the PBL model. Creative thinking training appears during the brainstorming stage, group collaboration, and when PBL model steps (non-routine problem solving, identification, discovery, determining possible solutions, etc.) can optimize the development of students' creative thinking abilities.

The stages of the PBL model allow students to clearly understand the entire learning process and stages of thinking. Students generally have more opportunities for success at every step of the process. In addition, the occurrence of group discussions, sharing of ideas is an open technique that is very effective for practicing creative thinking skills. The group discussions and a list of ideas for solving non-routine problems that are given provide many opportunities for students during the decision-making process for problem-solving. In addition, group discussions can make a significant contribution to student performance and motivation. In this way, certain ambiguities in real-world problems are highlighted during long group discussions, which can have a positive effect on the development of creative thinking.

Students' creative thinking skills improve significantly in the PBL model class. Creative thinking skills are trained through the PBL model which requires students to be able to produce many original ideas in solving problems during learning (Kashani, Afrooz, Shokoohi, Kharrazi, & Ghobari, 2017). The PBL model steps begin with giving non-routine problems to students, then students solve problems by training students' creative thinking skills covering aspects of thinking fluency, flexibility, originality, and elaboration more optimally (Risvirenoel, 2015; Sukidjo, 2015).

Learning in conventional classrooms is dominated by teacher-centered varied lecture strategies. The teacher explains the subject matter, gives examples, then students are asked to solve questions (Darmawan, 2010). The results showed that conventional classroom learning using varied lectures was not able to empower students' creative thinking skills (Sa'dijah, Nurrahmawati, Sudirman, Muksar, & Anwar, 2018).

## CONCLUSION

The data analysis proved that the PBL model is effective for testing creative thinking skills better than the varied lecture method. Giving problems in the PBL model can train students' creative thinking skills in the IPS subject. Non-routine problem-solving training can support the empowerment of students' creative thinking skills. Non-routine problems that students solve generally cannot be solved using one method or a common usual solution. There are many opportunities for future research related to the PBL model on students' creative thinking abilities. Furthermore, research on the PBL model can also be expanded to various other disciplines.

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