

## **The Effect of Project Based Learning Model for Students' Creative Thinking Skills and Problem Solving**

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**Abstract :** *The purposes of this research were to analyze the effect of project based learning model type for student's creative thinking skills and problem solving. This research was a quasi experiment research. The population was all students of class X MIA SMA Cahaya Medan academic year 2016/2017. The sample selection was done by using cluster random sampling technique of two classes. The first class was the class X-MIA 1 as an experimental class taught with project based learning model and the second class was class X-MIA 2 taught by conventional learning. The instruments consisted of a creative thinking skills test and a problem solving test. The data in this research were analyzed by using independent-samples t-test. The results showed that the creative thinking skills of students who were taught using project based learning model better than conventional learning. The problem solving of students who were taught using project based learning model better than conventional learning.*

**Keywords** - *project based learning model, creative thinking skills, problem solving*

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### **I. Introduction**

The success of a country can be seen from the quality of education in the country. The higher the quality of education of a country then the development in the country progresses. The field of education is very strategic, because it is a vehicle to create quality human resources (HRD).

The results obtained from the United Nations Development Program (UNDP) survey reported that Indonesia in 2014 was ranked 111 out of 188 participating countries in the Human Development Index Human Development Index with a score of 0.0684 in the medium category [1]. Furthermore, the Trends in International Mathematics and Science Study (TIMSS) survey shows that the average score of Indonesian students' science achievement is significantly below the international average. Indonesia in 2007 was ranked 35<sup>th</sup> out of 49 participating countries and in 2011 was ranked 40<sup>th</sup> out of 45 participating countries with a score of 406 is still far from the international score of 500 [2]. The results obtained in the international study of UNDP and TIMSS are reinforced by research conducted by [3] which involves 4203 students throughout Indonesia in relation to physics skills in TIMSS. The results obtained showed that the average achievement of Indonesian students in terms of cognitive (knowing, applying, reasoning) is still low. The 2006 PISA (Program for International Student Assessment) study focusing on IPA literacy confirmed that Indonesian students ranked 50<sup>th</sup> out of the 57 participating countries with an average score of 393 [4].

Interviews that have been conducted with physics teacher in SMA Cahaya reveal that teachers have not assessed the creative thinking ability of students, whereas the ability to think creatively is very important. Creative thinking allows students to analyze their thoughts in making choices and draw conclusions intelligently. The researcher also proposed some problems related to physics students in SMA, from 36 students only 27% of students are actively involved in learning activities, the rest answered but with unreasonable opinions, some even refuse to give his opinion when given the opportunity to express an opinion. It shows that students' creativity is low. This is in line with [5] assertion that students with low creativity have characteristics such as (1) lacking the desire for high curiosity, (2) being closed to new experiences, (3) having no desire to find and research, (4) have no passionate dedication and are not active in completing the task, and (5) are unable to respond to the questions posed and tend to give short answers. In the current era of development is highly demanded by creative humans [6]. So it is important to train students' creative thinking skills in creating something innovative. Teachers need to equip learners with the ability to solve problems. Problem solving is seen as one of the main skills that learners must have when entering the real world [7]. Learners are given the opportunity to solve problems that prioritize problems in accordance with life and how to learn. A person who has problem-solving ability can be classified as a qualified human resource because by having the ability, one can solve problems from the lightest to the most complex [8].

Creativity and problem-solving skills are also the capabilities demanded by today's world of work. According to [9], some of the individual characteristics of the desired workforce are: (1) self-confidence, (2) motivation for achievement, (3) master basic skills such as reading, writing, listening, speaking, and computer

literacy, (4) mastering thinking skills, such as problem solving, problem posing, decision making, analytical thinking, and creative thinking (4) creative thinking), and (5) master interpersonal skills, such as the ability to work in teams and negotiate.

Changes and innovations in learning activities to improve creative thinking skills and problem-solving students is to apply project-based learning. Project-based learning is a model that enables learning by relying on projects. Projects are complex tasks, based on challenging questions or problems, involving students in designing, problem-solving, decision-making, or investigating activities, giving students the opportunity to work relatively autonomously over a long time, and culminating in a realistic product [10].

## II. Literature

### Project Based Learning

Definition of project-based learning according to [11] as a learning model that emphasizes student activity in solving open-ended problems and applying their knowledge to working on a project to produce a certain authentic product. This PjBL not only examines the relationship between theoretical information and practice, but also motivates students to reflect on what they learn in learning with a real project. Project-based learning is defined by [12] that student-centered learning and allows learners to conduct in-depth investigations of appropriate topics.

### Creative Thinking Skills

Measurement of creative thinking skills is done by using creativity tests. The creative thinking test can be verbal, if the task demanded, expressed in words, or figural, if the task demanded is expressed in the form of a picture [8]. There are four characteristics of creative thinking according to [13], as a process involving elements of originality, fluency, flexibility and elaboration.

### Problem Solving

Problem solving according to [14] is one type of high-level learning because students must have the skill of incorporating rules to achieve a solution. Solving problems means finding the right way to bridge the existing gap or in other words finding a way out to solve the problem at hand. Problem solving according to [15] is to find a way out of a difficulty, a way around an obstacle, reach a certain goal or use various solutions to solve a problem.

## III. Research Methodology

This research was hold at SMA Cahaya Medan which is located at Jalan Hayam Wuruk No.11 Medan in the second semester academic year 2016/2017.

The population of this study was all students of class X in the second semester which amounted to 4 classes in SMA Cahaya Medan academic year 2016/2017.

The sample in this study consists of two classes selected by cluster random sampling technique, each class of the population was entitled to have the opportunity to be a research sample. One class as an experimental class (a class applying a project based learning model) and one class as a control class (a class that applies conventional learning).

Variable in this research consist of two variable that were independent variable and dependent variable with explanation as follows: a) The independent variable was the variable that influences or causes the change or the incidence of the dependent variable. The independent variables in this study were the project based learning model and conventional learning. b) The dependent variable was the variable that was influenced or caused due to the independent variable. The dependent variable in this research was the creative thinking skills and problem solving in the second semester of students in SMA Cahaya Medan academic year 2016/2017 on optics subject.

The research involved two different treatment classes in which the experimental class was treated using the project based learning model, while the control class was using conventional learning. The treatment was aimed to know the creative thinking skills and problem solving of the students by giving tests in both classes before and after treatment. The design of research was quasi experimental, by design: two group pretest-posttest design. Thus the research design can be seen in table 1.

Table 1. Research Design

Classes	Pretest	Treatment	Posttest
Experimental	Y <sub>1</sub>	X <sub>1</sub>	Y <sub>2</sub>
Control	Y <sub>1</sub>	X <sub>2</sub>	Y <sub>2</sub>

Information:

X<sub>1</sub> = treatment in the experimental class was the application of project based learning model.

X<sub>2</sub> = treatment in the control class was the application of conventional learning.

Y<sub>1</sub> = pretest given to the experimental class and control class prior to treatment.

$Y_2$  = posttest given to the experimental class and control class after the treatment

#### IV. Results

Student's creative thinking skills on control class and experiment class shown in Table 2 below.

**Table 2.** Pre-test and Post-test Results of Student's Creative Thinking Skills

	Creative Thinking Skills	
	Control Class	Experiment Class
Pre-test	29.29	30.29
Post-test	62.57	70.29

Based on Table 2, the description of the average pre-test and post-test creative thinking skills in experiment class and control class as follows: Pre-test on control class and experiment class were 29.29 and 30.29. Post-test on control class and experiment class were 62.57 and 70.29.

#### Analysis Creative Thinking Skills on Control and Experimental Class

Before being given different treatment in the experimental class and control class, it was first given pretest to know the students' initial ability in both sample groups. In hypothesis testing through the average equality test (t test) to know the ability of students' creative thinking skills in both groups of samples, obtained tcount of 0,436 with significance level 0,664. The significance obtained is greater than 0.05, it can be concluded that the students' initial creative thinking skills in the experimental class are similar to the students' initial creative thinking skills in the control class. The average pretest of students' creative thinking skills in the experimental class is 30.29 and the average pretest of students' creative thinking skills in the control class is 29.29.

After the treatment on each of the two sample classes is given, then the next postes are given creative thinking skills. The average postes of students' creative thinking skills in the experimental class is 70.29 and the average postes of students' creative thinking skills on the control class is 62.57. This showed that the creative thinking skills of students taught by using project based learning models are better than the students' creative thinking skills with conventional learning.

Based on the results of hypothesis testing with one tailed t test to determine the effect of a treatment that is project based learning model of creative thinking skills of students, obtained t count of 4.225 and significance of 0.000. The significance obtained is smaller than 0.05, it can be concluded that there are differences in the results of students' creative thinking skills in the experimental class and control class. This is in line with research conducted by [16] that the application of project-based learning model has a significant effect on students' creative thinking skills.

Student's problem solving on control class and experiment class shown in Table 3 below.

**Table 3.** Pre-test and Post-test Results of Students' Problem Solving

	Problem Solving	
	Control Class	Experiment Class
Pre-test	38.14	39.34
Post-test	67.28	71.06

Based on Table 3, the description of the average pre-test and post-test problem solving in experiment class and control class as follows: pre-test on control class and experiment class were 38.14 and 39.34. Post-test on control class and experiment class were 67.28 and 71.06.

#### Analysis of Problem Solving on Control and Experimental Class

Problem-solving need to be optimized in a learning process. Problem solving is seen as one of the key skills that learners must have when leaving school and going into the real world [7]. The ability to solve problems they have will make learners as independent learners. To develop problem-solving abilities, a learning model is needed that enables learners to be active in learning activities. To encourage learners' ability to produce contextual work. One of the learning models considered to be potential to empower problem-solving abilities is the model of project-based learning (PjBL).

In this research, after hypothesis testing through the average equality test (t test) to determine the similarity of initial problem solving ability of students in both groups of samples, obtained tcount of 0.577 and significance of 0.566. The significance obtained is greater than 0.05, it can be concluded that the initial problem solving of the students in the experimental class are similar to the students' initial problem-solving skills in the control class. The average pretest of student problem solving in the experimental class is 39.34 and the average pretest of students' creative thinking skills in the control class is 38.14.

After the treatment on each of the two sample classes is given, then the postes are given problem solving. The mean postes of student problem-solving skills in the experimental class were 71.06 and the mean postes of student problem-solving skills in the control class were 67.28. It shows that student problem solving taught by using project based learning model is better than student problem solving with conventional learning. Based on the results of hypothesis testing with one tailed t test to determine the effect of a treatment that is project based learning model of students problem solving, obtained t count of 2.095 and significance of 0.044. The significance obtained is smaller than 0.05, it can be concluded that there are differences in students' problem solving in the experimental class and control class.

This is also in line with research by [17] who found that there were significant differences in problem solving abilities between students following both project-based and conventional learning models. The project-based learning model in this research also focuses on solving physics problems. Through challenging and exciting project activities, students are directed to develop their skills in problem solving, so that students are able to apply the physics concept in solving daily life problems.

## V. Conclusion

Creative thinking skills of physics students used project based learning model was better than creative thinking skills of physics students using conventional learning. This can be shown from the research data showing that the creative thinking skills of physics students using project based learning model equal to 70.29 and on the creative thinking skills of physics students using conventional learning of 62.57.

Problem solving of physics students used project based learning model was better than the students' problem solving using conventional learning. Based on data from the average score of students using project based learning model of 71.06 for students using conventional learning amounted to 67.28.

The next researchers should use a longer period of time because the time available in the implementation of learning by using project based learning model and by using conventional learning is still lacking, because adjusted to the school schedule in question. In applying the project based learning model should be well calculated division of the number of groups, don't get too much in one group.

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