The Effect of Problem Based Learning on Cognitive Outcome in Science Subject in Junior High School : Topic Water Pollution

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Abstract

The research aimed to determine the effect off Problem Based Learning in science learning on cognitive outcomes of 7th grade at junior high school on the topic of water pollution. This research is an experimental research. The research sample was selected by random sampling technique. The research data was collected through pre-test and post-test using cognitive learning outcome instruments. Analysis data using t-test. The results showed the Problem Based Leearning significantly improved on cognitive outcome this can be seen from the increase in the post-test in the experimental group compared to the control group (74.43>68.23). Based on the resultd of these studies indicate that the use of Problem Based Learning affectes the learning of science on the cognitive outcomes of 7th grade at junior high school on the topic of water pollution.

Keywords: Problem Based Learning; Cognitif Outcome

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INTRODUCTION

Science is a collection of theories that have been tested for truth, explaining the patterns of regularity and irregularity of symptoms that have been carefully observed (Ministry of National Education, 2005, p.6). The development of science subjects in an integrated manner is a form of learning where students can know new concepts about science by using their minds. (Trianto, 2010, p.99) states that science is related to how to find out about nature systematically, so that science is not only mastering a collection of knowledge in the form of facts, concepts or principles, but also the process of discovery

To achieve satisfactory learning, especially in natural science learning, there must be an appropriate learning model or approach. Efforts to make improvements to student learning achievement can be applied to models or approaches that are appropriate to the topic. That approach is our starting point or perspective in looking at all the problems that exist in teaching and learning programs (W. Gul, 2002, p.4).

The low learning outcomes are influenced by several factors, both internal and external factors of the students themselves. Internal factors include students' interests, talents, motivation and intelligence while external factors include learning methods, facilities, media, learning processes both at school and outside school. Someone will succeed in learning if in themselves there is a desire to learn. One effort to improve the quality of education can be pursued through the use of learning strategies that are able to develop active learners' learning methods. The use of these strategies is intended to be able to increase students' learning motivation, especially in learning science so as to improve student learning achievement. Thus educators must master a variety of models and teaching methods and use them according to each material to be taught.

Learning outcomes are abilities possessed by students after participating in learning, (Nana Sudjana, 2013, p.22). assessment of learning outcomes is carried out to obtain one's identity in mastering abilities.

According to (Bloom, 1956, p.24) divides the "learning domain" as a goal formulated into three classifications or aspects, namely: (1) cognitive aspects; (2) affective aspects; (3) psychomotor aspects. Bloom's Taxonomy is a classification of learning objectives within education that educators set for students, (Omar, et. Al. 2011, p.25).

Problem-Based Learning supports high-level thinking in problem-oriented situations (Arends, 2008, p.57). The implementation of high thinking is inseparable from the role of the teacher in implementing problem based learning is to present ideas of various skills by providing authentic problems, facilitating investigations and supporting students. So the role of educators is able to improve student learning outcomes. Whatever the role of educators in the application of problem-based learning can improve cognitive learning outcomes.

The topic of water pollution is one of the themes or topics that are seriously happening right now around the neighborhood. The topic of water pollution and its impact is part of the science learning materials taught to students of grade VII junior high school. The material on the topic of water pollution includes material that is very suitable with the method of learning problem-based learning where problem-based learning is a learning model that provides a challenge for students to find solutions to real-world problems individually or in groups. Problem-based learning makes students develop skills to become independent students. The problem problems are chosen to explore natural curiosity by linking learning with students' daily lives, and emphasizing the use of analytical and critical thinking skills (Marike Nawang Palupi, 2009, p.1).

Based on observations in schools about learning science, it is known that the learning method that is widely used by educators is the lecture method. Educators explain and students record the educator's explanation. The process of learning science is an exploratory not just memorizing. For this reason, the natural science learning process needs to be made to a variety of good approaches, models, methods, media, and the atmosphere is comfortable for learning so that students are able to develop their ideas and potential. Learning outcomes obtained by students sometimes do not meet standards.

The use of problem-based learning is one of the alternative to improve science learning so that it is expected to make the teaching and learning process in the classroom more enjoyable so that it has an impact on improving students' cognitive learning outcomes.

Based on the background stated above, the science learning using problem-based learning with the theme of water pollution is expected to

improve learning outcomes of students' cognitive domains.

This study aims to determine the effect of the use of problem-based learning in science learning with the topic of water pollution on cognitive learning outcomes of grade VII students at Public Junior High School 2 Ngemplak Sleman

RESEARCH METHOD

This research is a quasi-experimental study, where the control is carried out on only one variable, the variable that is considered the most dominant (Nana S. Sukmadinata, 2009, p.59). This research was conducted at SMP N 2 Ngemplak Sleman Yogyakarta. When this research took place in the even semester of the academic year 2015/2016 precisely in April. The design of this study uses a pretest-post test one group comparison (McMillan & Scumacher, 2010, p.343). The research sample was class VII students consisting of a control group of 35 students, and the experimental group of 35 students was conducted using the purposive sampling method. Purpossive sampling (Sugiyono, 2009, p.124). Data collection uses instrument quality questionnaire which includes syllabus, learning process plan (RPP) and cognitive domain assessment questionnaire instrument with 6 indicators of Bloom Taxonomy in (Supriyadi, 2007, p.25) in the form of remembering, understanding, implementing, analyzing, evaluating and creating. The data analysis technique uses the t-test (Sample t-Test). Before the t-test is used, the prerequisite test is carried out, namely the Kolmogorov-Smirnov test and the F test (Levene's Test)

RESULTS AND DISCUSSION

Before analyzing the data to answer the hypotheses in this study "Are there any differences in problem based learning in improving cognitive learning outcomes of students?" the prerequisite test is performed first. The prerequisite test consists of a normality test and a homogeneity test.

The normality test uses the Kolmogorov-Smirnov test. This test is conducted to determine whether the data comes from a normal distribution or not. Data is said to be normally distributed if the Kolmogorov-Smirnov test p-value is greater than the significance level of 0.05. The results of the Kolmogorov-Smirnov test of the experimental group and the control group showed that the p-value of the pre-test control group was 0.081 and post-test 0.313, while the p-value of the Kolmogorov-Smirnov test of the experimental group pre-test was 0.429 and the post-test was 0.260. Because the Kolmogorov-Smirnov pre-test and post-test test p-values in each group are greater than the significance level of 0.05, it can be concluded that the data are normally distributed. (Table 1).

Homogeneity variance test uses the F (Levene's Test) If the p-value in the Levene's Test is greater than the 0.05 significance level, it can be concluded that the data are homogeneous or come from the same population. Leavenesest test results showed that the Levene's Test p-value was 0.451 and post-test was 0.906. This means that the pre-test and post-test p-value tests are greater than the 0.05 significance level so that it can be concluded that the data in the cognitive domain are homogeneous or come from the same variance. (Table 2).

After the assumption of normality and homogeneity is fulfilled, a different test can be performed. Different tests are performed with two types, namely Paired Sample t-test and Independent Sample t-test. Paired Sample t-test is used to test whether there are significant differences between two different groups in the same group, which in this study is used to test the difference between pre-test and post-test in the cognitive domain. The Independent Sample t-test was used to test whether there were significant differences between the two different groups. If the p-value is less than the significance level of 0.05, then the proposed hypothesis is accepted, if the p-value is greater than the significance level of 0.05, the proposed hypothesis is rejected.

Test results of independent sample t-test for pre-test and post-test, showed that the p-value of pre-test was 0.871. This means that the p-value pre-test is greater than the significance level of 0.05 (0.871> 0.05), so it can be seen that there is no significant difference in the pre-test results in each group. This is also evident from the mean values obtained in each group, namely 61.54 for the control group and 61.26 for the experimental group. The scores of the two groups are almost the same and the low mean in the pre-test is because the two classes have no treatment

.

Tabel 1. Kolmogorov-Smirnov Normality Results

Kelompok	Perlakuan	*p-value* Kolmogorov Smirnov	Keputusan
Kontrol	*Pre-test*	0,081	Normal
	Post-test	0,313	Normal
Eksperimen	*Pre-test*	0,429	Normal
	Post-test	0,260	Normal

Tabel 2. Levene's Test Homogenitas Result

Aspek	Perlakuan	*p-value Levene's Test*	Keputusan
Kognitif	*Pre-Test*	0,451	Homogen
	Post-Test	0,908	Homogen

Tabel 3. Independent Sample t-test Pre-Test and Post-Test Result

	Kelompok	N	Mean	Std,Deviasi	t-tes	*p-value*
Pre-test	Kontrol	35	61.54	7.102	0,164	0,871
	Ekperimen	35	61.26	7.508		
Post-test	Kontrol	35	68,23	7.681	-3.338	0,000
	Ekperimen	35	74,43	7.856		

Tabel 4. *Paired Sample t-test* Result

Kelompok		N	Mean	Std,Deviasi	t-tes	*p-value*
Kontrol	*Pre-test*	35	61.54	7.102	-5.874	0,002
	Post-tes	35	68.23	7.681		
Eksperimen	*Pre-test*	35	61.26	7.508	-8.906	0,000
	Post-tes	35	74.43	7.856		

While the p-value post-test results were 0.00. This means that the p-value pre-test is smaller than the significance level of 0.05 (0.000 <0.05), so it can be concluded that there are significant differences in the post-test results in each group. This is also evident from the mean values obtained in each group, namely 68.23 for the control group and 74.43 for the experimental group. This happens because both groups have both received treatment in learning. Table 3).

Paired Sample t-test test results showed that the average cognitive value of students in the control class at pre-test was 61.54 and the mean value at post-test was 68.23 with a significance = 0.002 less than 0.05, while the average cognitive value of students in the experimental class at the pre-test of 61.26, while at the post-test of 74.43 with a significance = 0,000 less than 0.05, so it can be seen that there is an increase in cognitive learning outcomes before and after learning science using problem-based learning with the theme of water pollution in the experimental class . Likewise for the control class that was not given the same treatment as the experimental class experienced a slight increase with can be seen from the results of the mean pre-test and post-test. (Table 4).

Based on the different test results above it can also be seen that the cognitive learning outcomes of students after using problem-based learning is better. This can be seen in the mean post-test value of the experimental group greater than the control group (74.43> 68.23). This shows that there is an increase in students' cognitive learning outcomes after being given science learning on the topic of water pollution using Problem Based learning. In addition, learning by using problem-based learning in science learning is better than not using the problem-based learning model.

This is in accordance with what was revealed by Masek & Yamin (2011, p.57) that "In theory, the problem based learing method as a role to create an environment that conductive for deep content learning, which in believed to affect students' ability to apply knowledge ". And this is also in line with what is expressed by (Tan, 2009, P.58) that problem-based learning contributes to cognitive aspects.

CONCLUSION

The use of problem-based learning affects the cognitive aspects of learning outcomes in science learning with the theme of water pollution in students of class VII semester 2 of SMP Negeri 2 Ngemplak, Sleman, Yogyakarta. SMPN 2 Ngemplak Sleman Yogyakarta is a school around which it is still integrated with nature so that it is a easier for studentsto see or know directly the problem of pollution that around the school.

Learning outcomes of cognitive aspects of students who when learning science by using problem based learning is higher than the learning outcomes of students' cognitive aspects in learning science without using problem based learning with the theme of water pollution. It can be seen that the mean post-test value of the experimental group is greater than the control group (74.43> 68.23). This shows that there are differences in participants' cognitive learning outcomes in learning science with the topic of water pollution using problem-based learning with students who in learning do not use problem-based learning.

Learning by using problem-based learning in science learning is better than not using the problem-based learning model.

The application of natural science learning with problem-based learning provides invaluable experience for students to be able to understand the problems faced in the environment and in real life. With problem-based learning it is hoped that students will care about the problems that arise in the community so that they are able to play an active role in helping to overcome these problems

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