



The Effect of Problem Based Learning to Improve Students' Creative Thinking Abilities

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Abstract: This study was aimed to determine students' creative thinking abilities after being given a problem-based learning (PBL) model with practicum method on energy conversion material. The Quasi-experiment with one group pretest-posttest design was used in this study. The measurement of the effect of students' creative thinking abilities uses 10 questions of creative thinking abilities with indicators, i.e. elaboration and flexibility. The questions were given to students before and after being treated and the results of the data were analyzed using paired sample T-Test and N-Gain. Hypothesis test results about the effect of students' creative thinking abilities using problem-based learning models with practicum on energy conversion material obtained asymp sig values. (2 tailed) of 0.001 and the value of N-Gain is 0,672. Based on these results, it is known that students experience an increase in the ability to think creatively after being given learning with a problem-based learning model with practicum methods on energy conversion material. Therefore, problem-based learning models with the practicum method affects students' creative thinking abilities on energy conversion material.

Keywords: Creative thinking, Practicum method, PBL

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INTRODUCTION

The 21st Century brought rapid changes especially in the development of Science and Technology that changed the learning paradigm. Every application of 21st century skills requires academic development in knowledge and understanding, one of them is in physics lessons that aim to emerge thinking skills to overcome various problems in daily life (Partnership, 2019). According to Liliawati (2011), physics as a vehicle to emerge thinking skills in order to solve problems creatively. The concept of physics used by students to explain various natural phenomenon and solve problems both qualitatively and quantitatively. One of the thinking skills which can be used to solve daily life problem is creative thinking skills.

The results of preliminary test collected through interview and documentation method at Pringsewu 2 High School, together with Mr. Budi Susanto as physics teacher of XII Science class, was known that students' creative thinking abilities are still low. This can be caused by the learning approach aren't utilizing practicum method, where the teacher only teaches with the lecture method and uses the worksheets provided. The addition of practicum method in learning process aims to make students have better understanding of the material and become more creative in solving problems exist in the conversion of heat energy to electricity lesson material. The lecture method in its implementation still dominates the science learning process, whereas physics learning requires appropriate and effective learning methods and approaches to improve students' activities and skills so that their learning outcomes and creative thinking abilities can be increased (Rahayu, Susanto, & Yulianti, 2011).

The appropriate learning model selection can be used as a way to improve students' creative thinking abilities. Creative thinking can be emerged through learning process that explores all possibilities of students' ideas with various potential inside (Prasetyo & Mubarakah, 2014). Students' creative thinking skills can be taught and developed through problem based learning (PBL) model. This statement reinforced by Utomo's opinion (2014) creative thinking is a process of generating new ideas, and PBL can develop thinking abilities, exercise problem solving skills and stimulate higher level of thinking process. Indicators of creative thinking ability according to Rudyanto (2016), i.e. fluency, elaboration, flexibility, and originality. The indicators used in this research are the elaboration and flexibility indicators.

Based on that data, lower creative thinking ability also causing lower problem solving ability. One of the solutions to overcome this problem is by implementing PBL model with practicum method. PBL can improve the ability to think creatively and solving problem. According to Tan (2003) in PBL, students investigate, solve problems, collect data, and present the learning outcomes through experiments or problem-based practicum by creatively expressing and improving their skills. The learning of physics make students will acquire problem solving skills which are relevant to their life (Argaw et al, 2016). According to Parasamy and Wahyuni research (2017), the result from practice PBL Method are percentage completeness from students increased until 94%, significant increased about learning process of students and teacher. This study is different from previous research, the novelty of this research is combines the PBL method with practicum methods on energy conversion

material. This Research contributes in the field of education as well with practicum in physics.

Based on the description above, researchers are interested in conducting research titled “The Effect of Problem Based Learning to Improve Students' Creative Thinking Abilities”, with the intention of become an innovative and effective learning approach.

METHOD

Research Design & Procedures

The method used was a quasi-experimental design with one group pretest-posttest design (Sugiyono, 2016). The research design can be seen in Table 1.

Table 1. Research Design

<i>Pretest</i>	<i>Treatment</i>	<i>Posttest</i>
O ₁	X ₁	O ₂
Mean : O ₁ = Variable before treatment; X ₁ =Treatment; O ₂ = Variable after treatment		

Variable O₁ is the students' creative thinking ability before treated, 10 questions of creative thinking ability are used to measure it. X₁ is the treatment given to students, specifically learning the energy conversion materials using problem based learning models with practicum methods. Variable O₂ is the students' creative thinking ability after the treatment is applied, the posttest measurement used the same 10 questions as the pretest.

Population and Sample

The samples of this study consisted 31 students of XII MIPA 5 at Pringsewu 2 High School in the 2020/2021 academic year. The population in this research are all students of XII Mathematics and Natural Sciences classes. Based on the random sampling techniques. The research was conducted in two sessions, in February, 28th 2020 and March, 6th 2020.

Data Collection and Instrument

The data of this research were employed an essay test collected using 10 questions of creative thinking ability. The indicators of creative thinking ability used in those questions refer to Rudyanto (2014) with two indicators, i.e. elaboration and flexibility. The questions were given before learning session as a pretest and after learning session as a posttest.

RESULT AND DISCUSSION

Before conducting research, the instruments used in this research were tested for validity so that the data obtained is valid and trusted. This validity test was conducted

on objects out of the research sample, i.e. 2019th students of Physics Education in Lampung University. The 10 questions given were declared valid, because $r_{\text{count}} > r_{\text{table}}$. The r_{table} scored 0.349 was obtained from a lot of respondents, total 32 respondents with $\alpha = 0.05$. Furthermore, the valid questions instrument were tested for reliability. Based on the reliability test of the creative thinking ability questions, the Cronbach's Alpha scores 0.631. Cronbach's Alpha valued above 0,600 to 0,800 means very reliable, it shows that the instruments of creative thinking ability in this research are reliable to use.

Instruments of creative thinking ability that have been tested for validity and reliability were given to students as a measurement tool for this research. The instruments were given before and after the treatment. The average pretest and posttest scores can be seen in Figure 1 below.

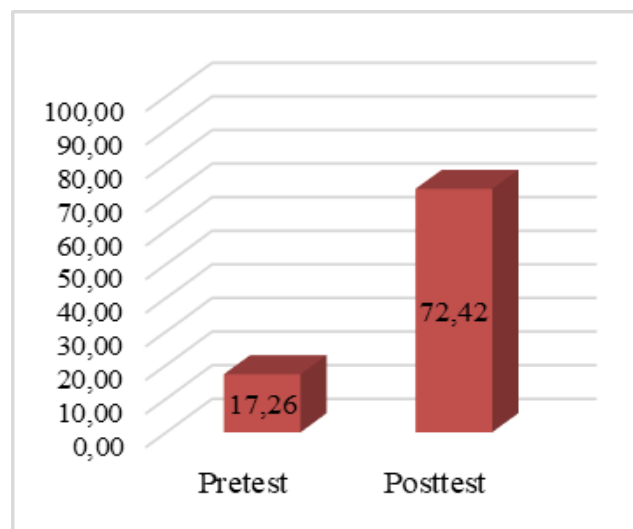


Figure 1. The Average Pretest and Posttest Score

Based on the pretest and posttest scores of students' creative thinking abilities in Figure 1, it's known that the increase in the average score is quite large with 55.16 difference. Then the hypothesis test, the pretest and posttest data were tested for normality first. The results of normality test before and after used problem based learning model with practicum method can be seen in Table 2.

Table 2. The Normality Scores of Creative Thinking Ability.

Variable	Asymp. Sig	Note
Pretest	0,207	Normal
Posttest	0,519	Normal

That data was tested by the N-Gain to see the increase in students' creative thinking abilities, i.e. the results before and after treatment. The average N-Gain creative thinking ability obtained 0.672 (medium category). It means there's an increase in students' creative thinking abilities before and after treatment. Besides N-Gain, the hypothesis tested with the Paired Sample T-Test using the SPSS 21.0 program. The results can be seen in Table 3 below

Table 3. The Paired Sample T-Test Scores of Creative Thinking Skills

<i>Pair</i>	T	df	Sig. (2-tailed)
Pretest-Posttest	-31,58	30	0,000

Based on Table 3, it can be concluded that the sig valued <0.05 , concluded that H_0 is rejected. This means there are differences in students' creative thinking abilities before and after using the problem based learning model with practicum methods.

In each indicators, the ability to think creatively increases after implementing problem based learning model with practicum methods on energy conversion material, considered the elaboration indicator (ability to have broad ideas and elaborate certain details) and flexibility indicator (ability to provide different angles, ideas, and answers). These indicators improved because in problem based learning model with practicum methods, the students have opportunities to play an active role in learning process to provide arguments or opinions about exist problems. This opinion is in line with research conducted by Saputra, Nurjanah, & Mansyur (2014) that stated the problem based learning model with practicum method requires students to be active and accustom to thinking creatively. This causes students to solve problems in flexible way and has reason why they choose that way (detail).

The high increase in N-Gain is in line with the students' learning outcomes that exceeds the Minimum Criteria of Mastery Learning (KKM). Based on the KKM scored 70.00, it's known that 23 students are complete and 8 students are incomplete. The students's mastery scores graph was shown in Figure 2.

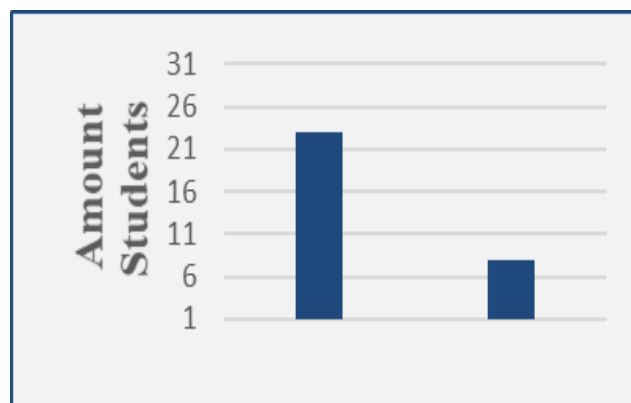


Figure 2. The Students's Mastery Scores Graph.

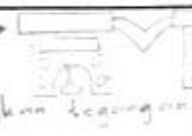
The PBL model with practicum methods improved students' creative thinking abilities, because that learning model involves students to create a learning environment that allows the exchange of ideas which are open, flexible, and active in learning process, so students are trained to think creatively. This statement is supported by Tan's (2003) opinion that problem-based learning consists of investigating, solving problems, collecting data, and presenting the learning outcomes through experiments or problem-based practicum by creatively expressing and improving their skills. Besides that, Abdurrozak, Jayadinata, & Isrok'atun (2016) PBL models was proved to improve students' creative thinking abilities in learning. From

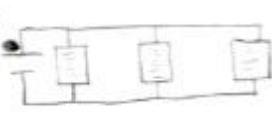
the students' answers during the pretest and posttest about the indicators of elaboration and flexibility in Figure 3 and 4 can be seen the result.


b) hubungan arus listrik yang dihasilkan terhadap proses charger

Figure 3. Pretest Results.

Jawaban

a) * Seri →  Kuantitas arus (I) listrik yang mengalir pada setiap bagiannya sama. Sedangkan tegangannya berbeda.

* Pararel
Tegangan (V) yang mengalir pada setiap bagiannya sama $V_1 = V_2 = V_3$. Sedangkan kuat arusnya berbeda $I = V/R$. 

* Seri - Pararel
 Cara mempermudah menggunakan yaitu menggunakan Pararel terlebih dahulu.

b) Thermoelectric generator dapat digunakan untuk memproduksi charger handphone. Arus listrik dirubah untuk mengecaskan handphone. Rata-rata arus dalam charger adalah $1A - 2A$ dgn $1A = 1.000 mAh$ mengeluarkan tenaga hingga $1000 mAh$ dlm $1 jam$. Sehingga thermoelectric harus diramuikan.

Figure 4. Posttest results

Based on Figures 3 and 4, it's known that there is an increase in students' answers during the pretest and posttest. On the posttest answer sheet, students were seen to think creatively in terms of the elaboration and flexibility indicators. Therefore, based on hypothesis tests, supporting theories, and relevant research, it can be conclude that the implementation of problem based learning models affect students' creative thinking abilities on energy conversion material.

CONCLUSION

It can be concluded that the PBL model with practicum methods was more effective to improve creative thinking abilities on energy conversion material.

However, the application of the effect of problem based learning models on students' creative thinking abilities was limited by the suitable learning materials and with two indicators of creative thinking abilities. Researchers recommended to use all indicators in further research, so that the effects of PBL model on students' creative thinking abilities can be fully covered.

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