

PAPER • OPEN ACCESS

## The Influence of Project Based Learning based on Process Skills Approach to Student's Creative Thinking Skill

To cite this article: Ratna Very Viana *et al* 2019 *J. Phys.: Conf. Ser.* **1233** 012033

View the [article online](#) for updates and enhancements.



**IOP | ebooks™**

Bringing you innovative digital publishing with leading voices to create your essential collection of books in STEM research.

Start exploring the [collection](#) - download the first chapter of every title for free.

# The Influence of Project Based Learning based on Process Skills Approach to Student's Creative Thinking Skill

**Ratna Very Viana<sup>\*</sup>, Jumadi, Insih Wilujeng, and Heru Kuswanto**  
State University of Yogyakarta, Indonesia

\*Email: [rveryviana99@gmail.com](mailto:rveryviana99@gmail.com)

**Abstract.** This study aims to examine the effect of Project Based Learning (PjBL) based on a process skills approach to students' creative thinking skills. This study uses a one-shot case study design. Research subjects were students of class X SMA N 1 Kalasan, Sleman with a total of 48 students. The selection of research subjects was done by simple random sampling. Data is collected from the results of the work done by students. Data analysis was carried out by descriptive analysis and inferential analysis. The results of the descriptive analysis presented are the average value, standard error, standard deviation, minimum value, maximum value, and percentage of the achievement of each indicator of creative thinking skills. Descriptive analysis on the influence of creative thinking skills is done by analyzing each indicator on the ability to think creatively. The results obtained from the descriptive analysis showed that the achievement values on the indicators of Flexibility, Fluency, Elaboration and Originality showed the results of 31%, 26%, 24% and 19% respectively. In inferential analysis is done by analyzing normality and hypothesis testing with one sample t-test. In the normality test obtained by result of  $H_0$  which shows that there is influence of creative thinking skills after using learning with the PjBL model based on process skills approach.

**Keywords:** Project Based Learning; Process skill; Creative thinking skill.

## 1. Introduction

Education is an inseparable part of the setup process Human Resources (HR) quality, tough and skilled. In achieving quality education, the important thing to note is that the education system. Science is the study of various natural events, including physics. Physics as part of science basically contains four aspects, namely product, process, attitude, and application [1]. Physics as a product means that physics contains theories, facts, principles and laws. Physics as a process means that there is a problem-solving process through scientific methods.

Learning physics in the classroom should be able to engage learners to be more active to discover the concepts on any matter that learned in order to train the learners construct new concepts were obtained that will create meaningful learning atmosphere. Acquisition of theoretical physics through learning is largely determined by the ability and creativity of learners in mastering the science process skills [1]. Learners are good their science process skills that academic performance is also good. This shows that the mastery of teaching materials and science process skills are interrelated.

Learning is said to be ideal when oriented learning on the learner (student centered). According Permendiknas 22 of 2006, with a student centered learning learners will seek to construct knowledge and to be actively involved in the search for the problem or information. One of the main lessons predicted to overcome these problems is through a model of Project Based Learning (PjBL). The PjBL



model focuses on the concepts, the core principles of a discipline. In addition, the PjBL model of an investigation involving learners to problem solving and provides the opportunity learners to work autonomously in assembling their own knowledge. Furthermore, PjBL is a model of systematic learning through a structured search process [2] and assist students in learning solid knowledge and skills built through authentic tasks and work [3] and can change the nature of the relationship between various aspects including in supporting the teaching and learning process [4].

Physics is a subject studied physical phenomena an event in everyday life. Project Based Learning (PjBL) is part of the context of the instructional approach. Project-based learning in Physics provides several advantages, namely to embed learning into a context that makes sense for students, taking into account that the learning process of physics in the classroom has a broader context, and to support the students' learning process [5]. This is corroborated by a statement of opinion, that the required learning physics and design appropriate strategies centered the participants in order to involve them both intellectually and emotionally as well as attract the attention of learners to learn on his own.

The process skills approach is knowledge or insight into the development of intellectual, social and physical skills derived from fundamental abilities which in principle already exist in students[6]. Science process skills encourage students to find their own facts, concepts of knowledge and develop attitudes and values demanded [7]. The application of the process skills approach has an interaction with the ability to think creatively [8] and can improve students' creative thinking skills [9].

In the 21st century, creative thinking is the basis for the progress of the world. Although the creative achievement is influenced by many variables, but the basis of creativity is supporting the generation of high quality, original and have an elegant solution in solving complex problems [10]. An understanding of creativity is enhanced through assessment of individual differences are illustrated by way of thinking and behaving. In some studies, express need to understand the cognitive creativity and personality of the process performed by their own understanding [11]. In education, the development of the creativity of learners has become a destination for learning. International research has found that teaching for creativity in learners produce quite challenging for teachers [12].

Creative thinking skills include the ability to see new possibilities and then discover relationships between different ideas and is able to re-construct or find ways of solving the problem [13]. The ability to think creatively influenced by several things, such as the development of logical thinking and reasoning abilities. The development of logical thinking is certainly related to the age of the learner, the more mature of logical thinking is also increasing. So is the ability of reasoning, the adult learners, then the ability of reasoning can already be taken into account [14].

Each of these aspects of creative thinking abilities have the following indicators: 1). Current Thinking (Fluency); 2). Flexible thinking (Flexibility); 3). Original Thinking (Originality); 4). Detailed think (Elaboration)[15]. Indicators of creative thinking include answering a number of questions with a number of facts, fluently express ideas, see the error of an object, providing a point of view, to think of ways of solving the problem, classifying things according to different categories, resolve new problems, to find meaning more depth to an solving the problem and try to make something new. Teaching creativity of learners can be done by encouraging learners to engage in practical activities to develop skills and confidence in their own abilities. In other words, the ability to think creatively learners can improve self-esteem [16].

The research purpose is to examine the effect of Project Based Learning (PjBL) based on a process skills approach to students' creative thinking skills. The research target is to find out the influence of creative thinking skills after using learning with the PjBL model based on the process skills approach. The rest of this paper is organized as follow: Section 2 describes the proposed research method. Section 3 presents the obtained results and following by discussion. Finally Section 4 concludes this work.

## 2. Research Method

This research is a quantitative research using experimental methods of design one-shot case study [17]. This study was conducted to determine the effect of independent variables on the dependent

variable. Syntax conducted in this research is by giving treatment to the subject matter of the research is a workmanship. Subjects in this study are the students of class X was given treatment with PjBL physics learning model based on science process skills. This study was conducted in April-May 2018 SMA N 1 Klasan, Sleman. Subjects in this study were 48 learners in class X MIPA 2 and X MIPA 4 SMA N 1 Kalasan, Sleman. Subject selection is done by simple random sampling. Research was initiated by the school and classroom observation. Observations include the learning process, the learning device used. In addition to observation was also conducted interviews to teachers related to the curriculum in force in SMA N 1 Kalasan, Sleman. The study was conducted in two classes, namely X MIA 2 and X MIA 4. Total research subjects were 48 students. The research was done by giving the same treatment to both classes. The treatment is done with a model PjBL-based learning process skills. Materials used in this study is the impulse and momentum. The data used in this study of the work of students in the work on the problems. Data is collected using student worksheet undertaken by learners. Student worksheet the form of multiple choice questions reasoned.

### 2.1. Data Analysis Technique

Data analysis was carried out by descriptive analysis and inferential analysis.

#### 2.1.1. Descriptive analysis

Descriptive analysis of data consists of workmanship of worksheet after being given the model Project Based Learning (PjBL) -based process skills approach. This analysis describes the indicators on the achievement scores of creative thinking skills of learners. Descriptive analysis presented is the average value, standard error, standard deviation, minimum value and a maximum value. Analysis on the influence of creative thinking skills by analyzing each indicator in creative thinking abilities. In this study, the scoring guidelines with scoring tests made in politomus with four scoring categories in accordance with the assessment criteria used instrument in Table 1 [18].

**Table 1.** Guidelines for scoring

Score	Criteria
4	Answer correctly and the reason really
3	Answer wrong, but the true reason
2	Answer correctly, but the wrong reasons
1	Answer incorrectly and the wrong reasons
0	No answer

#### 2.1.2. Inferential analysis

This analysis is used in the proof of the basic assumptions and hypothesis testing.

##### a) Normality test

$$D_{\text{value}} = \text{maximun } |F_0(X) - S_N(X)| \quad [19]$$

##### b) Test One Sample t-test

- Statistical hypotheses  
Ho:  $\mu = 75$   
H1:  $\mu \neq 75$

Information:

H<sub>0</sub>: There is no effect of creative thinking skills after using PjBL-based learning model with process skills approach

H<sub>1</sub>: There is the influence of creative thinking skills after using PjBL-based learning model with process skills approach

- Determining the value of degrees of freedom
- Determining the value of table at  $\alpha = 0.05$
- Test statistic to determine  $t$  and  $t$  table [20]

### 3. Result and Discussion

In this study, to test the effect of PjBL based on the ability of creative thinking processes of learners. The PjBL model in this study conducted in several phases, namely the determination of fundamental questions, making project planning, scheduling, completing, monitoring project learners, assessment and evaluation results. Each phase position adjusted with 5M stages in the scientific approach applied to the curriculum in 2013. In the first phase, the determination of fundamental questions is done by giving apperception. Then the teacher divided the group consisting of 4-5 members per group.



**Figure 1.** The teacher is doing apperception

The Figure 1 above shows that the teacher is displaying apperception to students form phenomena drawing coconuts fall from the tree. This phenomenon shows the legal event of conservation of momentum. The second phase, preparing the project planning begins with a little explanation related material the project. Before the students planning the project, the teacher gives examples and provide a selection of tools and materials to be made into a simple experimental project on the law of conservation of momentum. Furthermore, the students began to draft a proposal of project tasks into mini under the direction of teachers. The next phase of work is developing on schedule. This phase is done by teachers to guide learners in determining the time of manufacture and observations to assess the situation and conditions. Furthermore, the phase of completing the project and monitoring participant is carried out. In this phase learners complete the project and observe.



**Figure 2.** The students completing the project

In the Figure 2 above, it seems that students are completing projects related to the phenomenon of momentum. The last phase is assessment and evaluation results. In this phase, each group discussed and presented the observations that have been made as shown in Figure 3.



**Figure 3.** The student are presenting the results of the observations that have been discussed with the group.

For the evaluation stage done with the questions that would be executed by learners. Here is presented Table 2.

**Table 2.** Integration PjBL Model in Process Skill Approach

<b>Phase PjBL</b>	<b>Step Process Skills</b>
Determination of the fundamental question	Reflection
Designing project planning	Research
Develop schedule	Discovery
Learner and progress monitoring project rest result	Application
Evaluating experience	Communication

### *3.1. Descriptive analysis*

In the descriptive analysis to describe the creative thinking abilities of learners can be observed in Table 3.

**Table 3.** Descriptive Analysis Result of Creative Thinking Skill

	<b>Flexibility</b>	<b>Originality</b>	<b>Fluency</b>	<b>Elaboration</b>
N	48	48	48	48
Minimum	1	1	1	1
Maksimum	4	4	4	4
Mean	3,4	2,1	2,8	2,6
Standard Error	0,15	0,18	0,16	0,14
Standard Deviation	1,04	1,22	1,14	0,96

Table 3 illustrates the flexibility that the indicator showed the largest average value compared to other indicators, ie by 3.4 to a maximum of 4. Learning with the model PjBL can improve creative thinking skills of learners. This is supported by research that has been done [21], explained that the application of the PjBL can enhance the creativity of students grade XI-2 at MAN Klaten. In addition, strengthened by the results of research conducted [22], shows that the PjBL can affect the creativity of learners with learning outcome significantly.

The data in this study of workmanship worksheet undertaken by learners. The following Figure 4.

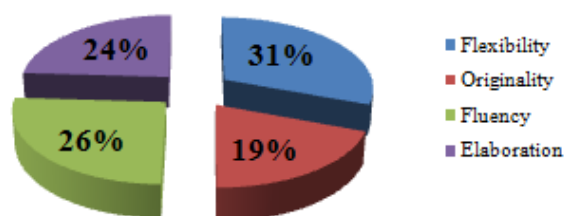
**Figure 4.** Graph Achievement Creative Thinking Skill.

Figure 4 shows that the Flexibility has the greatest value. It is clear that students are able to perform the interpretation of the answer to a problem by providing a point of view, looking for alternative answers by thinking about the problem as presented, categorize according to the different divisions [15]. Based on the above, it can be said that the students as research subjects have flexibility in thinking to solve the problem contained in the question. Fluency and elaboration on this indicator, the data show nearly the same values. This indicates that learners well enough in answer a number of questions with some facts and try to create something new [15]. However, a significant difference seen in the results of originality. These results indicate that the lack of learners in planning new things as well as the lack of having a unique idea or unusual [23]. This suggests that the lack of the ability of learners in solving new problems contained in the matter.

### 3.2. Inferential analysis

In the inferential analysis is conducted to determine the effect of PjBL skills based on the ability of creative thinking processes. The analysis was performed according to the minimum completeness criteria (KKM = 75). The following will be shown in Table 4.

**Table 4.** Results of Normality Test Analysis

	Kolmogorov-Smirnov <sup>a</sup>			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
nilai	.146	48	.012	.961	48	.107

a. Lilliefors Significance Correction

Table 4 shows the normal distribution using the Shapiro-Wilk and Kolmogorov-Smirnov. In Table shows that the significant value of the Shapiro-Wilk and Kolmogorov-Smirnov showed values  $> 0.05$ , it was concluded that the data are normally distributed.

This impact analysis using the technique of one sample t-test. The decision criteria used are  $H_0$  accepted if the significance level  $> 0.05$ , which indicates there is no influence creative thinking abilities after using the learning model-based approach to process skills PjBL vice versa, if the significance level  $< 0.05$ , then  $H_0$  is rejected and  $H_1$  accepted which indicates there are significant creative thinking abilities after using PjBL-based learning model with process skills approach. The following Tables 5 and 6.

**Table 5.** The results of the test One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
nilai	48	68.85	14.271	2.060

**Table 6.** The results of the test One-Sample Test

	t	df	Test Value = 48			
			Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
nilai	10.124	47	.000	20.854	16.71	25.00

Tables 5 and 6 shows that the significant value of 0.00 with  $\alpha = 0.05$ . The table also shows the value of  $t = 10.124$ , while in theory the value table = 2.01063. This shows that  $\text{sig.} < \alpha$  or  $t_{\text{value}} > t_{\text{table}}$ , then the decision is reject  $H_0$ . Thus, it can be concluded that there are significant demonstrated creative thinking skill after using PjBL-based learning model with process skills approach.

#### 4. Conclusion

The research has presented an examination on the effect of Project Based Learning (PjBL) based on a process skills approach to students' creative thinking skills. Based on the analysis carried out it can be concluded that flexibility indicators have the greatest value that is 31% which illustrates the flexibility in thinking to solve the problem. Fluency and elaboration on this indicator showed the same results, with 26% and 24%. For originality indicator shows the lowest value, which amounted to 19%, this case illustrates that lack of ability of learners in solving new problems contained in the matter. So, there is the influence of creative thinking abilities of learners after use a model PjBL-based learning process skills approach.

#### Acknowledgment

Acknowledgment are conveyed to class A post students of physics education of Yogyakarta State University who have helped field surveys and data documentation and also to Mr. Sumarna, S.Pd who has helped implement this research and to student of class X SMA N 1 Kalasan who have worked well together.

#### References

- [1] Zuhdan Kun Prasetyo, *et al*, Pengembangan Perangkat Pembelajaran Sains Terpadu untuk Meningkatkan Kognitif, Keterampilan Proses, Kreativitas serta Menerapkan Konsep Ilmiah Peserta Didik SMP, Program Pascasarjana UNY, Yogyakarta, 2011.
- [2] Tresna Dermawan, *et al*, Buku Panduan Pengembangan Kurikulum Berbasis Kompetensi Pendidikan Tinggi, Direktorat Jenderal Tinggi, Jakarta, 2008.



- [3] Mahanal, S and Wibowo A. L.P, Penerapan Pembelajaran Lingkungan Hidup Berbasis Proyek untuk Memberdayakan Kemampuan Berpikir Kritis, Universitas Malang, Malang, 2009.
- [4] Stojcevski, A., D. Fitrio. 2008. Project Based Learning Curriculum in Microelektronics Engineering *IEEE Computer Society*. **14** pp 773-777.
- [5] Mikelskis, Silke-Seifert. 2012. Physics Teachers' Profesional Development in the Project "Physics in Context". *Journal COSMOS*, **8(2)** pp 211-227.
- [6] Dimiyati & Mudjiono, Belajar dan Pembelajaran, Rineka Cipta, Jakarta, 2009.
- [7] Wulanningsih, S, B. Prayitno, R. Probosari. 2012. Pengaruh Model Pembelajaran Inkuiri Terbimbing Terhadap Keterampilan Proses Sains Ditinjau dari Kemampuan Akademik Siswa SMA Negeri 5 Surakarta. *Pendidikan Biologi*. **4(2)** pp 33-43.
- [8] Deta, U. A, Suparmi, S. Widha. 2013. Pengaruh Metode Inkuiri Terbimbing dan Proyek, Kreativitas, serta Keterampilan Proses Sains Terhadap Prestasi Belajar Siswa. *Jurnal Pendidikan Fisika Indonesia (Indonesian Journal of Physics Education)*. **9(1)** pp 28-34
- [9] Rahayu, E., H. Susanto, D. Yulianti. 2011. Pembelajaran Sains dengan Pendekatan Keterampilan Proses untuk Meningkatkan Hasil Belajar dan Kemampuan Berpikir Kreatif Siswa. *Jurnal Pendidikan Fisika Indonesia (Indonesian Journal of Physics Education)*. **7** pp 106-110.
- [10] Mumford, M. D., Medeiros, K. E., & Partlow, P. J. 2012. Creative thinking: Processes, strategies, and knowledge. *Journal of Creative Behavior*. **46(1)** pp 30-47.
- [11] Wechsler, S. M., Maria, C., Vendramini, M., Oakland, T., Maria, C., & Vendramini, M. 2012. Thinking and Creative Styles : A Validity Study. *Creativity Research Journal*. **24(2-3)** pp 235-242
- [12] Bich, T., Tran, L., Nhat, T., Mackenzie, S. V, & Kim, L. 2017. Developing assessment criteria of a lesson for creativity to promote teaching for creativity. *Thinking Skills and Creativity*. **25** pp 10-26
- [13] Hoenicke, R. et al. 2010. Forecasting Multiple Watershed-level Benefits of Alternative Storm Water Management Approaches in the Semi-arid Southwest: Required Tools for Investing Strategically. *Low Impact Development* pp 1111-1122
- [14] Kim, K. H. 2011. The Creativity Crisis: The Decrease in Creative Thinking Scores on the Torrance Tests of Creative Thinking. *Creativity Research Journal*. **23(4)** pp 285-295.
- [15] Liliawati, W. 2011. Pembekalan Keterampilan Berpikir Kreatif Siswa Sma Melalui Pembelajaran Fisika Berbasis Masalah. *Jurnal Pengajaran MIPA*. **16** pp 93-98.
- [16] Yates, E., & Twigg, E. 2016. Developing Creativity in Early Childhood Studies Students. *Thinking Skills and Creativity*. **42** pp 42-57
- [17] Sugiyono, Metode Penelitian Pendidikan Pendekatan Kuantitatif, Kualitatif, dan R&D, Alfabeta, Bandung, 2014.
- [18] Istiyono, E. (2014). Developing Higher Order Thinking Skill Test Of Physics (PhysTHOTS) For Senior High School Students. *Penelitian Dan Evaluasi Pendidikan*. **18(1)** pp 1-12.
- [19] Purwanto, Statistika Untuk Penelitian, Pustaka Belajar, Yogyakarta, 2011.
- [20] Siregar, Sofyan, Statistik Parametrik untuk Penelitian Kuantitatif, PT Bumi Aksara, Jakarta, 2013.
- [21] Yulistiyana, P., Bakti, M., & Tri, R. 2015. Penerapan Model Pembelajaran Project Based Learning untuk Meningkatkan Prestasi Belajar dan Kreativitas Siswa Pada Materi Pokok Sistem Koloid Kelas XI IPA Semester Genap Madrasah Aliyah Negeri Klaten Tahun Pelajaran 2013/2014. *Jurnal Pendidikan Kimia, Program Studi Pendidikan Kimia, Universitas Sebelas Maret*, **4(1)** pp 89-96.
- [22] Insyasiska, D., Zubaidah, S., & Susilo, H. 2015. Pengaruh Project Based Learning Terhadap Motivasi Belajar, Kreativitas, Kemampuan Berpikir Kritis, dan Kemampuan Kognitif Siswa Pada Pembelajaran Biologi. *Jurnal Pendidikan Biologi*. **7(1)** pp 9-21.
- [23] Hondzel, C. D., & Hansen, R. (2015). Associating creativity, context, and experiential learning. *Education Inquiry*. **6(2)** pp 23403.