The Influence of Project-Based Learning Model on Creativity and Cognitive Learning Outcomes of the Students of SMAN 1 Amarasi Timur, Indonesia

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Abstract

Creativity is one of four crucial competencies for students in the 21st century. It has an important role in forming a superior generation to face challenges 4.0. This research is set to determine the difference of the influence of using the project-based-learning model on the students' creativity and cognitive learning outcomes. It is experimental research by using non-parametric data analysis techniques. Kruskal Wallis test is employed to test hypothesis then a post hoc follow-up test (Mann-Whitney U) is carried out. The sample is the entire population of the students of class X SMAN 1 Amarasi Timur, Indonesia. Creativity and cognitive learning outcomes are measured by using material momentum and impulse. Student's creativity is measured by using a closed questionnaire that consists of positive, negative statements, and project work results. Meanwhile students' cognitive learning outcomes are measured using a multiple-choice test with 22 questions. The results research inform that there is a significant influence of using the project-based-learning model on students' creativity and cognitive learning outcomes.

Keywords: Project-Based Learning, Creativity, Cognitive Learning Outcomes.

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A. INTRODUCTION

Education is a basic need that must be possessed by all humans because they can develop their abilities comprehensively through it. School education is carried out by providing references, forming a will, and developing students' creativity in teaching and learning activities (Martaida, T., 2017)

Professional educators are needed in the implementation of teaching and learning activities to achieve good education as expected by the societies Martaida, T., 2017, but Tabun et al., 2019 said that with the implementation of teaching and learning activities in the classroom, many teachers close the opportunities for the students' criticism by not providing learning that increases their creativity. As a competent teaching staff, the role of teachers is very important because they have the main function of forging, providing teaching, training, guiding, and evaluating students through formal primary and secondary education (Law No. 14 of 2005).

Mulyasa, (2011) states that teacher quality is viewed from two aspects, namely the process and the results "when students are more active in the learning and social process, physically and mentally, they will get involved in terms of process. It shows that quality of teachers is achieved, and in terms of results, namely: during classroom learning activities, most of the students' abilities can improve so that

better basic competency is achieved. Through these descriptions, improvements and breakthroughs are needed so that learning objectives can be achieved.

Especially in physics, one of the problems encountered in the world of education is the lack of students' involvement in learning activities. The students do not get encouragement in finding the knowledge itself, but they just memorize what the teachers say. It indicates the incompetence of students to find solutions for the problems, especially when the problems involve the concept of physics.

Based on observations in class X-MIA of Senior High School (SMAN) 1 Amarasi Timur shows that the students' are less involved in the learning activities and passive in the classroom because it is dominated by the role of the teacher. Based on the above explanation, physics learning material is expected to provide real experiences so that scientifically the students can accept and understand the concepts of physics. Besides, the students can meet the expected learning outcomes.

Applying a learning model that fits the target is one way of implying that make students can be directly involved in understanding the concept of physics. Four learning models are in line with the scientific approach, namely: inquiry, discovery-learning, project-based-learning, and problem-based learning. These learning models are oriented towards the active role of students, one of which can be used is a project-based learning model.

Project-based-learning is a learning model that focuses on learning activities through contextually complex activities (Indrawan et al., 2020) meaning that in this learning students conclude understanding based on direct experience. Project-based learning is redefined based on constructivist learning which emphasizes students to collect their knowledge, this is in line with Indrawan's opinion. This project-based learning focuses on concept and problem solving, it allows the students to work independently in reconstructing learning that ends in presenting the results. It is concluded that project-based learning is used in teaching and learning activities where students are involved to integrate their understanding in design, problem-solving, and lead to product presentation.

According to observations carried out at Senior High School (SMAN) 1 Amarasi Timur, it turns out that ideas and updates are needed to make the props that can be used in learning activities because it is found that the props in the physics laboratory are still limited by using equipment that can be found around the environment. This is strengthen by the opinion of (Liliana, 2009) which states that the students' creativity can be formed when the students experiment with self-created tools and simple materials that can be found around the house and them.

This high-quality generation is supported by skills that include collaboration, innovation, digital literacy, initiative, accountability, productivity, responsibility for practical intelligence, creativity, communication, business and management, leadership, high ethical standards, professionalism, dynamics, agility, resilience, flexibility, critical thinking, and problem-solving (National Academy of Engineering, 2004); (Trilling & Fadel, 2009) Creativity is a competency that must be possessed by students in the 21st century, the National Education Association (n.d.) identifies the

skill as "The 4Cs." “The 4Cs” covers critical thinking, creativity, communication, and collaboration.

Creativity is a skill in getting something new, have an authentic character, including its expertise in creating new diverse, and unique ideas in perfecting new solutions (Leen et al., 2014). That means the creativity has a significant role in building a sustainable future. (Semiawan, 2009), defines creativity as the ability to change and update things that are previously owned to form a new concept. Torrance describes creativity into four components, namely: fluency, flexibility, elaboration, original.

B. LITERATURE REVIEW

1. Project-Based Learning Model

Thomas (Hosnan, 2014) states that project-based learning is an assessment that requires interlocking work, based on questions or problems that ask the students to be involved in designing, finding solutions, investigating, drawing conclusions, and giving the freedom to work independently so as ends in the appointment of results.

2. Creativity

Creativity can also explain a skill that generates unique or unusual and unexpected ideas (Alrubaie dan Esther., 2014). (Torrance, & Presbury., 1984) stated that the main characteristics of creativity are Fluency, Flexibility, Elaboration, and Originality. (1) Fluency, the ability to create new ideas, (2) Flexibility is the ability to make various ideas, (3) Elaboration is the ability to describe, add to, and evacuate ideas, (4) Original is the ability to create extraordinary ideas.

3. Students’ Cognitive Learning Outcomes

Cognitive includes understanding, then understanding is the earnestness regarding a matter acquired through the thought process (also initiative, response, etc.), so to speak is a way to learn something through real experience. According to Bloom, knowledge is a domain that consider the development of intellectual abilities and skills. Winkel, 2019 said that the place to regulate knowledge activities is through the mental activity itself. Winkel, (2019) also said that the special characteristics of cognitive learning are based on the acquisition of the use of forms that reflect objects or events. Those objects are displayed or displayed personally by an intellectual reaction.

C. METHOD

The research employs an experimental method with non-parametric analysis techniques. This non-parametric analysis technique can be used when the qualifications of parametric statistics do not meet the standards. Whereas, the sample in this research is the whole population. The statistical analysis is the Kruskal

Wallis test with the test criteria: the significance level of $P_{\text{-value}} \geq 0.05$ accepting the null hypothesis and if $P_{\text{-value}} \leq 0.05$ then the result is rejecting the null hypothesis.

This test contains twenty-five questions arranged in a closed questionnaire which includes three indicators, namely: fluency, flexibility, and elaboration. The three indicators are linked to each other in a positive and a negative statement, then the practical test uses the scores from the results of the projects that the students work on. The student's ability to complete a multiple-choice test of 25 items is a cognitive learning outcome measured in this research.

D. RESULTS AND DISCUSSION

Data on tests of creativity and students' learning outcomes are measured and checked using predetermined guidelines. The results of the descriptive analysis of scores for each aspect of creativity are presented in Table 1 and Table 2 below:

Table 1. Creativity Data Description

Creativity Attitude Aspects	Min	Max	Mean	Std.Dev	Median
Low	62	87	75	6.73	76
High	67	90	79	5.36	80
Creativity Skills Aspects					
Low	78	89	79	4.08	78
High	73	90	83	3.38	84

Through Table 1, it is clear that the data description from the students with low creativity gets an average score for the learning outcomes of creativity in the aspects of attitudes and skills, respectively 75 and 79. While the students who have high creativity in the realm of attitudes and skills get a score of 79 and 83. The results of learning knowledge in this study are how the knowledge possessed by students is poured out through test work, momentum material, and impulses. After that, they are then analysed. The following shows the data on students' learning outcomes in Table 2.

Table 2. Achievement Value Data Description of Cognitive Aspect

Learning Model	N	Min	Max	Mean	Std.Dev	Median
Low	31	62	87	75	6.73	76

The next step is to analyze whether there are differences in the influence of using the project-based learning model on students' creativity and cognitive or not. This analysis uses the SPSS 18 program with the test is the non-parametric statistical analysis test of Kruskal Wallis test. The Kruskal Wallis test can be used when the qualifications on the use of parametric statistics do not meet the standards. The results of the Kruskal Wallis test are presented in Table 3 and Table 4 below:

Table 3. Kruskal Wallis Test Creativity

Class	N	Mean Rank
PjBL	31	36.85
Total	31	

Statistics Test[a,b]

	Creativity
Chi-square	5.483
df	1
Asymp. Sig.	.019

a. Kruskal Wallis Test
b. Grouping Variable: Class

Table 4. Learning Model with Creativity on Learning Outcomes

Class		N	Mean Rank
Learning Outcomes	PjBL	31	52.97
	Creativity	31	68.02
	Total	124	

Statistics Test[a,b]

	Learning Outcomes
Chi_Square	3.726
df	2
Asymp. Sig.	.055

a. Kruskal Wallis Test
b. grouping Variable: Class

Table 3 and table 4, show the significant value of students' creativity sourced from the Kruskal Wallis test of 0.019, and the significance value of using learning models and creativity on students' cognitive learning outcomes is 0.055. The significance of the two variables obtained is P value < 0.05, then the conclusion is that the research hypothesis is accepted, this indicates that there is a significant difference in the influence of the project-based learning model and creativity on students' cognitive learning outcomes. After carry out the Kruskal Wallis test, the next post hoc test is the Mann-Whitney U test, this is conducted to strengthen the decision on the Kruskal Wallis test. The Mann-Whitney U test calculations are presented in Table 5.

Table 5. Post Hoc follow-up test (Mann_whitney test)

Creativity			N	Mean Rank	Sum of Ranks
Creativity towards Learning Outcomes	dimension1	Upper	31	36.85	1142.50
		Lower	31	26.15	810.50
		Total	62		

Statistics Test

	Creativity towards learning outcomes
Mann-Whitney U	314.500
Wilcoxon W	810.500
Z	-2.342
Assymp.Sig. (2-tailed)	.019

The average value obtained for high creativity is 81 and for low creativity is 71. Based on the results of the Kruskal Wallis test, it has a significant value of 0.019 ($P_{\text{-value}}$ significance level, < 5% $\alpha = 0.05$) then rejecting H_0 and accepting $H_{\text{alternative}}$. The conclusion drawn from calculations is that there is a significant difference between project-based-learning models and creativity toward aspects of students' knowledge. Student creativity is defined as the skills of students in remodelling or updating something into something new.

This research also shows that there is an influence of high and low creativity on students' learning outcomes; it reveals is that the creativity of students can support learning outcomes. Mathisen & Monnick (2009) say that students with high creativity can solve problems well. Creativity can help students form the needed skills and knowledge. It can be seen during research, with high creativity, the students have the desire to do experiments and do new things while they are with low creativity tend to be passive. This is an impact on the mastery of material for students who have low creativity, in contrast to those who have high creativity, they can generate new ideas through memory or the concepts so that they can create something new and following the concepts of physics.

Supported by other supporting data, namely students' project results and creativity questionnaire data, the results of this research are in line with the research of Laura at all (2011), which conclude that the differences in high and low creativity can affect the learning process and students' learning outcomes. Besides, another research from (Eragamreddy, 2013) also concludes that there are differences in high and low creativity. The obtained results are also in line with previous research by (Aktamis & Ergin., 2008), concluding that there is an interaction between learning models and students' creativity.

E. CONCLUSION

The results of this research indicate that there is a significant difference in influence between project-based-learning models and students' creativity on students' cognitive learning outcomes. And thus, it can be said that the learning model influences the student's learning results. Therefore, this research needs to be informed to teachers that students need to be allowed to develop their creativity. The teachers also need to pay attention to and review appropriate learning models that will be applied in the learning process. It is expected that through this information,

teachers can accommodate students creativity because this is very important in this 21st century.

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