THE EFFECTIVENESS OF PROBLEM BASED LEARNING (PBL) MODEL ON STUDENTS' LEARNING OUTCOMES AT CLASS XI IPA 2 OF SENIOR HIGH SCHOOL 5 SOUTH KONAWE ON THE SUBJECT OF COLLOID SYSTEM

Maysara[a*]
Chemistry Education Study Program, Halu Oleo University, Kampus Bumi Tridharma, Zip Code 93123

Housing complex of Kendari Pemai Block L4/20 Kendari. Tel/Fax: 085241696896; Email: maysara.salam@ymail.com

ABSTRACT

This study was aimed to know the effectiveness of learning through Problem Based Learning model. Sample of this study were students at class XI IPA 2 in Senior High School 5 South Konawe with the total number of students were 20 students. Method of the study used is *Pre-Experiment* with *One-group Pretest Posttest Design.* Technique of data collection was done by administering research instruments in the form of multiple-choice questions, observation sheets, and questionnaires. Result of this study showed that the implementation of *Problem Based Learning* model on the subject of colloid system is effective with the N-gain score was 0.64 and students' chemistry learning outcomes was increased with the mean score is 76.

Keywords: Chemistry Learning Outcomes, *Problem Based Learning*, Colloid System

INTRODUCTION

The difficulty of studying chemistry is related to the characteristics of chemistry itself that proposed by Kean and Middlecamp (1985) are (1) the chemistry is abstract, (2) the chemistry is the simplification of the truth, (3) the nature of the chemistry are sequence and expanding rapidly, (4) the chemistry is not just solving problems, (5) the substance or the material to be taught very much. Recall the characteristics of the chemistry, it is not rare to found various problems in teaching practice. There is a perception of students who think that chemistry is one of the most difficult subjects, students are afraid of chemistry and feel inadequate in studying chemistry. Therefore, it needs to change and innovation in the practice of learning.

The data of chemistry learning outcomes in SMAN 5 South Konawe class XI IPA, for the last two years, showed the percentage of students' learning outcomes obtained are still low. In the academic year of 2012/2013 the percentage was only 67% of students who reached the KKM set by school which is KKM for the subject of colloid is 70. To overcome these problems, it is necessary to implement the appropriate learning model. The leaning model that can be applied is Problem Based Learning (PBL) model. PBL is a learning model that presents the contextual issues that stimulate students to learn. PBL can be interpreted as a series of learning activities that emphasizes the process of resolving the problems encountered scientifically.

There are three main characteristics of PBL, as follows:

a. PBL is a series of learning activities, it means that in the implementation of PBL there are a number of activities that students must to do. PBL did not expect the students just listen, take notes, and then memorize the subject matter, but through PBL students expected to think actively, communicate, find and process the data, and finally concluded.
b. The learning activities directed to resolve the problem. PBL puts the problem as keywords of the learning process. It means that without the problems then there can be no learning process.
c. The problem solving is done by using an approach to think scientifically. Thinking of using the scientific method is a process of deductive and inductive thinking. The thought process is conducted systematically and empirically. Systematic means that scientific thinking is done through certain stages. While empirical means that the process of problem solving is based on data and facts are clear.

There are several phases in the stages model of PBL in teaching learning process in the classroom, as follows:

a. Phase 1: Orienting Students on Problem

Learning begins by describing the learning objectives and activities to be undertaken. In the use of PBL, this stage is very important where the teacher should explain in detail what should be done by the students and the teachers, and described how the teacher will evaluate the learning process. It is very important to give motivation in order the students can understand the learning to be done. There are four things that need to be done in this process, as follows:

1. The main objective of teaching is not to learn a large amount of new information, but rather to learn how to investigate important issues and how to be an independent student.
2. Issues and questions that were investigated did not have an absolute answer "true", a complicated or complex problem has many settlements and often conflicting.
3. During the investigation stage (in this teaching), students are encouraged to ask questions and find information. Teachers will act as a mentor who is ready to help, but the students should try to work independently or with their friends.
4. During the phase of analysis and explanation, students will be encouraged to express their ideas openly and in full of freedom. None of the ideas will be ridiculed by a teacher or classmates. All students are given the opportunity to contribute to the investigation and expressed their ideas.

b. Phase 2: Organizing Students to Learn

In addition to developing problem-solving skills, learning of PBL also encourage students to learn collaborative. The problem-solving is need a cooperation and sharing between members. Therefore, teacher can start the learning activities by forming groups of students where each group will select and solve the different problems. The principles of

grouping students in cooperative learning can be used in this context as: the group should be heterogeneous, the importance of interaction between members, the effective communication, the peer tutor, and so on. Teachers are very important to monitor and evaluate the performance of each group to maintain the performance and dynamics of the group during the study.

After the students oriented towards a problem and have formed a study group, the next is teacher and students set specific subtopics, tasks of investigation, and schedules. The main challenge for teachers at this stage is to strive for all students actively involved in a number of investigation activities and the results of this investigation can produce a solution towards the problem.

c. Phase 3: Assisting Independent and Group Investigation

Investigation is the core of PBL. Although every problem situation requires a different investigation technique, but generally would involve identical characters, namely data collection and experiment, make hypothesiss and explanations, and provide solutions. Data collection and experimentation is a very important aspect. At this stage, teachers should encourage students to collect the data and carry out experiments (mental or actual) until they truly understand the dimension of the problem situation. The goal is for students gather enough information to create and build their own ideas.

Teachers help students to gather as much information from various sources, and teacher should has been asking questions for students to think about the problem and kinds of information needed to arrive at the problem-solving that can be maintained.

After the students collected enough data and give the issue of the phenomena that they investigate, then they begin to offer an explanation in the form of a hypothesis, explanation and solution. During the teaching in this phase, the teacher encourages the

students to express their all ideas and fully accept the idea. Teachers also need to ask questions that make students think about the feasibility of the hypotheses and the solutions that they make as well as about the quality of information collected.

d. Phase 4: Developing and Presenting The Work Result

The investigation stage is followed by creating works and exhibitions. The work result is more than just a written report, but it could be a video tape (indicating a problem situation and solutions proposed), model (physical manifestation of the problem situation and its solution), computer programs, and a multimedia presentation. Surely the sophistication of the work result is very influenced by the level of students' thinking. The next step is showing off their work and teachers act as the organizer of the exhibition. It would be better if in this exhibition involves other students, teachers, parents, and others who may be the "Assessor" or can provide feedback.

d. **Phase 5: Analysis and Evaluation of Problem-solving Process**

This phase is the final step in the PBL. This phase is intended to help students analyze and evaluate their own processes and investigations and intellectual skills they use. During this phase, the teacher asks the students to reconstruct thought and activities that have been done during the process of learning activities (Susiwi, 2007).

METHODOLOGY OF THE STUDY

This study was conducted on 13 May s.d. June 17 2014 in class XI IPA at SMAN 5 South Konawe listed in the Academic Year 2013/2014, that spread in two classes, namely class XI IPA 1 and XI IPA 2. The sampling technique done by purposive sampling which is its with a certain

considerations. From this sampling technique, then obtained class XI IPA 2 with the total number of students were 20 students as an experimental class.

Variables in this study consisted of the independent variable is implementation of the PBL model (X) and the dependent variable is the students' learning outcomes taught using PBL learning model (Y). Design of the study may be presented in the following table:

Table 3.1. *One Group Pretest-Posttest Design*

Group	*Pretest*	*Treatment*	*Posttest*
Eksperimen	O_1	X	O_2

Descriptions :

O1 : Initial tests (pretest) is done before students treated with PBL Model.

X : treatment (PBL model) is given to students in the form of learning using PBL model.

O2 : final test (posttest) performed after the students were given treatment using PBL models.

Data obtained from the study in the form of tests, observation sheets and questionnaires to obtain information about the implementation of learning and improving students' learning outcomes using PBL models. Data collected were analyzed by descriptive and inferential.

RESULTS

Data from students' chemistry learning outcomes in class XI IPA 2 SMAN 5 South Konawe are taught using PBL models are presented in the Table 2 below.

Table 2 : Score of students' chemistry Learning Outcomes Class XI IPA 2

Description of the score	**Class XI IPA_2**	
	Pretest	*Posttest*
Maximum	43,3	90,0
Minimum	20,0	53,3
Mean Score	31,3	76,3
Students (n)	20,0	20,0

Table 2 shows the learning outcomes of students of class XI IPA2. It showed a difference between the score of students' learning outcomes before treatment is given in the form of the implementation of PBL models with the score of student learning outcomes after being taught using PBL models.

Normalized Gain	**Classifications**	**F**	**Relative Frequncy (%)**
$G < 0,30$	Low	2	10
$0,30 \leq G \leq 0,70$	Medium	9	45
$G > 0,70$	High	9	45
Total		20	100

DISCUSSION

Based on the observation result, students activity from the first meeting until the fourth meeting tends to showed an increase in all aspects observed. It is classified very well. If seen from the mean score of N-gain that obtained of students in class XI IPA 2, then PBL learning model is effective to be used. Because the higher of N-gain score that obtained of the students, the more effective the learning model to be used. However, from the data of students' learning outcomes and N-gain obtained of student individually, it can be stated that the PBL model can improve students' chemistry learning outcomes in class XI IPA2 on the subject of colloid system when viewed from differences in learning outcomes between pretest and posttest.

PBL is focused on the development of students learning and not to help the teacher gather information that will be given to students during the learning process. In PBL, before start the teaching learning process in the classroom, students are asked to observe a phenomenon firstly. Then students are asked to submit and noting the problems that arise. After that the teacher's task is to encourage students to think critically to solve the existing problems. The task of the teacher is to guide students to ask questions, to prove the assumption, and listen to the different opinions of them.

Learning in the classroom by using PBL model, students are required to be more active. Where in the PBL models, there are five phases of activities. In the first phase the students are required to find and determine the issues of environmental cases that the teacher brought. So students have a responsibility and a role to solve these problems directly because they have determined the problem in learning while the teacher just could lead and guide so that students can raise a problem of environmental cases which the teachers brought in the classroom. In the second phase, students form discussion groups to understand the learning task. In this phase, students are

given time to read the instructional materials and worksheets assigned by the teacher. Furthermore, after students read instructional materials and worksheets, students are required to provide the hypothesis of the problems that arise before they do the problem solving process to find the source and relevant information. In the third phase, students are required to find the source and relevant information about the problem and conduct the investigations or doing a practical to test the hypothesis that they provide or the explanation of the problem-solving. Furthermore, in the fourth phase, students are required to plan and prepare their work and present it in front of the class to their other friends, while the other students asking questions about things that are not understood yet of the problem solving process that they serve. And for the final phase, the students do a reflection, both on the investigation that they did, and the process of the problem-solving by concluding all they did during the learning process. To determine the extent of improving of students' learning outcomes after implementation of the PBL model then students were given a final test (posttest). Posttest is the final activity of learning that seeks to measure the extent to which the increase in students' knowledge and mastery of the colloid system that is characterized by the score of learning outcomes. At the time of administration of test (posttest), students have been able to resolve or answer the questions that given by the teacher as well or there is an increase in students' learning outcomes obtained at the time of pretest and posttest. This is because the students' ability or mastery of concepts on the colloid system materials after being taught by PBL model is increasing. In addition, students have to understand the concepts and principles of simple water purification process.

Trinandita (1984) stated that the involvement of the student in the learning process will lead to high interaction between teachers and students or by students themselves. This will lead to the classroom atmosphere becomes fresh and conducive, in which each student can involve their ability as much as possible. The activity that arise from the students will also result in knowledge

and skills that will lead to improvements in learning outcomes. And vice versa if the student activity is low will causing the learning outcomes is low too. It can be seen from the data of questionnaire that gives very good response to the learning process by using PBL model with the percentage is 80.6%, which means the tendency of students responded very well.

The relationship between the students' response towards students' learning outcomes (N-gain) can be seen from the mean score of both. From the data obtained, it shows that the effectiveness of PBL learning models classified in the medium category with the mean score is 0.64 (quite effectively) showed improving of students' learning outcomes while students' response towards to the PBL model is in excellent condition with the percentage of mean score is 80.6%. This shows that with the good students' response will still affect students' learning outcomes or there is a correlation between the score of learning outcomes with the student interest. However, when seen from the mean score of students' response that is about 80.6% (excellent) while the N-gain score obtained by the students is 0.64 (moderate) it is not as expected, because the higher the students' responses towards the PBL model should have the higher score of the learning outcomes or N-gain score are obtained by the students. It can be happen because it is possible even though the students respond well or love of learning with the implementation of PBL model but they are still difficult to master the colloid system.

CONCLUSION

1. Students' chemistry learning outcomes who are taught by the model of Problem Based Learning on the subject of the colloid system at class XI IPA2 of SMAN 5 South Konawe in Academic Year 2013/2014 with the mean score is 76 included in the medium category.
2. Using the model of Problem Based Learning in learning colloid systems can improve students' learning outcomes, with the effectiveness rate is 0.64 were included in the medium category.

3. Response or interest of the students towards the learning process by using a model of Problem Based Learning classified in the category very well with the mean score is 80.6%.

DAFTAR PUSTAKA

Anisah, Neneng. 2013. *Profil Keterampilan Proses Sains Siswa Pada Pelajaran Sistem Koloid Menggunakan Metode Discovery- Inquiry*. Universitas Pendidikan Jakarta: Jakarta.

Arikunto, S., 2002. *Prosedur Penelitian Suatu Pendekatan Praktek*: Rineka Cipta. Jakarta.

----------, 2005. *Dasar-Dasar Evaluasi Pendidikan*. Bumi Aksara. Jakarta.

Asroful, Khadafi. 2012. *Pembelajaran Berdasarkan Masalah.* http://wyw1d.wordpress.com/2009/10/17/pembelajaran- berdasarkanmasalah pbl/http://asrofulkhadafi.wordpress.com/2012/04/22/model-model-pembelajaran/. Retrieved on November 15th, 2014.

Bahri, 1995. *Strategi Belajar Mengajar*. Rineka Cipta. Jakarta.

Dasna, I Wayan dan Sutrisno. 2006. *Pembelajaran Berbasis Masalah (Problem Based Learning).* Universitas Negeri Malang: Malang.

Meltzer, 2002. *The Relathionship Between Mathematics Preparation and Conceptual Learning Gain In Physics: A Possible Hidden Variable In Diagnostic Pretest Scores*. *American Journal Physics*. 70(2): 1259 – 1697.

Mulyasa, E. 2006. *Implementasi Kurikulum 2004 Panduan Pembelajaran KBK*. PT Remaja Rosdakarya: Bandung.

Sudrajat, Akhmad. 2008. *Penilaian Hasil Belajar*. http://akhmadsudrajat.wordpress. com/2008/05/01/penilaian-hasil-belajar/. Retrieved on March 21st 2014.

Suidin, 2013. *Model Pembelajaran Berbasis Masalah (Problem Based Learning).* http://suidinmath.wordpress.com/2013/03/02/model-pembelajaran-problem-based-learning/. Retrieved on November 15th, 2014.

Susiwi, S. 2007. *Pendekatan Pembelajaran Dalam Pembelajaran Kimia.* Universitas Pendidikan Indonesia: Jakarta.

Syafrudin, Muhammad. 2011. *Model Problem Solving Pada Diklat Calon Guru. Widyaiswara Madya BDK*: Surabaya.

Utami, Budi. 2009. *Kimia SMA Kelas XI Program Ilmu Alam.* Departemen Pendidikan Nasional: Jakarta.

Widyatun, Dyah, S.ST. 2012. *Model Pembelajaran Berbasis Masalah*. Semarang . Indonesia.

Yulaelawati, Ella. 2004. *Kurikulum dan Pembelajaran, Filosofi Teori dan Aplikasi.* Pakar Raya, Bandung.