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Implementation of the Use of Project Based Learning Model in Making Organic Pesticides to Improve Creativity and Learning Outcomes of Students

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Abstract- Research objectives: analyze the feasibility, increase creativity, learning outcomes and student responses to project based learning (PjBL) learning models in making organic pesticides. This type of research is quasi-experimental, with non equivalent control group design. The population is class VII students of SMP 5 Brebes Academic Year 2017/2018. The sample is class VIIA as an experimental class with the learning of the PjBL model and the VIIB class as a control by learning the scientific approach. The results of the study were analyzed with the SPSS application version 16.

It was found that: the implementation of the PjBL model learning was well implemented, was indicated by the implementation that all the PjBL model syntax by the teacher with an average percentage of 89.53% in the very good category. The PjBL model of making organic pesticides can develop students' creativity. The results of the significance hypothesis test $0.004 < 0.05$, the initial hypothesis (H_0) is rejected, meaning that there is a difference in the average creativity of students between the experimental class and the control class. The results of the hypothesis test of learning outcomes obtained significant values, $0,000 < 0,05$ then the initial hypothesis (H_0) is rejected indicating that there are differences in cognitive learning outcomes between the experimental class and the control class. The learning process of making organic pesticides using the PjBL model shows > 80% of students respond positively. The learning process is more creative, innovative and fun so as to improve learning outcomes.

Keywords: PjBL, student's creativity, learning outcomes

I. INTRODUCTION

Generally learning activity in Indonesia is carried out by the teacher still use the lecture method. Student activities in teaching and learning activities are still very less, students only receive knowledge that comes from the teacher. Learning activities are still teacher-centered (teacher centered) have not involved students maximally. Students are still at least once doing activities involving all senses, thinking skills and abilities, the conclusion of science learning carried out by teachers is still monotonous. The learning process is still monotonous, lack of teacher innovation in learning, lack of / does not involve the role of students more optimally, and unable to improve the ability to think critically and creatively in solving problems in daily life, resulting in student learning outcomes that are still low.

One of the environmental problems that arises is environmental pollution due to the impact of excessive use of synthetic / chemical pesticides that disrupt and pollute the environment, another impact is the presence of food ingredients exposed to chemicals that can interfere with health. Based on these problems the teacher must plan learning that is able to invite students to solve problems. One learning model that is able to foster the ability of students to solve problems is one of them is PjBL Project Based Learning. The learning process of the PjBL which deals with the problem of the use of

hazardous chemical pesticides is to develop a project for making organic pesticides.

According to Wekesa, et al. (2016) under the title "Project Based Learning on Students' Performance in the Concept of Classification of Organizations Among Secondary Schools in Kenya" explained that the project based learning model is able to provide opportunities for students to actively build their own knowledge so that they change their attitudes towards complex and abstract concepts positively so as to improve performance academic.

The research of Husamah in 2015 entitled "Blended Project Based Learning: Metacognitive Awareness of Biology Education for New Students". The results showed that there were differences in mean values in metacognitive awareness (knowledge of cognition and cognitive regulation) between the experimental and control classes. The average value of the experimental class is higher than the control class.

The PjBL stage was developed by The George Lucas Educational Foundation in the Ministry of Education and Culture (2014) as follows. Start With the Essential Question, Design a Plan for the Project, Create a Schedule, Monitor the Students and the Progress of the Project, Assess the Outcome, Evaluation the Experience.

What is Creativity? According to Semiawan (2009) creativity is a modification of something there is already a new concept. In other words, there are two old concepts that are combined into a new concept. According to Munandar (2009), argues that creativity is: The result of interaction between individuals and their environment, the ability to create new combinations, based on data, information, or elements that already exist or are known before, namely all experiences and knowledge that has been obtained someone during his life either in the school, family, or community. According to Mulyasa in Fitranty (2016) creativity is a very important thing in learning, and teachers are required to demonstrate and demonstrate the creativity process. Creativity is something that is universal and is characteristic of aspects of the world of life around us. Creativity will be seen if students are able to see some possibilities - possibilities and expectations - and find new ways and strategies in solving a problem (Makmur, 2015). Some of the descriptions above can be stated that creativity is essentially the ability of a person to give birth to something new, both in the form of ideas and real works, both in the form of new works and combinations of things that already exist, all of

which are relatively different from what already exists previous. Cognitive learning outcomes are one type of student learning outcomes besides attitudes (spiritual and social) and skills (Education Ministry Regulation, 2014). Knowledge in the dimensions of thinking has six levels or levels of ability. The lowest level shows a simple ability, while the highest level shows a fairly complex ability.

According to Education Ministry Regulation (2014) the target of assessment of learning outcomes by teachers on the dimension of knowledge consists of factual, conceptual, procedural, and metacognitive knowledge. Factual is knowledge about terms, names of people, names of objects, numbers, years, and things that are specifically related to a subject. Conceptual is knowledge about categories, classifications, linkages between one category and another, causal laws, definitions, and theories. Procedural is defined as knowledge of specific procedures and processes of a subject such as algorithms, techniques, methods, and criteria to determine the accuracy of the use of a procedure.

II. RESEARCH METHOD

A. Research Design

The research was conducted from January to June 2018 in Brebes 5 Middle School, Brebes Regency, Central Java Province. The population of this study was the seventh grade students of SMP Negeri 5 Brebes semester 2 of the Academic Year 2017/2018 which numbered 258 students divided into 8 study groups.

Data retrieval research using nonprobability sampling method with purposive technique, namely the technique of determining the sample that does not provide an opportunity for each member of the population to be selected as a sample.

This research is quasi-experimental research which aims to compare two different treatments to the subject of the study. With the experimental method can be expressed creative student learning and learning outcomes due to treatment.

The research design used was nonequivalent control group design. This design uses two classes as research subjects, namely the experimental class and the control class. In the experimental class treatment was given in the form of implementation of the practice of making organic pesticides through learning the Project Based Learning (PjBL) model,

while in the control class using a scientific approach with the lecture method.

Table 1. Research Design

O ₁	X _a	O ₂
O ₃	X _b	O ₄

O₁= pretest of class experiment

O₂= posttest of class experiment

O₃= pretest of class control

O₄= pretest of class control

X_a = lecture method

X_b = implemented with PjBL

material, increasing participation in learning, and motivation.

B. Data Collection Technique

Data about learning Project Based Learning models are taken from the results observation during learning. Data on creativity and learning outcomes are taken from the results of student ability tests in accordance with the theme. Data about student responses were collected by questionnaire method. The research instrument consists of:

- a. The Project Based Learning learning sheet is in the form of an observation sheet on the implementation of the PjBL learning model with aspects of observation: preliminary activities, core activities and closing activities.
- b. The observation sheet about the creativity of students using an observation sheet in the form of a rubric assessing students' creativity in making organic pesticides with indicators: fluency (flexibility), flexibility (eloquence), elaboration (detailing), originality (original thinking) and evaluation (judging).
- c. Written tests about cognitive learning outcomes of students in the form of multiple choice questions in the form of 15 questions about environmental pollution material with cognitive / knowledge indicators include: remembering (C1), understanding (C2), applying (C3), analyzing (C4), evaluating (C5) , and create (C6).
- d. Student questionnaire opinion sheet about Project Based Learning, with indicators: novelty, interest in students with PjBL, ease in receiving

III. RESULTS AND DISCUSSION

A. Implementation of learning uses the Project Based Learning model

The results of the activities carried out by the teacher in the learning process using the PjBL model are described in the following data table 2.

The table 2 showed that the implementation of learning using the PjBL model has been carried out very well by teachers through the implementation of all the PjBL model syntax indicators by teachers with an average total implementation of 89.53% with a very good category. While the results of observations of student activities in the learning model PjBL are shown in table 3.

The table 3 showed that the implementation of learning using the PjBL model fosters positive activity from students well. The average observation of teacher activities is 89.5% with a very good category, while the average activity of students in learning model based learning is 81.4% with good categories.

Teacher activities in learning are in a very good category while student activities in learning are in a good category because students who are sampled / treated are students of class VII (seven) whose high level of thinking still needs teacher guidance. But in general student activity is quite good. The good activity of students in this activity cannot be

separated from teacher guidance through the use of student worksheets.

Table 2. Percentage of Observation Results for Teachers in the Model PjBL the Making of Organic Pesticides

No.	Aspects observed	X	Average %	Category
A	Preliminary activities	3,58	89,6	Very Good
B	Core activities	3,53	88,4	Very Good
C	Closing Activity	3,62	90,6	Very Good
	Average		89,53	Very Good

Table 3. Percentage of Student Activity Observation Results In the Model PjBL the Making of Organic Pesticides

No	Activity Step	Aspects observed	Average	Percentage	Category
1	Aspects observed	Pay attention to the teacher's explanation	3,4	85,0	Good
2	Core activities	Respond to questions and assignments project	3,1	78,5	Good
		Carry out experiments, cooperation and discussion	3,2	80,0	Good
		Presentation, problem solving delivery of ideas / ideas	3,2	79,2	Good
3	Closing Activity	Draw Conclusion	3,3	84,3	Good
	The average total activity of students in learning		3,2	81,4	Good

attitudes, critical and creative attitudes to develop students' problem solving abilities.

It is advisable to keep all the given values. Through student work sheet as an experimental guide for making organic pesticides, students will explore their cognitive, psychomotor and affective abilities through small discussions in their groups. Student work sheet designed by the teacher has been developed to facilitate the growth of cognitive and psychomotor abilities of students, namely the existence of work procedures or work steps in the form of practicum instructions that provide opportunities for the growth of cognitive aspects such as understanding, analyzing, implementing and implementing practical designs. Psychomotor aspects are also trained through activities to discuss and carry out lab work together with group members. Through practical implementation students are given the opportunity to improve skills in terms of designing a simple experiment, honed performance skills and enhance collaboration between students. The affective aspects of students will also be explored through several questions in the Student work sheet that foster students 'scientific

This is in accordance with the opinion of Trianto (2013) which explains that student worksheets are student guides that are used to carry out investigation or problem solving activities. Wena (2014) explained that the PjBL model can present a learning environment that is able to provide positive feedback and encourage students to use high-level thinking processes in learning. Paian (2017) adds that students' creative thinking abilities are taught using a project-based learning model (PjBL) better than conventional learning.

B. Increasing Student Creativity in Making Organic Pesticides Using the Project Based Learning Model

Based on the data in table 3, it can be concluded that the average value of learning creativity of control class students is 72.8 in the good category. While the

average value of students' creativity in the experimental class is 78.6 in the good category.

The results of the hypothesis test of differences in creativity between classes using the PjBL model

Table 4. Student Creativity Data

No	Creativity Indicator	Control Class	Treatment Class
1	Fluency	77,3	79,7
2	Flexibility	72,7	82,0
3	Elaboration	75,0	74,2
4	Originality	67,2	71,9
5	Evaluation	71,9	85,2
	Average	72,8	78,6
	Category	Good	Good

between the two treatment classes, although the differences are quite low. But at least there is a difference in the average ability of creativity between the two classes and in terms of criteria, both are still in the good category. It is clear that the syntax in PjBL model learning has been able to grow, develop and enhance student creativity. In the control class that uses a scientific approach, students are less / not trained to convey and spark ideas, ideas, opinions and even solutions to problems, students are less able to give opinions to solve problems or questions and are not taught how to find alternative solutions to problems by developing ideas through design a product.

Bagheri et al. (2013) explained that the project based learning model is an educational approach in which students collect, analyze, and interpret data effectively and consequently present their interpretations to the classroom, so that students' creativity in collecting, analyzing, and interpreting the results of practice data will grow through mod PjBL.

Making products in the PjBL model is carried out through practical activities to develop creative thinking skills through designing a product. Pratama (2016) further explained that the Project Based Learning learning model provides new experiences and knowledge for students because indirectly learning becomes a scientist, performs scientific actions in implementing a project, starting from formulating problems, determining procedures, determining tools and materials needed, conducting investigations, designing and creating products, presenting or communicating products as a result of

and the class using the scientific approach (lecture method) can be described that there are differences

the investigation process, and conducting group discussions.

C. Improving Student Learning Outcomes in the Materials of Environmental Pollution with Making Organic Pesticides Using the Project Based Learning Model.

Based on the data in table 5, it can be concluded that the average value of the control class learning outcomes is 80.0 in the good category while the average value of the experimental class learning outcomes is 88.75 in the good category .

Through learning the project based learning model the practice of making organic pesticides, students are faced with problems they encounter in everyday life, namely the negative impact of the use of chemical (synthetic) pesticides. This problem certainly needs solving through a critical and creative attitude, namely through cooperation in their groups in making simple projects, collaborating in conveying ideas, ideas / opinions and joint discussions. Through practicum making organic pesticides in his group will grow the ability to think scientifically and solve problems.

This is in line with the opinion of Rais (2010) that to equip personal abilities such as soft skills in students is absolutely necessary a learning strategy approach that can synergize academic skills such as understanding theory and soft skills (problem solving, independence, teamwork, independence, responsibility, honesty, and the ability to communicate convey ideas and ideas through the percentage of project groups). One of the learning strategies is project-based learning. Project-based learning emphasizes education that provides opportunities for student-centered learning systems,

collaboratively and integrates real and practical knowledge and creativity. problems, teaching is effective in building

Table 5. Postest Data Analysis of Learning Outcomes

No	Class	Average Grade	Category Assesment	Completeness Learn
1	Control	80,00	Good	65,6 %
2	Treatment	88,75	Good	96,9 %

D. PjBL Model Improves Student Response in Learning.

Based on table 6, it can be concluded that the implementation of the project based learning (PjBL) model on environmental pollution material received a positive response from students. This positive response is indicated by the average student

response, 30.2% of students strongly agree, 46.6% agree on the implementation of project based learning model learning. Meanwhile, only 11.9% of students disagree and 11.4% of students did not strongly agree.

From the aspects of each questionnaire / response indicator, responding students also responded well to indicators of novelty, student

Table 6. Students' Response to Learning Implementation

No	Indicator	Percentage of Students Answering				Total (%)
		Strongly Agree	Agree	Disagree	Strongly Disagree	
1	Novelty	10,9	60,9	10,9	17,3	100
2	Student interest with the PjBL model	43,0	54,0	3,0	0,0	100
3	Ease in receive material	47,5	33,1	13,1	6,3	100
4	Increase role and students in learning	26,0	40,6	9,4	24,0	100
5	Increase motivation	23,4	43,8	23,4	9,4	100
	Average	30,2	46,5	11,9	11,4	100

interest in the PjBL model, ease in receiving material, increasing student participation in learning and increasing motivation. This shows that students respond well to the implementation of learning environmental pollution material using the PjBL model. According to Morsound in Wena (2014), one of the advantages of the PjBL model is that the PjBL model can increase student motivation, students feel more passionate in learning, and delays in attendance are greatly reduced. The same thing was conveyed by Triani (2015) that the project based learning model has many advantages, among others, inviting students to get more motivation

towards the learning process, besides that the learning model of project based learning is able to improve cooperation with students.

IV. CONCLUSION

From this study it can be concluded:

1. Implementation of learning using the PjBL model seems that the teacher is able to carry out good learning. This is indicated by the implementation of all the PjBL model syntax indicators by teachers with an average total implementation of the learning process of 89.53% with a very good category.

2. The use of the project based learning model in making organic pesticides is able to develop students' creativity, this is reflected in the average value of creativity achieved by the control class which is 78, and the average reativity value of the experimental class is 78.6 with a good category . Test results hypothesis sig. 004 value < 0.05 , the initial hypothesis (H) is rejected. This means there is differences in the average student creativity between experimental and control classes.
3. The average learning outcomes between classes that use the project based learning (PjBL) model are higher than those that use a competitive approach (lecture method). Has tested the learning outcome hypothesis sig. 0,000 $< 0,05$ then the initial hypothesis (H) is rejected. This means that there are differences in average results Cognitive learning between the experimental class and the control class.
4. The learning process for making organic pesticides for environmental pollution using the PjBL model received a positive response from students $> 75\%$ of students respond positively.

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