THE EFFECT OF PROBLEM BASED LEARNING MODEL ON LEARNING OUTCOMES IN STATIC FLUID TOPIC FOR CLASS XI AT SMA N 3 MEDAN ACADEMIC YEAR 2012/2013

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Abstract

The purpose of this research was to know the effect of problem based learning model on learning outcomes in static fluid topic for class XI at SMA N 3 Medan Academic Year 2012/2013. The research method was quasi experimental. The population were all students at class XI semester II consist of 10 classes. The sample of this research conduct two classes and consist of 84 students, here class XI_3 as experiment class and class XI_1 control class and define by random cluster sampling. The result that were obtained: post-test mean value of the experimental class was 75.24 and 67.37 was the mean value for control class. Standard deviation for two classes were 7.30 and 6.32. Normality of the test result form the both samples was normal and homogeneous, the testing criterion was accepted H_0 if -2.01 < t < 2.01 and refuse H_0 in other condition. Here, H_0 was rejected because t is 5.14 and H_a was accepted. Learning activity of student as long as using problem based learning model increased, at the first meeting 55.03% and the second meeting 73.65%. The increasing percentage of learning activity is 33. 8 %, and the increasing percentage of learning outcomes is 11.7 %. So can be concluded that there were any effects of Problem Based Learning Model to the learning outcomes of students in Static Fluid Topic for Class XI at SMA N3 Medan.

Keywords- problem based learning model, learning outcomes, learning activity.

Introduction

In Law of Republic Indonesian Number 20 Article 1 of 2003 of National Education System has been established that "Education is a conscious and deliberate effort to create an atmosphere of learning and the learning process so that learners are actively developing the potential for him to have the spiritual strength of religious, self-control, personality, intelligence, noble character, as well as the necessary skills themselves, the community, state and nation. " So education is obliged to prepare a new generation that can face the challenges of the age to come. So that the education course to prepare human resources in a creative, able to solve actual problems in life and are able to produce new technology which is an improvement from before. Meanwhile, the main problem of education today still revolves around the matter of equal opportunity, relevance, quality, efficiency and effectiveness of education to develop students' potential and capacity optimally, which aims to improve the quality of education.

Field study of the physical sciences as part of the Natural Sciences (IPA) is the object of subjects of interest and need more understanding than memorization. However, the reality of physics is often viewed as an abstract science students with the theoretical and difficult questions. Based on the author's experience during Field Experience Program (PPL), that the teaching and learning activities of students given only theories and how to solve physics problems without directing students to bring the concepts of physics in everyday life. This causes students become active and creative so as to be boring physics lesson and become one of the hard lessons learned, and not liked by the students. As a result, students are less able to understand and apply the concepts of physics in everyday life.

Also in SMA N 3 Medan when did observation there, the result of observation show that the learning activities in physics still teacher-orientated. It is mean the teacher more active than student, which it will influence the activity and creativity of students like explanation in paragraph before and also will influence the learning outcomes of students in fact will cause the learning outcomes become low. Then the laboratory still not use maximally, the amount students in every room is to many not suitable again to the size of the room and it could make the room become uncomfortable, students also still seldom asked to think to find the physics concept in daily life so physics become boring.

This problem can actually be solved if teachers can see the problems in the classroom and looking for an appropriate approach to learning the subject matter presented in order to be absorbed and understood by the students well. One alternative learning model that enables the development of students' thinking skills (reasoning, communication, and connections) in solving the problem is Problem Based Learning (Rusman, 2010:229). One model of learning that can increase the activity and creativity of the students are learning model based

on the problem / PBM (Problem Based Instruction / PBI). According to Tan in Rusman (2010: 229) argues that: "*PBM merupakan inovasi dalam pembelajaran karena dalam PBM kemampuan berpikir siswa betul-betul dioptimalisasikan melalui proses kerja kelompok atau tim yang sistematis, sehingga siswa dapat memberdayakan, mengasah, menguji, dan mengembangkan kemampuan berpikirnya secara berkesinambungan*".

Slameto said that (2010: 96) " *Akitvitas belajar merupakan prinsip atau asas yang sangat penting di dalam interaksi belajar-mengajar.*" It should be added that the learning activity is physical or mental. In the second learning activity must be linked. In connection with this, Piaget explains that a child's thought as long as he did. Without action means the child is not thinking. Therefore, the child thought to themselves it must be given the opportunity to do their own. Thinking on the verbal level will be raised after the child was thinking at the level of action.

Objective

The objectives of this study were: (i) To know the learning physics outcomes of students using Conventional Learning Model and also to know learning outcomes of student using Problem Based Learning on Fluid Static subject matter for Class XI , (ii) To know the increasing learning activity of student using Problem Based Learning Model on Fluid Static subject matter for Class XI. (iii) To know the difference of student learning outcomes using Conventional Learning Model with Problem Based Learning Model on Fluid Static subject matter for Class XI.

Literature Review

Problem-based learning model is a learning model that is based on a number of issues that require investigation authentic investigations that require real resolution of the real issues. Problem-based learning is an effective approach to teaching higher-order thinking processes (Trianto, 2010:92). Learning is helping students to process the information that is already finished in his mind and develop their own knowledge about the social world and its surroundings. Learning is suitable for developing basic knowledge and complex.

According to Arends (Trianto, 2010:92), problem-based learning is an approach to learning in which students work on authentic problems in order to construct their own knowledge, inquiry and to develop higher level thinking skills, develop independence and confidence. This learning model also refers to other learning models, such as "learning based projects (project-based instruction)", "experiential learning (experience-based instruction)", "authentic learning (authentic learning) and" meaningful learning (anchored instruction).

Meanwhile, (Rusman, 2010:232) characteristics of problem-based learning is as follows: (a) The problem becomes the starting point in the study. (b) Issues raised are issues that exist in the real world that is not structured. (c) The

problem requires multiple perspective (multiple perspective). (d) Problems, challenges the knowledge possessed by students, attitudes, and competencies which then requires the identification of learning needs and new areas of learning. (e) Learning self direction becomes the main thing. (f) The use of diverse sources of knowledge, use, and evaluation of sources of information is essential in the learning process based on the problem. (g) Learning is collaborative, communication, and cooperative. (h) Development of inquiry and problem-solving skills are as important as mastery of content knowledge to find solutions to a problem. (i) Disclosure processes in problem-based learning includes synthesis and integration of a learning process. (j) Learning by problems involving the evaluation and review of the expe rience of students and the learning pr ocess.

The syntax of a learning provides practical steps to be taken by teachers and students in an activity. In problem-based learning consists of five main steps that begins with the teacher introducing students to a problem situation and end with the presentation and analysis of student work. The five steps outlined by the steps in below table.

Table 1: Syntax for problem based learning

Phase	Teacher Behavior
Phase 1 Orientation of students to the problem.	Teacher goes over the objectives of the lesson, describes important logistical requirements, and motivates students to engage in problem-solving activity.
Phase 2 Organize students for study.	Teacher help students define and organize study task related to the probl em
Phase 3 Assist independent and group investigati on.	Teacher encourage students to gather appropriate information, conduct experiments, and search for experiments, and search for explanations.
Phase 4 Develop and present artifacts and exhibits.	Teacher assist students in planning and preparing appropriate artifacts such as reports, videos, and models and help them share their work with oth er
Phase 5 Analyze and evaluate the problem-solving process.	Teacher help students to reflect on their investigation and the processes they used.

Methodology

The research method was quasi experimental. In doing research used two samples, namely experimental and control class that was taken with a random cluster sampling. Before treatment, test was given to know the initial ability of students *(pre test)* and after treatment to know the final ability of students *(post test)*.

The population were all students at class XI semester II consist of 10 classes SMA N3

Medan. The sample of this research conduct two classes and consist of 84 students, here class XI_3 as experiment class and class XI_1 control class.

The research instrument used to collect data from students, use of cognitive learning achievement test on the subject matter of fluid static and the test is an easy test that consists of 5 items. Before conducted research, test that has been arranged is validated.

This study was conducted PBL in Static Fluid Topic: (1) Learning Topic Matter that tough were: (a) Density, (b) Hydrostatic Pressure (c) Pascal's Law (c) Archimedes's Law (d) Surface Tension of Liquid. (2)Teaching and learning scenario. The scenario of teaching and learning using problem based learning model are: (2.1) Preliminary. In this step teacher ask students to make a conducive situation so that students ready to follow the teaching and learning process. Then teacher give pretest before teaching and learning process begin. (2.2) Doing teaching and learning process. In teaching and learning process, there phase that done namely: (a) Phase Orient students to the problem. Teacher goes over the objectives of the lesson, describes important logistical requirements, and motivates students to engage in problem-solving activity. (b) Organize students for study. Teacher help students define and organize study task related to the problem. (c) Assist independent and group investigation. Teacher encourage students to gather appropriate information, conduct experiments, and search for explanations. (d) Develop and present artifacts and exhibits. Teacher assist students in planning and preparing appropriate artifacts such as reports, videos, and models and help them share their work with other. (e) Analyze and evaluate the problem-solving process. Teacher help students to reflect on their investigation and the processes they used. (2.3) Closing After all steps done teacher give post test to know the final ability of student. To carry out this research will be pursued with the following steps: (1) Preparation Phase, include: (a) Develop research schedule according to schedule lessons at school, (b) Prepare the lesson plan (RPP) in accordance with the Education Unit, (-) Level Curriculum (SBC), (-) Preparing data collection tool, (c) Managing research papers, (d) Work with the teacher and school. (2) Implementation Phase include: (a) Determine sample grade two classes of experimental class and control class. (b) Conduct the pretest (T_1) to the experimental class and control class early to measure the ability of students to the material being taught. (c) Checking the pretest results. (d) Implement learning, using problem-based learning models for classroom experiments and conventional models for the control class. (c) Provide posttest (T_2) to the experimental class and control class. (d) Checking the posttest results. (3) Data processing. Data processing is carried out by using appropriate data analysis techniques for the purpose of research. In the data processing steps are as follows: (1) Calculate the raw score. (2) Determine the average

value and standard deviation. (a) Determine the average value, (b) Determine the standard deviation. (3) Test for Normality. (4) Homogeneity test. (5) Hypothesis Test. (a) Similarity Test Pretest average (t-test Two Parties), (b) Similarity Test average pretest (t test of the Parties).

Result and Discussion

This research is quasi experimental research involving two classes that were given different treatments. The data of pre-test of both class can be seen in the following bar chart:
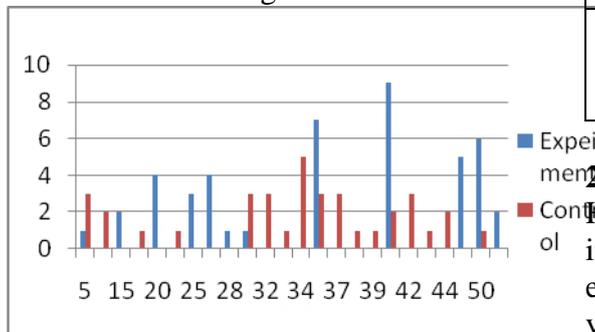

Figure 1: Bar Chart of Pretest Data in Experiment and Control Class

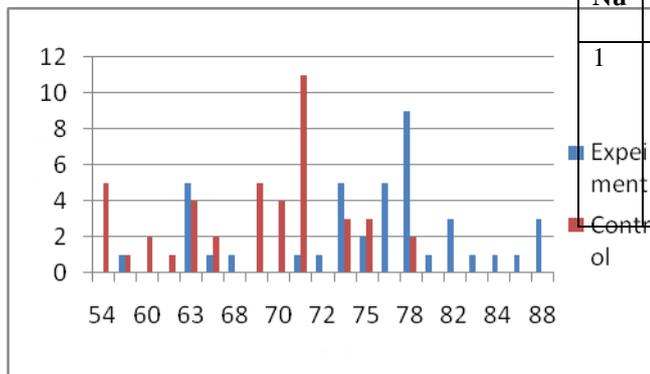The data of post test of both classes can be seen in the following bar chart:

Figure 2: Bar Chart of Pretest Data in Experiment and Control Class

Test Data Analysis

1. Normality Test

Normality test of data pretest and post test in experiment and control class using liliefors test. The result of normality test of data of pretest and post test for both of classes obtained in table 4.4 below:

Table 2: Normality test for both of sample

Num	Data	L_{count}	L_{table}	Conclusion
1	Pretest of Experiment Class	0.0088	0.1384	Normal
2	Pretest of Control Class	0.1292	0.1352	Normal

2. Homogeneity Test

Homogeneity test of pretest for experiment and control class using test equality of two variances. For more, the calculation of homogeneity test given on table below:

Table 3: Homogeneity test for experiment class

Nu	Data	Variance	F_{count}	F_{table}	Conclusion
1	Pretest of Experiment Class	144.48 119.46	1.21	1.66	Homogenous
	Pretest of Control Class				

From table 4.2 and 4.3 above can be concluded that the research data have normal distribution and homogeny, so has full fill the requirements for testing the hypothesis.

Hypothesis Test of Research

After the data full fill the requirements of homogeneity and normality, so hypothesis test in this research using different test (t test).

Hypothesis test for Pretest Ability

The result pretest value for experiment class and control class was obtained the average value for experiment class was 36.29 and the average value for control class was 31.63.

The summary calculation hypothesis test for pretest ability in experimen and control class can be seen in the following table:

Table 4: Summary of calculation hypothesis test for pretest ability

Num	Data Class	Average Value	t_{count}	t_{table}	Conclution
1	Pretest of Experiment	36.29	1.32	2.01	H_0 was Accepted
2	Pretest of Control	31.63			

According to table 4.6 above, the calculation differentiation test average value experiment class and control class for $\alpha = 0.05$, can concluded that the initial ability of students in experiment class same with the initial ability of student in control class.

Hypothesis test for Pos Test Ability

After given a different treatment in experiment class, so the post test result for experiment and control class was obtained the average value of learning outcomes for experiment class was 75.24 while for control class was 67.37. From the data above can be seen that the average value of post test in experiment class higher than the average value in control class. With the difference increasing of learning outcomes as big as 7.87, and $t_{count} > t_{table}$ $(5.14 \geq 1.68)$, can be concluded that there is the effect of problem based learning model to the learning activities of students in Fluid Static topic for class XI in SMA N 3 Medan.

Table 5: Summary of calculation hypothesis test for post test ability

Num	Data Class	Average Value	t_{count}	t_{table}	Conclution
1	Posttest Experimen	75.24	5.14	1.68	Ha was accepted
2	Posttest Control	67.37			

Observation

Observatio was done during teaching and learning process that consist of two times meeting. The result of observation by observers given in table in chart below.
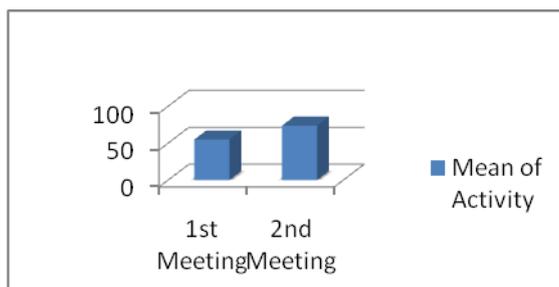
Figure 3: Bar Chart of Mean Activity

Discussion

The result of research show that there were any effects using problem based learning model to the students physics learning outcomes on Fluid Static topic in for class XI in SMA N 3 Medan. This was reinforced by the acquisition of the mean value of 36.29 pre test in experimental class with a standard deviation of 12.02 and mean value of 75.24 post- test with a standard deviation 7.30. Where as in control class the mean values obtained pre-test of 31.63 with a standard deviation of 10.93 and mean value for post-test 67.37 with a standard deviation of 6.72, and was obtained t_{count} (5.14) where as bigger same as 1.68. Students activity in experiment class occured increasing from 55.03 % become 73.65 %, so H_a was accepted. The increasing percentage of students learning activity is 33.8 %. This supported with the previous research, said that there the positife effect from problem based learning model to the learning outcomes and learning activity.

The difference in learning outcomes are cause by excess using problem based learning model to help student to develop thinking ability, problem solving and intellectual creativity: learn some people adult activity by involved them in real experience, and they become an autonomous and independent learner. Learning steps in PBL model encourages student to more active in class. For example when doing problems, student divided in to group and the member 5 until 6 people in one group, doing problem for about 40 minutes, then present the discussion result to other friends. This encourage student to more participate in group discussion. And the most important in this learning model is giving reward to the best group. This reward also become one of motivation for student so that giving the best in their group.

According to the data before the percentage Problem Based Learning Model was done by researcher as a teacher not reach until 100 %. This caused by students still not usual with problem based learning model so instruction and motivation that given by researcher less understand by some students. So student activity on the first meeting classified less active 55.03%. By the condition, the researcher giving advice and instruction to students so that they give attention and more seriously to the next meeting. So on the second meeting there increasing students activity become 73.65% namely on category good active.

Because principally learning is to do, so by there was the increasing of student activity hoped student learning outcomes also increase. After observing the result observation by observer to the both student activity, in fact student activity parallel with the increasing student learning outcomes. In

learning activity for every meeting, researcher as a teacher that applied learning model applied learning activity as time allocation that given, but as long as teaching and learning process still there obstacle that faced by researcher. The obstacles are the condition class difficult controlled because chance discussion in teaching and learning process giving chance for some students making noise so bothered other group discussion, and also time allocation that limited making the group discussion result can not present for all group in front of class.

Conclution

Based on the research result, calculation and testing hypothesis, so can be concluded that: (1) The physics learning outcomes of student using conventional learning model in class XI second semester SMA Negeri 3 Medan academic year 2012/2013 in subject matter of static fluid with a mean 67.37 and the physics learning outcomes of student using problem based learning model with a mean 75.24. (2) Learning activity of student during using problem based learning model increased from the first meeting until to the second meeting. (3) There is a difference between physics learning outcomes of student using problem based learning model with conventional learning model in the subject matter fluid static in class XI SMA N 3 Medan school year 2012/2013.

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