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COMPARISON BETWEEN STUDENTS LEARNING OUTCOMES CHEMISTRY TAUGHT BY PROBLEM-BASED LEARNING AND COOPERATIVES TYPE OF THINK-PAIR-SHARE BY USING MACROMEDIA FLASH

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Abstract

This research aims to determine differences between students Chemistry learning outcomes taught by learning *Problem- Based Learning (PBL)* and cooperative type*Think – Pair- Share (TPS)* that use *macromedia flash* on the subject of solubility and solubility product. The population in this research were the studentsof SMA Negeri Lima Puluh class XI which consisted of 3 classes. Samples were taken by using *random sampling (randomly)* which consists of two classes and each class has 30 students. The results shows that student in the PBL class had average pre-test value of 35 $\pm$ 6,16 and average post-test value of 84,50 $\pm$ 9,50 with the average gain value76,78%, Meanwhile the students in the TPS class had the average pre- test value of 33,50$\pm$ 5,89 and post-test value of 78,5 $\pm$ 8,63 with average gain value 67,90 %. Hypothesis with by **t**-test of two way and it was found that t_{count} = 2,564 and the t_{table} = 2,0021 for α = 0.05, and db = 58 show that $t_{count} > t_{table}$. There for Ha is accepted, it mean there is a significant difference between learning outcomes of students who was taught by *PBL* and the students learning outcomes taught by cooperative type *TPS* model using *macromedia flash*

Keywords: PBL Learning, Cooperative Type TPS, Macromedia flash

A. INTRODUCTION

Teacher has an essential part in directing, designing and controlling the learning process. If teacher can implement them efficiently and effectively in manipulating the teaching and learning in the school, then by itself will run an efficient learning process that ultimately realization pattern of behavior that is expected. In learning process, student should be the subject (actor) not only is subjected to the treatment (the object). By being the subject, thewhole body of student get involved, as well as emotions, and thoughts and imagination (Mudyahardjo, 2001).

Learning method which is dominated by the teacher, it made the students to understand difficultlyaboutscientific concepts that are abstract and the lack abilityofthe students in correlating concepts or subject matter in the daily life. In addition, the students are also difficult to be active and creative in learning, because the learning process is not interesting and meaningless so that students tend to be bored and tired. It was a big influence on learning achievement is low.

Chemistry is a compulsory subject in the senior high school (SMA) Science Program (IPA). In learningchemistry,thestudents get several difficulties that can be sourced at: (1) the difficulty in understanding the term, this difficulty arises because most students just memorize terms and not understand the true intent of the term often used in the teaching of chemistry; (2) difficulties with numbers, often encountered the students who do not understand the chemical formula calculations, it is because the students do not know the basic of mathematics well; and (3) difficulty in understanding the concept of chemistry. Most of the concepts in chemistry is a concept or an abstract and complex material so as to overcome this, the concept needs to be demonstrated in a more concrete form, for example by experimentation or certain media

Based on the facts on the field, most of the learning process in SMA Negeri 1 Lima Puluh still using teacher centered learning model means that the learning process is centered on the teacher, so that students do not get involved actively in the learning process. This is because the nature of the learning method is a direction from the teacher to the students who lead less active students in learning. Therefore, we need a model of learning that can involve active students to think and develop knowledge, provide support and opportunities for students to develop their ideas. In addition to the use of the learning model, the media is indispensable to facilitate students' understanding of the material presented. Media also increase the interest of students in the learning process. With the help of the media, learning will be easier and the result will be a maximum.

Problem Based Learning (PBL) is a learning model that is based on the constructivist a problem that exists in real life and can be carried out cooperatively. Of the problem students are stimulated to study the problem based on the knowledge and experience of learning that will allow students to establish new knowledge and experiences. PBL learning more priority in the learning process, in which the duty of teachers should focus on helping students achieve self-directed skills.

Think Pair Share (TPS) is a simple technique with great advantage. Think Pair Share (TPS) can improve students' ability to recall the information, and a student can also learn from other students and with each other to convey the idea to be discussed before it is delivered to the class. In addition, Think Pair Share (TPS) also can improve confidence and all students are given the opportunity to participate in the class.

The second study model was able to increase the activity of students in learning. Students are required to think actively, develop knowledge, provide support and opportunities for students to develop their ideas, but the implementation of the learning

model is not enough to maximize the results of studying chemistry student, because it required the media to convey information lessons for learning chemistry is not imaginary. One medium that can be used is Macromedia Flash. Through Macromedia Flash, learning activities can be intraktif and can not give visual experiences to students in order to give motivation to learn, clarify and simplify the complex and abstract concepts become more simple, concrete, as well as easy to understand.

Based on the above, the authors are interested in conducting a research study comparing the two models, namely the model Problem Based Learning and Think Pair and Share with the help of Macromedia Flash (Macromedia Flash to enhance the learning outcomes of Chemistry students on the subject of solubility and solubility product.

B. METHOD

This research was conducted at SMAN1 Lima Pulu hat Jalan Besar Lima Puluh. The date of this research in the second semester of the Academic Year 2013/2014, precisely inMay 2014.

The study design using TrueExperiment Design.The study involve sampleof two classes :first class applying the learning model Problem Based Learning with the help of MacromediaFlash, second class learning modelThink Pair Share with the aid of Macromedia Flash Both classes are selected using a random sampling

To determine the students' learning results obtained from the application of the two treatments, the students were given a test. The shape of the design used was pre test-post test control group design. The study design chart can be see in Table1.

Table 1. Pretest-Posttest Control Group Design

Group	Pre-Test	Treatment	Post-Test
Experiment I	T_1	X_1	T_3
Experiment II	T_2	X_2	T_4

Information:

X_1 = Learningwith implementation ofthe Problem Based Learning Model by using MacromediaFlash.
X_2 = Learning with implementation of*Think Pair Share*Type by using*Macromedia Flash.*
T_1 = The observation of the experimental group 1 at the beginning research.
T_2 = The observation of the experimental group 2 at the beginning of research.
T_3 = The observation ofthe experimental group1at theend of research.
T_4 = The observation ofthe experimental group2at theend of research.

Data analysis technique consists of pre requisite test and test hypotheses. Prerequisite test consists of a test of normality and homogeneity test.

C. RESULTS

1. Findings of Research

The data obtained in this research is achemistry student learning outcomes in the form of cognitive value to the subject solubility and solubility product. The data were taken from the experimental group I that class treated PBL learning model using Macromedia Flash and for the experimental groupII are given class treatment o fcooperative learning model TPS by using Macromedia Flash. The number of students involved in this research were 60 students, consisting of 30 students of class XI IPA1 and 30 students of class XI IPA3.

Inprocessing data for both samples (Appendix 24) obtained the pretestand post test experimental class I and class II experiment summarized in Table 2.

Table 2. The Mean of Pretest and Postest.

Group	Data					
	Pre test			Pos test		
	$\bar{X}$	S	S^2	$\bar{X}$	S	S^2
Experiment I	35	6.16	37,93	84,50	9,50	90,26
Experiment II	33,50	5,89	34,74	78,50	8,63	74,40

$\bar{X}$ = average values; S = Standar Deviasi; S^2 = Varians

Based on the above table it can be described differences in the results of the average acquisition value of pretest and post test experiment experimental class I and II through the graph in Figure 1 below.

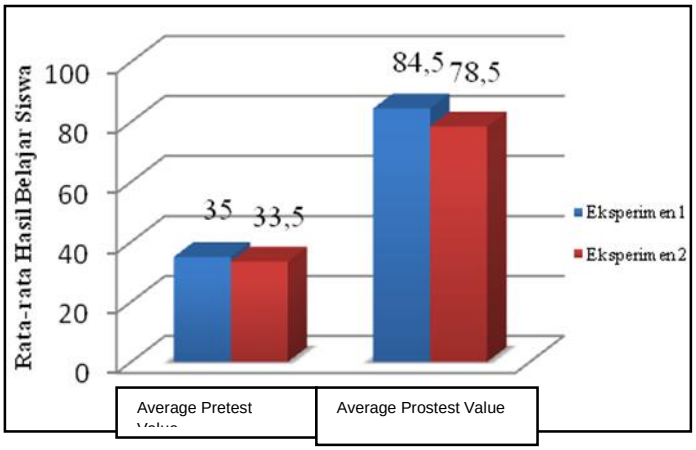

Figure 1. Graph results on average pre-test and post-test samples

2. Pre requisites Test Analysis

Before analyzing the hypothesis test, first tested the pre requisite analysis includes tests of normality and homogeneity test.

a) Normality Test

To determine whether the data pre test and post test samples both classes normally distributed or not, then the Chi Square test at significance level α=0.05. Based on the data normality test results pre test and post test data obtained as follows.

Tabel 3. Normality test Data Pre test and Pos test

Group	Data Source	χ^2_{count}	χ^2_{Table}	α	Description
Eksperimen I	Pretest	7,75	11,07	0,05	Normal distribution
	Postest	6,95	11,07	0,05	Normal distribution
Eksperimen II	Pretest	5,35	11,07	0,05	Normal distribution
	Postest	7,15	11,07	0,05	Normal distribution

χ2 = chisquared; α = significant level

Based on Table 3 concluded that : Normality test result datagrade students experiment I obtained χ2 count 7.75 for pre-test and post-test χ2 count to 6.95. By taking a significance level α = 0.05 and df = 5is11.07, the price of the data visible Chi Square (χ2 count) < price Chi Square (χ2 Tabel), it can be concluded chemistry student learning outcomes dataare normally distributed.

Data normality test student learning out comes obtained experimental class II χ2 count 5.35for pre-test and post-test χ2 count to 7.15. By taking a significance levelα = 0.05 and df = 5 is 11.07, the price of the data visible Chi Square (χ2 count) < price Chi Square (χ2 Tabel), it can be concluded chemistry student learning out comes dataare normally distributed.

b) Test Homogeneity

Homogeneity test aimed to see whether the data derived from different samples are homogeneous. Based on the calculation of the data homogeneity test pre test and post test of both samples were obtained the following data:

Table 4. Test Data Homogeneity pre test and post test

Source	Group	S^2	F_{count}	F_{table}
Pre-test	Experiment I	37,93	1,092	1,85
	Experiment II	34,74		
Post-test	Experiment I	90,26	1,213	1,85
	Experiment II	74,40		

S^2 = variance samples; F Table = db(n-1), (n-1) (α=0.05).

In accordance with the table data obtained Fcount price pre test = 1.092, while the price of Fcount pos test = 1.213. Based on the table values for the F distribution with significance levelα = 0.05 and 29 df numerat or and denominator 29db (FO (29.29) obtained Ftabel price = 1.85 (with interpolation). Due to the price of F < F table, then conclude that pre test and post test of both classes are homogeneous.

3. Analysis Improved Learning Outcomes

a) Gain Data Normality

To determine whether the gain of the second class of data samples normally distributed or not, then the Chi Square test at significance levelα = 0.05. Based on the data normality test results pre test and post test data obtained as follows :

Table 5.Normality Test Data pre test and post test

Group	Data Source	χ^2_{count}	χ^2_{Tabel}	A
Eksperimen I	Pretest	9,25	11,07	0,05
	Postest			
Eksperimen II	Pretest	7,75	11,07	0,05
	Postest			

χ^2 = chi kuadrat ; α = taraf signifikan Based on Table 5concluded that:

Test data normality improving student learning out comes obtained experimental class I and χ2count χ2count = 9.25 to 7.75 post-test. By taking a significance levelα = 0.05 and df = 5 is 11.07, the price of the data visible Chi Square (χ2count) < price Chi Square (χ2Tabel), it can be concluded chemistry student learning outcomes data are normally distributed.

b) Gain Data Homogeneity

Homogeneity test aimed to see whether the data derived from different samples are homogeneous. Based on the calculation of the data homogeneity test pre test and post test of both samples were obtained the following data:

Table 6. Test Data Homogeneity pre test and post test

Group	**S^2**	**F_{count}**	**F_{tabel}**	**Description**
Eksperimen I	0,017	1,062	1,85	Data homogen
Eksperimen II	0,016			

S^2 = variance samples; FTable = dk(n-1), (n-1) (α=0.05).

In accordance with the data obtained price table 6 Fcount Gain =1.062. Based on the table values for the F distribution with significance levelα = 0.05 and 29 df numerator and denominator 29 hp(FO (29.29) obtained Ftabel price = 1.85(with

interpolation). Due to the price of F < F table, then conclude that pre test and post test of both classes are homogeneous.

c) Percentage Improved Learning Outcomes

Results of calculation of the percentage increase in learning outcomes can be seen in Table7 below.

Table 7. Percent Improved Learning Outcomes

Group	Criteria	$\Sigma\bar{g}$	% G	Discription
Eksperimen I	G < 0,3 = Low 0,3 < G > 0,7 = Medium G > 0,7 = Tinggi	$\Sigma\bar{g}$ = 0,7678	76,78%	High
Eksperimen II		$\Sigma\bar{g}$ = 0,679	67,90%	Medium

Based on the above table it can be seen that the largeincrease in learning outcomes in the first experimental class is higher than the improvement of learning outcomes in the experimental class I. The data increase learning outcomes in both experimental class can be seen on the following chart below:

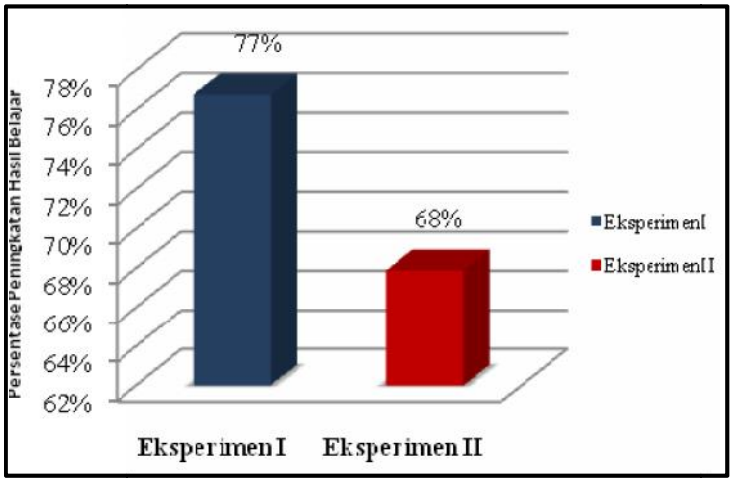

Figure 2. Graph Improved Student

Results from the graph above shows the difference in chemical yield improvement in teaching students with models Problem Based Learning (PBL) for an experimental class I and learning model Think Pair Share (TPS) for the experimental class II. In the first experimental class are improving student learning outcomes amounted to 76.78%, while the increase in learning outcomes in experiment class II in the amount of 67.90%.

d) Hypothesis Testing

Having in mind that the data posttest normally distributed and homogeneous, it can test the hypothesis by using statistical test that is testing the two parties. This test

is used to determine whether this hypothesisis accepted or rejected. Testing criteria if t < t ½α and t > t½α then the alternative hypothesis (Ha) is accepted and the null hypothesis(Ho) is rejected.

Data calculation results of hypothesis testing can be seen in Table 8 below.

Table 8. Test Results Hypothesis.

Data Source	Grop	$\bar{X}$	S^2	t_{count}	t_{table}	Discription
Learning outcomes	Eksperimen I	84,50	90,26	2,564	2,0021	(Ha) accepted
	Eksperimen II	78,50	74,40			

Based on the results of hypothesis testing student learning outcomes obtained price t <- 2.0021 and t>2.0021with a significance level(α =0.05) so that Ha is accepted and concluded there is no difference between the results of studying chemistry students that learned by using learning model problem Based Learning and that learned using cooperative learning model Think Pair Share.

D. DISCUSSION

In this research, the authors provide a different treatment, in which the learning process using the learning model of problem-based learning in the experimental class I and cooperative learning model Think Pair Share the experimental class II. However, prior to learning both classes were given initial tests (pretest) were performed 1 week before the study with the aim to determine the initial ability of students and to divide students into small groups consisting of 5 persons with the ability of different, so the students can share knowledge which they understand. Implementing the research carried out for three weeks. In practice, learning to use a model problem based learning requires students to realize that many things in the surrounding environment need to be analyzed truth, especially those related to chemistry lesson. Model problem based learning requires students to think critically ie critical thinking to analyze a given problem. In addition there are stages that most provide encouragement and interaction among students is at the stage of group learning with solving a different problem. All students are trained to become independent learners and are also able to work with friends in the group. This encourages them to ask questions, seek a solution to the problem of concrete by a group or individually and completing these tasks independently and groups as well as develop critical thinking skills to get used to solve scientific problems. At this stage each group to discuss each other play an active role in working on the analysis sheet that has been provided, so the pattern of thinking students are connected with each other. Problem Based Learning Model

consists of five steps, namely orientation of students to the problem, organize the students, guiding the investigation of individuals and groups, develop and present the work and analyze and evaluate the problem solving process.

Cooperative learning model Think Pair Share assist students to develop an understanding of concepts and subject matter, developing the ability to share information and draw conclusions, and develop the ability to consider other values of a subject matter. The use of cooperative learning model Think Pair Share is classified as type cooperative with the syntax: teachers present material to students and student work groups by means of paired bench-bench (Think-pairs), group presentations (share), quiz individual, create a balanced development of each student , announce the results of the quiz and give a reward. Application of learning model Think-Pair-Share is expected that students can develop the skills to think and respond in communication with each other, help each other and work in small groups. This is consistent with the understanding of the learning smodel Think-Pair-Share itself.

In the process of learning Problem Based Learning model with visible enthusiasm of learners in solving problem quite well. It can be seen from the dynamics of group work that happens, the exchange of ideas, an independent lab at home, looking for references other than textbooks of schools, and the presentation of results of group work in class. On the Problem Based Learning towards grade students who are active and have a good starting capabilities as many as 12 people were spread across six study groups. At the time, the active student learning has increased to 10 people in six groups and 3 begin to show patterns of thought critical to the arguments and questions to ask when other groups are doing presentation the work in front of the class. In the dynamics of learning, there are several groups that good enough in analyzing the problem and presented the results of his work among group 1, group 3 and group 4. In Problem Based Learning class woke up system which is based on group work contructivism learning, where students are intelligent to build individual capability and the ability to group your friends so happens equalization ability of students. The concept of the students about the lessons to be more focused and directed. Students were initially shy and reluctant to deliver the idea, is now able to convey his ideas freely. This is the learning factor Problem Based Learning had good results in this study.

In the process of cooperative learning Think-Pair-Share, LKS presented a clear indication of the problem is given. This will certainly affect the activity and the depth of knowledge of the students as the students' knowledge is limited to what is known teachers. Application of learning model Think-Pair-Share is expected that students can

develop the skills to think and respond in communication with each other, help each other and work in small groups.

Aspects of cooperation of students, one of which is communication skills. These skills at the beginning of the meeting are less visible, such as asking, answering questions, put forward and respond to the opinion. Students feel embarrassed expression and no courage to speak in front of the crowd. However, after being given the motivation at each subsequent meeting of student activity level in communication has increased. They began to dare express their opinions, respond to his answer, and gave another answer when presenting the results of the discussion. Impact, the communication that occurs not only take place between the groups, but also with the students of the class. But the dynamics of group work in this class do not like the class of Problem Based Learning. At this class students are active only around 60% of the total students in the research samples (18). From the research findings apparent ineffectiveness of the group process, this happens because Think Pair Share class 1 group consists of 2 students, so the motivation of students in group work is very low. Not to mention the friend bench who have low chemical capabilities so that a difficulty factor of students in analyzing a given problem. Constructivist expected not running properly, the student is busy debating the issues without any mediators. In addition to the class of Think Pair Share ideas appear less. Of the 15 groups that formed the beginning of the study, only 9 groups are quite active in the learning process, analyze problems, to share with another group, presentation to the class, response when another group presented the results of discussions and make conclusions from the discussion.

Based on the students' learning outcome data were tested for normality and homogeneity, the results obtained both groups homogeneous samples and normal distribution. Hypothesis testing is done by using t-test and a test of the two parties obtained t = 2.564, while table = 2.0021 for α = 0.05 and db = 58. Thus Ha Ho accepted and rejected, which means there is no difference between the results of chemistry students taught using models Problem Based Learning and cooperative learning model Think Pair Share.

Results of the above description has explained that the learning model Problem Based Learning is better to find and solve problems as well as to help students organize the concept of lessons learned, remembered and understood while the teacher can be a clue how to connect between concepts with one another in a lesson plan. Based on data analysis of learning outcomes in the study, prior to a different treatment to the two classes of samples obtained that the average student learning outcomes

experimental class I is 35 + 6.16 and after a given learning through teaching model Problem Based Learning to use Macromedia Flash Media Animation obtained the results of student learning at 84.50 + 9.50. As for the experimental class students II before treatment was obtained in student learning outcomes at 33.50 + 5.89 and after being given instruction through learning model Think Pair Share using Macromedia Flash Media Animation gained an average of chemistry student learning outcomes 78.5 + 8 , 63.

E. CONCLUSION

Based on the research which has been done, it can be concluded that:

1. The difference between the results of studying chemistry students that learned with a learning model Problem Based Learning and cooperative learning model Think Pair Share on subject solubility and solubility product of 9%. Students are taught by learning Problem Based Learning obtain chemistry learning outcome higher than students taught by cooperative learning Think Pair Share model.
2. Improving learning outcomes chemistry class XI student of SMAN 1 Lima Puluh on subject solubility and solubility product by applying the learning Problem Based Learning model using Macromedia Flash animation media by 76.78%, where as using learning model Think Pair Share media animation using macro media flash by 67.90%.

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