

The Interaction of Student's Creativity Thinking Skills Through Project Based Learning and Learning Cycle 7E in Parabolic Motion on the Second Grade Students of Senior High School

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Abstract: Creativity thinking skills is one of the competencies that must be possessed in the 21st century. Teachers must provide facilities for students to develop creative thinking skills through the selection of appropriate learning methods. This study aims to find out the interaction between student's creativity thinking skills, Project Based Learning, and Learning Cycle 7E methods in Physics lesson chapter parabolic motion on XI grade students. The methods of this study are quasi experiment with two ways ANAVA design. This research was conducted at Al Islam 1 Senior High School Surakarta West Java Indonesia in August 2022. Sample of this study selected using the cluster random sampling technique. The research used was class XI 1 as Group 1 with Project Based Learning methods and XI 2 as Group 2 with Learning Cycle 7E methods. Based on the analysis data by using SPSS program at the significant level of 5% it can be concluded that there is interaction between student's creativity thinking skills, Project Based Learning, and Learning Cycle 7E methods in Physics lesson chapter parabolic motion on XI grade students. It is also concluded that Project Based Learning give better impact to enhance student's creativity thinking skills.

Keywords: Creativity thinking skills; Interaction; Learning cycle 7E; Project based learning

Introduction

Education has an important role in the development process of a person's life. Not only as a material transfer process but education also had an important role as a process of increasing the competence and skills of students. To present an optimal learning process, a teacher has to choose the right learning method so that the learning process is not monotonous and boring. There are many cooperative learning models that can be implemented in learning. One of the student-centered learning models is Project Based Learning. Ministry of Education and Cultural (2006) stated in their book that Project-Based Learning is a learning model that uses problems as a first step in collecting and integrating new knowledge based on experience in real activities. Sani (2014) stated that there are six stages in

Project Based Learning namely problem presentation, making plans, arrange scheduling, monitor project reaction, perform assessment and evaluation. Kristiawan et al. (2021) stated that Project Based Learning teaches students not just content, but also important skills in ways students have to be able to function like adults in our society. Mahendra (2017) give another statement, Project Based Learning models allows students to carry out scientific learning activities in the form of asking, doing observing, investigating or experiments, reasoning, and interweaving relationship with others in efforts to obtain information or data. Study from Fatimah (2016) conclude that Project-based learning has significant effects on the creative thinking skills of students. Another study from Lidi et al. (2021) conclude that project-based learning (PjBl) model based on local wisdom through the goggle classroom media can train and improve several science process skills and

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performance can also increase the competence of prospective biology teacher students through real work of scientific product creativity. Based on the literature above, it can be concluded that Project Based Learning can be used as a learning model that can enhance student's creativity thinking skills.

Another learning model that can be used to attract students' interest is Learning Cycle 7E. The 7E Learning Cycle learning model consists of Elicit, Engage, Explore, Explain, Elaborate, Extend, and Evaluate. According to Eisenkraf in Trimayanti et al. (2015) it is briefly mentioned that the flow of the learning process in the 7E Learning Cycle model begins with bringing in students' initial knowledge, involving students in direct experience activities, students gain knowledge with direct experience related to the concepts being studied, giving students the opportunity to conclude and present the results of their findings, give students the opportunity to apply their knowledge, the teacher guides students to apply the knowledge that has been obtained in new contexts, then sees changes in students' thinking from the learning outcomes that have been carried out through evaluation. According to Sumiyati et al. (2016) the 7E Learning Cycle model is a constructivism-based learning model whose learning activities are oriented to student activities. Maskur et al. (2019) stated that one of the notable strengths of the 7E Learning Cycle is its ability to encourage the students to be active and think maximally to acquire the knowledge. Hartono (2013) stated that the main characteristics of Learning Cycle-7E are proposing problem or question, focusing interdisciplinary of study field, authentic exploration, and cooperation of work, designing a work and presenting the work. All of that characteristic is main point to enhance student's creativity thinking skills.

In this 21st century learning, there are four kinds of skills that must be possessed by students, namely Critical Thinking and Problem Solving, Creativity Thinking Skills, Communication Skills, and Ability to Work Collaboratively. Creativity thinking skills are one of the important components that must be developed as a provision for students to face the changes and developments of the current era. Someone who has a good creative thinking skills is able to provide solutions when encountering a problem and is able to always develop themselves positively. Ramadhani et al. (2018) stated that creative thinking is the ability to create new and original ideas. Prihatin et al. (2021) stated that Higher-order thinking skills, especially the skill to think creatively, are skills that must be possessed to face the challenges of life in this 21st century. Developing creative thinking skills requires a strategy, for example by making predictions of information, defining problems, formulating hypotheses based on observed phenomena, and testing hypotheses. This study aims to

find out the interaction between student's creativity thinking skills, Project Based Learning, and Learning Cycle 7E methods in Physics lesson chapter parabolic motion on XI grade students.

Method

This study aims to find out the interaction between student's creativity skills, Project Based Learning, and Learning Cycle 7E methods in Physics Lesson on XI grade students. The methods of this study is quasi experimental with two ways ANAVA design. The study was conducted on two groups, each of which was given a different model learning method. Group 1 was assigned treatment with Project Based Learning method, and group 2 was given a Learning Cycle 7E method. The research was conducted in August 2022 at Al Islam 1 Senior High School Surakarta, West Java, Indonesia. The population in this study were all students of class XI Science. The sampling technique uses a cluster random sampling technique, where all samples are considered homogeneous so that all members of the population have the opportunity to be sampled (Budiyono, 2003). The sample in this study was class XI 1 as many as 36 students for Group 1 and XI 2 as many as 36 students for Group 2.

In this study, four meetings were held in Group 1 and three meetings in Group 2. The first meeting in the Project Based Learning class was carried out in the first step, namely presenting the problem by way of discussion and the second step in the form of planning by giving worksheets to students. The second meeting was still continuing the planning steps with the second worksheet. Worksheet functions so that students understand more about the concept of Parabolic Motion material. The third meeting was carried out during the schedule preparation and product manufacturing stages as well as the project monitoring stage. In this class the project is made in the form of a water rocket. The selection of the project was based on the fact that the students had never made a water rocket and the motion of the water rocket was a parabolic motion that students could see directly. In the fourth meeting, the evaluation stage was carried out to determine the level of students' understanding of Parabolic Motion and data collection on creative thinking skills by distributing questionnaires.

In the Learning Cycle 7E class, the first meeting was carried out in the first step, namely Elicit with a trigger question so that an initial discussion emerged regarding the concept of Parabolic Motion and the second step, and namely Engage as reinforcement. The last step in this first meeting is exploration, namely the stage of working on worksheets so that the concepts developed by students can be understood more clearly. At the second meeting, the Exploration step was continued with the

second worksheet in the same group. Before class was over, the last step was Elaboration by discussing with the students' examples of Parabolic Motion in everyday life. In the third meeting, the Evaluation step was carried out, namely students were asked to do a test about Parabolic Motion to find out their level of understanding. After that, the last step is Extend. The teacher asks students to connect the Parabolic Motion material with the previous material, namely Straight Motion. In addition, the teacher also conveys the relationship between Parabolic Motion material and the following material, namely Circular Motion.

Table 1. Indicators of Student's Creativity Thinking Skills

The dimensions of student's creativity thinking skills	Indicators	Items
Fluency	Generating many problem solving ideas.	13, 14, 16, 17
Flexibility	Answering questions based on the classification of certain categories.	10, 11
Originality	Seeing a problem from various points of view.	27, 28, 29, 30
	Use strategies that are new, unique, or unusual to solve problems.	1, 2, 3, 5, 6
Elaboration	Provide ideas, examples or statements that are new, unique, or unusual.	4, 7, 8, 9, 12
	Give the right reason for the answer to a problem solving and look for a deep meaning to the answer.	15, 18, 19, 20, 21
	Presenting the work of discussion results properly and smoothly as well as conveying and taking notes on important things during the presentation.	22, 23, 24, 25, 26

Data collection techniques in this study were using tests and non-tests. Student's creativity thinking skills data were collected through a questionnaire using a Likert scale with four answer choices (strongly agree, agree, disagree, and strongly disagree). Student creativity thinking skills instrument was designed based on the dimensions of creativity (Guilford, 1975). This questionnaire consists of 30 question items that map 7 indicators of student creativity that are developed can be seen in Table 1. While the data on the effectiveness of the Project Based Learning and Learning Cycle 7E is seen from the student's cognitive learning outcomes obtained from the post-test. The interaction between student's creativity skills, Project Based Learning, and Learning Cycle 7E was conducted by two-way variants analysis

by using SPSS program version 26 at the significant level of 5%.

Result and Discussion

This study aims to find out the interaction between student's creativity skills, Project Based Learning, and Learning Cycle 7E methods. Before using two ways ANAVA there are some pre-requisite test, normality and homogeneity test. This pre-requisite test intends to make sure that the sample in this study normally distributed and homogeneous. The result of the pre-requisite test can be seen in Table 2 and Table 3 below.

Table 2. Normality Test Result

Factors	Observation	Shapiro - Wilk			Conclusion
		Statistic	df	Sig.	
Learning methods	PBL	0.945	36	0.073	Normal
	LC 7E	0.965	36	0.316	Normal
Student's Creativity Thinking Skills	High	0.972	35	0.488	Normal
	Low	0.971	37	0.424	Normal

Table 3. Homogeneity Test Result

Factors	Levene Statistic	df1	df2	Sig.	Conclusion
Learning methods	0.918	1	70	0.341	Homogeny
Student's Creativity Thinking Skills	1.818	1	70	0.182	Homogeny

Based on the research, the result of student's creativity skills obtained can be seen in Table 4.

Table 4. Student's Creativity Skills Score

Factors	Max	Min	Mean
Project Based Learning	90	45	67.8
Learning Cycle 7E	80	35	58.2

From Table 4 it can be described the histogram of the relationship between creative thinking skills. Based on Figure 1, it can be seen that students who receive Project Based Learning have higher creative thinking skills than students who receive learning with Learning Cycle 7E. Fadhil et al. (2021) stated that PjBL model can improve creative thinking skills and student learning outcomes. Another study was also conclude by Yamin et al. (2020) stated that PjBL implementation would help students develop creative thinking skills. Student could improve their creative thinking skills through product design activities as their effort to solve the problem they face. Research by Anazifa et al. (2017) conclude that student's creativity skills in project-based learning class has a higher average post-test than students in problem-based learning class and 5M class. The higher average is influenced by the experience of learning activities

experienced using project-based learning model. From the research that has been done and the literature from previous research studies, it can be seen that Project Based Learning is a learning method that can give a better impact for student's creativity skills. It is because Project Based Learning give students.

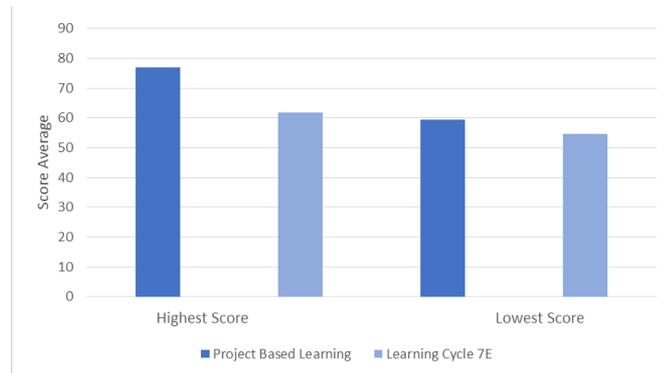


Figure 1. Histogram of creativity thinking skills and student's cognitive score

In this study, 2-way ANAVA testing was also carried out to determine the interaction between student's creativity thinking skills, Project Based Learning, and Learning Cycle 7E methods. The 2-way ANAVA test was carried out with SPSS version 26 and the results are shown in the Table 5.

Table 5. Description of Two Ways ANAVA

Tests of Between-Subjects Effects					
Dependent Variable: Score					
Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	4861.697	3	1620.566	13.243	.000
Intercept	287416.63	1	287416.631	2348.7	.000
Methods	1823.12	1	1823.122	14.898	.000
Creativity	2703.47	1	2703.467	22.092	.000
Methods *	508.722	1	508.722	4.157	.045
Creativity					
Error	8321.29	68	122.372		
Total	298825.0	72			
Corrected Total	13182.986	71			

a. R Squared = .369 (Adjusted R Squared = .341)

From Table 5 it can be seen that there is interaction between student's creativity skills, Project Based Learning, and Learning Cycle 7E methods in Physics lesson chapter parabolic motion on XI grade students. Parno et al. (2019) stated that there were significance differences between STEM-7E learning cycle and 7E learning cycle in increasing students' creative thinking. Both groups increased their creative thinking skills from Almost Not Creative to Creative levels. Based on Table 5, it can be seen that creativity thinking skills give an impact to student's score, learning methods (Project

Based Learning and Learning Cycle 7E) also give an impact to student's score, and there is interaction between the impact from creativity thinking skills and the learning methods.

Conclusion

Creativity thinking skills is an important part for students to face current development. Teachers should use some learning methods that can increase student's creativity skills. Based on the result of data analysis, it can be concluded that there is an interaction between student's creativity skills, Project Based Learning, and Learning Cycle 7E methods in Physics lesson chapter parabolic motion on XI grade students. It also can be concluded that Project Based Learning make a better impact for student's creativity skills than Learning Cycle 7E.

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