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## THE EFFECT OF PROBLEM BASED LEARNING ON CREATIVE THINKING SKILLS IN SIMPLE HARMONIC MATERIALS

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### *Abstract*

This study aims to determine the effect of the problem based learning (PBL) model on students' creative thinking skills in simple harmonic materials in the second semester X class of SMA Negeri 1 Batang Kuis. The research method used was quasi-experimental with the design of two group pre-test post-test. The population of this study was all class X IPA 4 as the experimental class applied PBL model and in class X IPA 3 as the control class applied a conventional model, each class as many as 32 students. The data of this study were obtained using an instrument in the form of an essay test consisting of a test of creative thinking skills, each amounting to 5 items that have been declared valid. Analysis can be done using normality, homogeneity, and hypothesis testing. The finding of the data analysis obtained the average posttest value of creative thinking skills experiment class 68.5 and the average value of the control class 59.18. The posttest data t test results There are significant differences in creative thinking skills between students who learn to use the PBL model and students who learn to use conventional models.

**Keywords:** Creative Thinking Skills, Problem Based Learning, Simple Harmonic

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Education is a human need that requires a learning process so as to produce results that are in accordance with the process that has been passed. Education plays an important role in the proses of increasing human resources. Improving the quality of education is process that is integrated with the process of increasing human resources. Education plays an important role because it is a vehicle for improving and developing the quality of human resources. Educated human resources will be able to keep up with the development of science and technology. In line with the development of the world of education which is increasingly rapidly demanding that educational institutions be more able to adapt to the development of science and understanding concepts.

Data from the United Nations Development Program (UNDP), education in Indonesia ranked 107 out of 177 countries assessed in terms of the Human Development Index (HDI). One of the things that needs to be improved in the world of Indonesian education is the learning system. In general, in the learning process, students' thinking skills are not developed enough so that students only memorize the material without being trained to hone their thinking skills and analyze problems. Therefore, most students cannot relate the knowledge they get to the benefits of such knowledge in life, Sahala (in Agustina & Maria, 2018).

The ability to think creatively is one of the cognitive characteristics of creativity. Suradi and Herman (2008) explain that creative thinking ability is a thought process to express new relationships, see things from a new perspective, and form new combinations of two or more concepts that have been mastered before. The ability to think creatively helps students create new ideas based on the knowledge they have to solve problems from different perspectives. The ability to think creatively is also needed to find new innovations in human life.

Based on the results of interviews at 1 Batang Kuis Public High School to one of the physics teachers stated that 60% of students said they did not like physics, with the reason that physics was difficult to understand because it focused on remembering very many formulas. 65.7% of students said the teacher's teaching method was only taking notes and working on the questions. This statement is reinforced by the results of interviews with physics teachers, Dameria. M. Situmorang, S.Pd. He said that some students did not give a good response and were less active when physics learning took place. Students are more enthusiastic if the material taught is related to everyday life. He also said students were still unable to apply physics concepts in the real world so that students' creative thinking skills were also lacking. In this case students also often answer with the same answers as other students in answering questions. In the question and answer activities with the teacher, sometimes students always need codes or keywords. This shows that students cannot yet have their own answers to a question. In accordance with the components of this problem can be seen from their low skills in solving problems.

One solution to overcome the above problems is to use a learning model that can attract students' interest in learning physics which will trigger students to understand the concepts of physics and can develop students' thinking skills which will result in students' creative thinking abilities. The model must also be adjusted to the learning objectives and subject matter taught. The learning model applied is problem based learning (PBL). According to Arends, (2012) PBL is one of the learning models that made primarily to help students develop their thinking skills, problem solving and intellectuals, learn the role of adults by experiencing it through simulating real situations, and becoming independent students. Problem-based learning includes five main stages, beginning with the teacher directing students to problems, preparing students to learn, helping independent and group research, developing and presenting artifacts and ending by analyzing and evaluating problem solving processes.

PBL is a learning model that uses real world problems as a context for students to learn about creative thinking and problem solving skills, and to acquire knowledge and concepts that are essential to subjects. The steps of the PBL model are as follows: (1) learners' orientation to the problem (2) guiding individual / group experience (3) developing and presenting the work. (4) analyze and evaluate the problem solving process (Agustina & Maria, 2018).

PBL model is a model that uses real world problems as a context for students to learn about creative thinking and the ability to solve problems, and to acquire essential knowledge from subjects. PBL model aims to help students develop to improve their creative thinking skills, foster student initiative in work, internal motivation in learning, and can develop interpersonal relationships (Rusman, 2012). Based on the description above, This study intends to determine the extent to which the model PBL effect on creative thinking skills of students in SMA Negeri 1 Batang Kuis.

## METHOD

This research was carried out at SMA Negeri 1 Batang Kuis, on April 10 to May 13, 2019, Payagambar Village, Pendidikan Street Batang Kuis, Deli Serdang Regency. The implementation is carried out for class X students in semester II of the 2018/2019 academic year. All students of class X IPA SMA Negeri 1 Batang Kuis in Semester II T.A. 2018/2019 were the population of this study. The sample used in this study consisted of two classes, each of which consisted of 32 students representing the population with the same characteristics. Sampling in this study was taken randomly by using random sampling.

This study involved two classes namely the experimental class and the control class that was given different treatments. the experimental class uses the PBL model with creative thinking skills, while the control class uses conventional learning. The research design used was two group pretest-posttest design. Students will be given a post-treatment test called posttest. The design of this study is in table 1.

Table 1. Two Group Pretest- Posttest Design

Class	Pretest	Treatment	Posttest
Experiment	X <sub>1</sub>	Y <sub>1</sub>	X <sub>2</sub>
Control	X <sub>1</sub>	Y <sub>2</sub>	X <sub>2</sub>

Information :

- X<sub>1</sub> = Initial Ability Test (Pretest)
- X<sub>2</sub> = Final Test (Posttest)
- Y<sub>1</sub> = Treatment in the Experiment Class Using the Problem Based Learning (PBL) Model
- Y<sub>2</sub> = Treatment in The Control Class Using Conventional Learning Models

The researcher gave the pretest to the experimental class and the control class. The instrument used in this study consisted of 5 questions in the form of essay questions. The learning outcomes test is standardized first using the content validity test by two lecturers and one teacher according to expert experts. After the pretest data was obtained, the data analysis was done by normality test, namely Lilliefors test, homogeneity test and similarity variance test. Posttest data was carried out prerequisite test with normality test and homogeneity test, then t test was conducted to find out whether there was influence of PBL model on students' creative thinking skills compared to conventional learning on simple harmonic vibration material.

## RESULT AND DISCUSSION

### *Research Result*

The data described in this study includes data on the results of students' creative thinking skills on simple harmonic vibrations, which are given different treatments namely 1) problem based learning models, 2) conventional learning using. The results of the data pretest of the experimental class and the control class can be shown in table 2.

Table 2. Creative Thinking Skills Pretest Data in The Experimental Class and The Control Class

Score range	Control class	Experiment class
	frequency	frequency
0-9	7	9
10-19	10	8
20-29	5	7
30-39	6	2
40-49	1	3
50-59	3	2
60-69	0	1
<b>Total</b>	<b>32</b>	<b>32</b>
<b>Average</b>	<b>20,56</b>	<b>20,69</b>
<b>Std deviation</b>	<b>15,4</b>	<b>16,62</b>
<b>Variance</b>	<b>237,22</b>	<b>276,29</b>

Based on Table 2 shows the initial creative thinking skills of students in the experimental class and control class has a low value but the value of the experimental class and the control class is not much different, the comparison of the average values is 20.69 and 20.56. The frequency distribution of posttest data of the experimental and control class students can be visualized in table

3.

Table 3. Creative Thinking Skills Post-Test Data in The Experimental Class and Control Class

Value Range	Control class	Experiment class
	Frequency	Frequency
40-48	5	0
49-56	8	4
57-64	10	11
65-72	5	5
73-80	4	9
81-88	0	3
<b>Total</b>	<b>32</b>	<b>32</b>
<b>Average</b>	<b>59,18</b>	<b>68,5</b>
<b>Std deviation</b>	<b>10,67</b>	<b>9,39</b>
<b>Variance</b>	<b>114,03</b>	<b>88,25</b>

Table 3 shows that the experimental class posttest value is higher than the posttest value of the control class, the average comparison of values is 68.5 and 59.18. There was an increase in students' creative thinking skills obtained in both classes, but the experimental class was better than the control class.

### *Discussion of Research Results*

#### *Student's Creative Thinking Skills Using Problem Based Learning (PBL) Models Higher Than Conventional Learning*

The first hypothesis is to determine whether there is an effect of the Problem Based Learning (PBL) model on students' creative thinking abilities. The results of hypothesis testing indicate that there is an influence of the PBL model on students' creative thinking abilities and higher than those taught using conventional learning.

The use of the PBL learning model raises aspects of creative thinking abilities, some of which are presented by Munandar (2012), creative characteristics, namely 1) always curious, 2) have very broad interests, 3) and like to do creative activities. From the expression unconsciously will make students think openly, besides that it can also increase understanding in a concept and information that is being studied. So, it is very influential to foster the ability to think creatively of students in creating new ideas or ideas.

Saragih and Habeahan (2014) state that PBL model activities have a positive influence on student creativity. This is in line with the research conducted by Ersoy and Baser (2014) as well as Yeh and Goh (2016), which concluded that students' creative thinking abilities learning uses the PBL model higher than students who follow conventional learning models.

After testing the hypothesis with t-test one party to find out the effects of a treatment that is PBL model on students' creative thinking abilities, obtained  $t_{\text{count}}$  of 3.704 and  $t_{\text{table}}$  of 1.668 for posttest average value of students' creative thinking ability of the experimental class is 68.5 while the value the average post-test ability of the creative thinking of the control class is 59.18. This shows that there are differences in students' creative thinking skills taught with PBL models and higher than students' creative thinking abilities taught by conventional learning models. Then learning with PBL models is said to have an effect on students' creative thinking skills.

Learning with PBL models is more effective in developing students' creative thinking skills because PBL models have five learning phases that make students' knowledge better. And as for creative thinking ability indicators are very relevant and integrated in PBL learning phases. Indicators of creative thinking ability consisting of fluency (thinking fluently), flexibility (flexible thinking), originality (original thinking), elaboration (thinking detailing), all can develop in learning problem based learning (PBL).

The first phase of the PBL Model begins by orienting the real problems that exist in students' lives. Students are oriented into problems by the teacher with statements that provoke students to think. At this stage allows students to convey ideas or ideas in developing thinking skills smoothly. Students look active in conveying their ideas. While the control class learned by conventional learning is not used to issuing opinions so that the process of thinking is not smooth. The second phase is organizing students to organize learning to provide space for students to collaborate in investigating problems that are manifested in group work so that it becomes an interaction between group members to exchange opinions. The opinions and ideas expressed by each group member have different points of view. Discussions in small groups can improve the skills of thinking fluently and flexibly that students have to construct their knowledge. Students in the control class who learn conventional learning are not trained to cooperate in groups, so students are not used to issuing opinions that are different from the opinions of their friends. The third phase is to help independent and group investigations. Investigations conducted in groups are activities of students to build their own knowledge through experimental activities in order to solve problems can improve detailed thinking skills. The activity of designing experiments encourages students to

think about the tools and materials needed, steps to work that must be done, and tabulate the data obtained so that the skills to detail students are higher. The fourth phase is presenting the work. The answers to each group in completing the worksheet are different from the answers of other groups. this reflects original thinking skills. The answers that have been stated by each group member can increase self-confidence, because students tend not to seek similar answers with other groups. The fifth phase is evaluating solutions. This stage is intended to help students analyze and evaluate the process of thinking until they present their work. The teacher as a facilitator guides student to reflect on the process of investigation.

### ***Effect of Problem Based Learning (PBL) Model on Creative Thinking Skills***

PBL learning model in the learning process has a positive influence on students' creative thinking skills, because in PBL students are trained to analyze problems and provide the most appropriate decisions to find answers to a problem, so that through this learning model will increase understanding of science, productivity and creative thinking, skills in acquiring and analyzing information. The stage or phase of the PBL learning model can foster and develop fluency skills (thinking fluently), flexibility (flexible thinking), originality (original thinking) and elaboration (detailed thinking). Whereas in conventional learning skills are rarely described, because learning usually only uses lecture methods and assignments to work on questions, which actually physics learning does not only require students to understand formulas but also must be fostered their creative thinking skills so that learning becomes more meaningful for the students themselves. This is in accordance with the results of hypothesis testing carried out where the test says that there is an influence of problem based learning (PBL) model on students' creative thinking abilities.

Sirait, M, et al (2016) Said interaction between learning models with creative thinking skills significantly affected student learning achievement. Significant results in research are caused by problem-based learning activities helping students to develop problem solving skills in discussion activities, where discussion activities condition students to work in teams, find ideas, and develop students' thinking in solving problems so that a process of social interaction with other friends in discussion activities spurs new ideas and enriches the intellectual development of students. Whereas Hidayati, et al (2019) say there is an corelation between learning models and creative thinking, critical thinking & student learning outcomes. From this opinion it is proven that there is a significant influence of PBL learning model on students 'thinking skills seen from student discussion activities where discussion activities can spur students' creative thinking skills well. Thus, based on the results of research conducted at and based on the existing theory, it is proven

that there is influence of the problem based learning model (PBL) on students' creative thinking abilities.

## CONCLUSION

Based on the results of the research data analysis, it was found that the creative thinking ability of students who took part in learning using the higher Problem Based Learning (PBL) model was 68.50 compared to students who followed the conventional learning model 59.18 in Simple Harmonic Motion material. And there is the influence of the problem based learning (PBL) model which is significant towards students' creative thinking skills.

Based on the conclusions above, then the suggestion for the next researchers is to be able to better correct the shortcomings that researchers have made in their research so that the results of this study can be used as a measure of students' creative thinking skills even better. In addition, the researcher hopes that the reader will be able to understand and provide criticism and input suggestions to develop improvements for this research.

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