

# The Effect of Problem Based Learning Model and Cooperative Learning Model Jigsaw type on Creative Thinking Skills Based on Students Learning Motivation

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**Abstract**—The aims of this research are to acknowledge the effect of Problem Based Learning model and Cooperative Learning model jigsaw type on creative thinking skills and the interaction between learning model and learning motivation on students creative thinking skills. The kind of this research is quasi experiment research. The population of this research was the VII<sup>th</sup> grade students of SMPN2 Percut Sei Tuan. Then, the sample was taken by using random sampling method, with VII-3 were chosen as experiment 1 class and VII-4 as experiment 2 class. The experiment 1 class was treated by using problem based learning model while the experiment 2 class was treated by using cooperative learning model jigsaw type. The result of this research shows that: students creative thinking skills was taught by Problem Based Learning Model higher than students creative thinking skills was taught by Cooperative Learning Model Jigsaw type and there is interaction between the learning model and the learning motivation on students creative thinking skills. Students with low learning motivation are better taught by cooperative learning model than problem based learning and students with high learning motivation are better taught by Problem Based Learning than Cooperative Learning Model

**Keywords**—creative thinking skills, problem based learning model, cooperative learning model jigsaw type, learning motivation

## I. INTRODUCTION

Creating graduates who can apply the knowledge and skills they have gained during their studies as professional is one of the important visions and missions in educational institutions [1].

So that students have the skills to think creatively, a student must learn to look at a problem from various points of view so

as to find various possible solutions to a problem. On this research the researcher conducted an interview on September 20, 2016 a mathematics teacher said, "Students are only able to work on math problems if the questions are similar to the examples of new questions given, if the questions are varied or different from the example questions which is given by the teacher, students will find difficulty to work on these problems".

The importance of this skills is not supported by the facts found in the classroom. From the pre-tests results that have been done by 32 students, it is found that the average score of creative thinking skills is 48. Based on the creative thinking skills score table from Mahmudi [2] SKBK <55, students are in the low category.

This requires that we as teachers try to improve students' creative thinking skills by choosing learning strategies that are appropriate to the material in order to reduce these errors. Problem Based Learning Model and Cooperative Learning Model Jigsaw type is a learning model that suitable with the curriculum 2013.

In the Problem Based Learning Model, students are oriented to the daily life problems and continued by group discussions so that Problem Based Learning Model allows students to think creatively. Whereas Cooperative Learning Model Jigsaw type emphasizes more on student interaction. Interaction make students to be able to build many ways so indicators of creative thinking can be built.

Problem Based Learning Model contains criteria that can improve students' creative thinking skills because in addition to presenting students understanding, meaningful problems,

making it easy to conduct investigations, learning about critical thinking and problem solving skills, these problems can be used to substitute a problem situations (mathematical models) used to find solutions.

Cooperative Learning Model Jigsaw type is suitable to be applied to improve students' creative thinking skills because in the Cooperative Learning Model Jigsaw type, students are conditioned to learn together in a team of experts to solve problems, then each student is required to be able to communicate his understanding to teach other friends in his group. Research with the application of Cooperative Learning Model Jigsaw type has been studied by Isman M Nur, et al [3] which shows that the mathematical creative thinking skills of students who taught by Cooperative Learning Model Jigsaw type is better than students who obtain conventional learning. This is also supported by research conducted by Elizabeth Dunphy [4] which shows that the application of Cooperative Learning Model Jigsaw type has a good impact on children's mathematics learning.

In the learning process, motivation is one dynamic aspect that is very important. It often happens that underachievement students are not caused by lack of skills, but due to lack of motivation to learn so that he does not try to exert all his skills. Thus, it can be said that low-achieving students may not necessarily be due to their low skills, but may be caused by lack of motivation.

The learning process will succeed when students have learning motivation. Therefore teachers need to foster student motivation. To maximize learning outcomes teachers are required to be creative in generating student motivation. The accuracy of the selection of learning models in the process of learning mathematics and student motivation is very important to be considered so that educational goals can be achieved.

Based on the explanation above it is necessary to reveal whether the Problem Based Learning model and the Cooperative Learning Model Jigsaw type have different contributions to the creative thinking skills of students. This encourages research that focuses on the Effect of Application of Problem Based Learning Models and Cooperative Learning Model Jigsaw type of Students' Creative Thinking Skills based on Student Learning Motivation SMPN 2 Percut Sei Tuan

## II. LITERATURE

### 2.1. Creative Thinking Skills

Higher order thinking occurs when a person takes new information and information stored in memory and interrelates and extends this information to achieve a purpose or find possible answers in reflecting situations" [5]. This is in line with the opinion of McGregor [6] that creative thinking is one type of thinking that directs the acquisition of new insights, new approaches, new perspectives, or new ways, in understanding things. Both of these opinions indicate the skills to think at a higher level when a student can associate new information with the information he already has in his memory and connect or rearrange and develop it.

Although including the skills to think at a higher level, creative thinking can be trained because creative thinking is a part of our daily lives. Creative thinking can also be seen as a process that is used when an individual brings in or brings up

a new idea. To get new ideas can not be separated from the knowledge that has been previously owned. When we are faced a problem or situation that must be solved, we will think to solve the problem. Therefore thinking is an activity experienced by someone in solving a problem.

Mathematics is actually knowledge that grows, changes, created by a human being [7]. So mathematics is growing and developing due to the creative thinking possessed by humans. Creativity in mathematics is termed as the skills to think mathematical creatively or briefly.

To increase the creative thinking skills of students. It can be done by (1) encouraging students to be creative (tell students to be creative), (2) teaching students several methods to be creative (teach students some creativity methods), and (3) accepting creative ideas produced by students (accept the result of creative exercise) [8].

Torrance [9] generally defines creativity as the process of problem understanding, looking for possible solutions, drawing hypotheses, testing and evaluating, and communicating the results to others. Furthermore, Torrance in the process of the creativity results includes original ideas, different perspectives, solving the chain of problems, recombining ideas or seeing new relationships between those ideas. Torrance describes four components of creativity that can be assessed, namely: (1) Fluency; the skills to generate a number of ideas, (2) Flexibility; the skills to generate diverse ideas, (3) elaboration; the skills to develop, embellish, or express an idea, and (4) Originality; the skills to generate ideas that are unusual among most or rarely.

Based on the description above, aspects of creative thinking to be achieved by students can be seen from: fluency; Flexibility; elaboration; Originality.

### 2.2. Problem Based Learning

Problem Based Learning is the interaction between stimulus and response, a relationship between two directions of learning and the environment [10]. The environment provides input to students in the form of assistance and problems, while the brain's nervous system functions to interpret help effectively so that the problem at hand can be investigated, assessed, analyzed, and the right solution solved. The experience of students who come from their environment provides material for learning process.

Arends [11] emphasizes that the essence of this learning is to present a variety of authentic and meaningful problem situations to students, which serve as a stepping stone for investigation and inquiry. In addition, Arends also stated that Problem Based Learning also refers to other learning models, such as "project-based learning", "experience-based learning", "authentic learning (authentic learning), and "meaningful learning or learning based on life".

Problem Based Learning emphasizes learning that is controlled by problems. Therefore, Problem Based Learning begins with problem solving, and problems that are presented to students give new knowledge before they can solve the problem. In learning the aim is not only to find the correct

single answer, but more than that, students must be able to interpret the problem given, gather important information, identify possible solutions to problems, evaluate choices, and draw conclusions. Mathematics education observers expressly state that students can be educated and trained in order to be a good problem solver by studying mathematics as heuristic knowledge.

Problem Based Learning Model focuses on students by directing students to become independent learners and actively involved in group learning. This model helps students to develop their way of thinking in solving problems through searching data so that solutions are obtained rationally and authentically.

Problem Based Learning Model is based on constructivist learning theory. Learning begins with the presentation of real problems which solutions need cooperation among students. The teacher in charge need to guide students to break down the problem-solving plan into stages of the activity; the teacher gives examples of how to use the skills and strategies needed for these tasks to be completed. In addition, the teacher also creates a flexible classroom atmosphere and it is inquiry oriented to efforts the students.

It can be concluded that, Problem Based Learning Model is a constructivist learning that presents real, authentic, and meaningful problems to students to help students construct their knowledge in the problem solving process so that students become the center of learning (student centered).

### *2.3. Kooperatif Learning Model Jigsaw type*

Cooperatif Learning Model Jigsaw type was first developed and tested by Elliot Aronson and colleagues at the University of Texas, and later adapted by Slavin at John Hopkin University [12]. Kooperatif Learning Model Jigsaw type is a type of cooperative learning that consists of several members in one group, students placed into heterogeneous learning teams of five to six members. Various academic material is presented to students in the form of text, in collaboration with positive interdependence and each student is responsible for learning one portion of the material and is able to teach that part to group members

In Kooperatif Learning Model Jigsaw type, there is an origin group and expert groups. Origin group namely the initial group. It consists of students with diverse skills, genders and family backgrounds. Expert groups, namely groups of students consisting of members of different origin groups are assigned to study and explore a particular topic and complete tasks related to the topic to be explained to home group members. The expert group is a combination of several experts from the original group. The success key of Kooperatif Learning Model Jigsaw type is interdependence, where each student relies on his team members to be able to provide the information needed to perform well at the time of assessment.

### *2.4 Learning Motivation*

Motivation is the hidden power within a person to behave and act in a unique way [13]. motivation can be defined as the dynamically changing cumulative arousal in a person that initiates, directs, coordinates, amplifies, terminates, and

evaluates the cognitive and motor processes where initial wishes and desires are selected, prioritized, operational and (successfully or unsuccessfully) acted out (acted out) [14].

Something that motivates a person's enthusiasm for work is to meet the material and non-material needs and satisfaction that he gets from the results of his work [15]. If the needs and satisfaction are increasingly met, then the spirit of working will get better too. Interest is a motive that shows the direction of individual attention to objects that are interesting and pleasing [16].

The strength that motivates a person to work actively in doing his work depends on the reciprocal relationship between what is wanted and needed from the results of the work [17]. Hurllock [18] says that someone who wants an activity, both games and work, will try harder to learn compared to someone who has low motivation. Thus motivation is associated with active learning. This means that if a person's motivation is high for learning, then he tends to be active in learning and will master the subject matter and if later tested. Conversely, if motivation is low it can be ensured that learning outcomes tend to be low, and if this happens, student motivation needs to be raised in every learning activity to improve student learning outcomes.

From the description above it can be concluded that learning motivation is a psychological aspect of someone in liking, questioning, doing, responding, accepting or rejecting an object or activity in learning. A person's learning motivation can be seen from the attention, willingness, responsibility, pleasure, tenacity, independence, fortitude and like challenges, as well as the desire for a lesson or conduct activities in learning.

## III. METHODS

This type of research is a quasi experiment research. This research is a type of research that aims to know the effect of Problem Based Learning Model and Cooperative Learning Model Jigsaw type on creative thinking skills based on students learning motivation. This research was conducted at SMPN 2 Percut Sei Tuan in grade VII in academic year 2017/2018, with a schedule that was coordinated with school activities carried out in July to August 2017.

In the research design the research steps can be described as follows: (1) field observations, (2) preparing research proposals, (3) validation and testing of learning tools and research instruments, (4) implementing learning with the Problem Based Learning Model and cooperative learning model Jigsaw type, (5) giving questionnaires to student responses and conducting tests, (6) data analysis and research findings, and (7) thesis writing.

The instruments in this study include: creative thinking skills test, motivation questionnaires.

## IV. RESEARCH FINDINGS

The purpose of this study is to obtain information about students' creative thinking skills with the application of Problem Based Learning and Cooperative Learning Model Jigsaw type. Based on the results of data analysis research results obtained as follows.

#### 4.1. Description of student Learning Motivation

Before carrying out learning using the Problem Based Learning model and Cooperatif Learning Model Jigsaw type on integer for 6 (six) meetings continued with tests on students to see students' learning motivation. Based on the student answer sheets that have been corrected, the results obtained by the level of student learning motivation as in table 1 below.

TABLE 1. LEVEL OF STUDENTS' LEARNING MOTIVATION MODEL

Class Research Sample	Student Learning Motivation		
	High	Medium	Low
Experiment Class 1 (PBL)	10	16	8
Experiment Class 2 (Jigsaw)	9	13	10
Total	19	29	18

Explanation: PBL : Problem Based Learning

Based on the above table obtained in the Problem Based Learning class of students' motivation for high criteria there are 10 students, 16 students and 8 students low, while in the Cooperative Learning Model Jigsaw type class students learning motivation for high criteria there are 9 students, 13 students and 18 low student. But in this study, researchers only limit students into low and high motivation.

#### 4.2. Description of student Creative thinking skills

The test of creative thinking skills is carried out at the end of learning with an equivalent type of problem. The final test was followed by 18 students from the Problem Based Learning class and 19 students from the Cooperatif Learning Model Jigsaw type class so that in the data analysis that was the subject of this study were 37 students who took the creative thinking skills test.

Based on the results of the tests of creative thinking skills obtained the lowest score ( $x_{\min}$ ), highest score ( $x_{\max}$ ), average score ( $\bar{x}$ ) and standard deviation ( $s$ ) for the experimental class as the following table:

TABLE 2. DESCRIPTION OF STUDENTS' CREATIVE THINKING ABILITY

Class	N	$x_{\min}$	$x_{\max}$	$\bar{x}$	$s$
Experiment class 1 (PBM)	18	80	30	63,056	13,654
Experiment Class 2 (Jigsaw)	19	85	35	53,947	11,676

Table 2 show that the minimum score of creative thinking skills of Problem Based Learning Model group students (30) is lower than the minimum score of creative thinking skills of students in the Cooperatif Learning Model Jigsaw type group (35) and the maximum score of creative thinking skills of students of Problem Based Learning groups (80) is lower than the maximum score on the creative thinking skills of Cooperative Learning Model Jigsaw type group students (85).

The average score of the students' creative thinking skills test Problem Based Learning group (63,056) is higher than the average score of the creative thinking skills test of the Cooperative Learning Model Jigsaw type group students (53,947). The standard deviation of the students' creative thinking skills test Problem Based Learning group (13,654) is different from the standard deviation of the creative thinking

skills of students in the Cooperative Learning Model Jigsaw type group (11,676). This means that the creative thinking skills test scores for the Cooperative Learning Model Jigsaw type group are less diffused than the problem-based creative thinking skills test scores.

To find out the difference in the average score of the creative thinking skills test in the Problem Based Learning class with the Cooperative Learning Model Jigsaw type class is quite significant or not tested using the ANAVA test, the normality test and the variance homogeneity test of the student's creative thinking test were done before.

#### 4.3 Normality Test Students' Creative Thinking Ability.

Normality test is intended to see whether the students' creative thinking skills test score data is normally distributed or not. Normality test is done by using Liliefors statistical test on both classes of data. Calculation of normality test data for students' creative thinking skills in problem based learning class and Cooperative Learning Model Jigsaw type class can be seen in the following table:

TABLE 3. NORMALITY TEST OF STUDENTS' CREATIVE THINKING ABILITY

	Tests of Normality					
	Kolmogorov-Smirnov <sup>a</sup>			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	df	Sig.
Creative thinking score	,114	37	,200 <sup>*</sup>	,975	37	,554

\*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

From the table above it can be seen that the significance value of Liliefors is 0.083 for the problem based learning class and the Cooperative Learning Model Jigsaw type respectively. The second significant value is greater than the significance level value of 0.05, so the null hypothesis that the data is normally distributed for Problem Based Learning classes and Cooperative Learning Model Jigsaw type classes is acceptable. In other words, Problem Based Learning classes and Cooperative Learning Model Jigsaw type classes have normally distributed data.

#### 4.4 Homogeneity Test Students' Creative Thinking Ability.

Homogeneity test is done by using the Homogeneity of Variances (Lavene Statistic) to test the homogeneity of the variance of the two classes of data on the creative thinking skills test between the Problem Based Learning class and the Cooperative Learning Model Jigsaw type class. The results of the homogeneity test calculation data on the skills to think creatively can be seen in the following table:



TABLE 4. NORMALITY TEST OF STUDENTS' CREATIVE THINKING ABILITY  
Test of Homogeneity of Variance

		Levene Statistic	df1	df2	Sig.
Creative thinking score	Based on Mean	,525	1	35	,474
	Based on Median	,453	1	35	,505
	Based on Median and with adjusted df	,453	1	34,557	,506
	Based on trimmed mean	,413	1	35	,525

From the table above it can be seen that the significance value of 0.474 is greater than the significance level of 0.05, so the null hypothesis which states there is no difference in variance between groups of data can be accepted. This shows that both the data groups for the problem based learning class and the Cooperative Learning Model Jigsaw type class have homogeneous data variance.

#### 4.5 Hypotesis Test

The research hypothesis testing was carried out using a 2 x 2 factorial variance analysis. The summary of the Anava calculation results can be seen in the table below

TABLE 5. SUMMARY OF ANAVA 2 X 2

Sumber Variasi	Dk	JK	RJK	F-hitung	F-tabel (2,33)
Model Pembelajaran	1	560,809	560,809	5,233	<b>4,14</b>
Motivasi Belajar	1	1474,821	1474,821	13,762	<b>4,14</b>
Interaksi	1	673,547	673,547	6,285	<b>4,14</b>
Galat	33	3536,389	107,163		
Total	36	6390,203			

Based on the table above, the test will be inform as follows:

##### 1. 1<sup>st</sup> Hypotesis

Based on 2 x 2 factorial Anava calculation,  $F_{count} = 5.233$ , while  $F_{table}$  value = 4.14 for dk (2.33) and levelsignificant  $\alpha = 0.05$ , it turns out that  $F_{count} > F_{table}$  so that the hypothesis testing rejects  $H_0$ . Thus it can be concluded that the average creative thinking skills of students taught by Problem Based Learning Model as a whole is better than the creative thinking skills of students taught by Cooperative Learning Model Jigsaw type can be accepted and proven empirically

##### 2. 2<sup>nd</sup> Hypotesis

Based on the calculation of factorial Anava 2 x 2 obtained  $F_{count} = 6.285$ , while the value of  $F_{table} = 4.14$  For df (2.33) and a levelsignificant  $\alpha = 0.05$ , it turns out that the value of  $F_{count} = 6.285 > F_{table} = 4.14$  so that the hypothesis testing rejects  $H_0$ . Thus, it can be concluded that there is an interaction between learning models and student motivation in students' creative thinking skillscan be accepted and proven empirically.

#### V. DISCUSSION

Student learning motivation is a dynamic change that exists in a person cumulatively that starts, directs, coordinates,

strengthens, limits, and evaluates cognitive and motor processes in the way that is expected to be chosen, prioritized, operated and implemented in the learning process. Each student has a different student motivation, especially in learning mathematics. These differences are often categorized into high and low levels. By knowing this, the teacher will be able to design a better learning.

Ideally students who have high learning motivation if taught byProblem Based Learning will increase students' creative thinking skills. This is due to problem based learning using real problems for students. Connecting subject matter with real events everyday is expected to help students understand the concepts given and find various solutions to problems that occur. Problem Based Learning makes it easy to explore students who have high learning motivation.

Cooperative Learning Model Jigsaw type is more effectively used for students with low learning motivation. Cooperative Learning Model Jigsaw type requires students to be more active in learning. Each student will be given responsibility as an expert in a particular topic so that they will feel an important role in the learning process. This will indirectly increase student motivation so students become more active in the learning process. In the discussion stage students will listen to many different solutions from classmates and classmates so that students'understanding will increase and help students to solve problems in various ways.

From the results of research data analysis, students' creative thinking skills in groups of students who have high learning motivation and are taught with Problem Based Learning Model are better than the average creative thinking skills of students who have high motivation student learning and taught by the Cooperative Learning Model Jigsaw type. Then the average results of students' creative thinking skills in groups of students with low student motivation and taught by Problem Based Learning Model is lower than the average creative thinking skills of students who have low learning motivation and taught by the Cooperative Learning Model Jigsaw type. Thus it can be concluded that the learning model and student motivation significantly influence students' creative thinking skills..

#### VI. CONCLUSION

The conclusions that can be drawn from the results of hypothesis test are as follows: (1) Students 'creative thinkingskills taught with Problem Based Learning models is higher than students' creative thinking skillstaught by Cooperative Learning Model Jigsaw type models.The average score of students 'creative thinking skills taught by the Problem Based Learning Model (PBL) is higher than the average score of students' creative thinking skills taught by the Cooperative Learning Model Jigsaw type. Thus the Problem Based Learning Model is more effectively applied in mathematics learning to improve students' creative thinking skills. (2) The results of the analysis of variance indicate that there is an interaction between the Problem Based Learning Model and learning motivation, where students who have low

learning motivation are better taught by Cooperative Learning Model Jigsaw type than by Problem Based Learning Model, while students who have high learning motivation is better taught by Problem Based Learning Model than by Cooperative Learning Model Jigsaw type.

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