

THE INNOVATION OF GUIDED INQUIRY – PROBLEM BASED LEARNING MODEL (I-PBL) WITH THE COMBINATION OF VIRTUAL MEDIA AND REAL LABORATORY ON ACID-BASED TITRATION TOPIC TOWARD STUDENT CHARACTER AND LEARNING OUTCOME IMPROVEMENT

Ani Sutiani, Ary Anggara Wibowo

Chemistry Department
State University of Medan
Medan, North Sumatera, Indonesia

ABSTRACT:The aim of this research are to know how the student learning outcome, team work skill, and student creativity improvement which is implemented with Guided-Inquiry – Problem Based Learning (I-PBL) Model compared with Problem Based Learning (PBL) Model for the Acid-Based Titration Topic through Virtual Media and Real Laboratory. Furthermore, the Instrument test used in the research is 20 questions valid with reliability 0.87 which is categorized high. The object is used in this research which is the 2nd grade natural science divided to two class. In addition, The 1st science class as an experimental class is using the I-PBL model while the 2nd science class is using the PBL model. The result of this research shows that the average of learning outcome for experimental class is 83.78 with the gain learning outcome 0.80 while the average of learning outcome for control class is 78.53 with the gain learning outcome 0.69. It can be observed that the team work skills and student creativities on the 1st science class much better than the 2nd science class. As a result of the research, analyzing data and hypothesis test are concluded that the learning outcome improvement for class which is implemented by I-PBL model is higher than the other ones.

KEYWORDS: *I-PBL, PBL, Team Work, Creativity, Virtual and Real Lab*

1. INTRODUCTION

There are several factors that we need to concern about the improvement of nation quality thorough education perspective which are the development of characters. In 2010, Indonesia government create educational character which is useful to revise national cases regarding behavioristic. Then, the educational character become a majority government program from 2010 to 2015. The character is relatively permanent of behavior which is good and bad enough. Generation 2045 is called “generation with gold character” should possess positive attitude, essential mind set, the normative of commitment and ability in competence (Manullang, 2013). It show that the implementation of character education should have the positive affects towards academic achievements, scientific behavior and also social student, and it posit that the integration of hard work character can be giving a positive contribution in creation od character and affection for academic achievement of improvements with equality for students (Mustaqim, 2013)

It is an indisputable fact that in Indonesia constitution No 20, 2003, about the system of national education, shown national education have a function to develop an ability and creating form the character and civilization of the nation's dignity in the context of the intellectual life of the nation. Further confirmed that, the National Education aims to develop the potential of learners into a man who is faithful and devoted to God the almighty One, noble, healthy, knowledgeable, skilled, creative, independent, and become citizens of a democratic and responsible. The essential of chemistry learning is needed an activity that involves students in solving a problem. Studied chemistry not only requires an understanding and mastery of concepts, but students are required to actively cooperate with teachers to apply knowledge learned through the use of learning strategies (Giancarlo and Slunt, 2004). Therefore, so that students can learn and understand the subject matter required more meaningful chemistry learning model is right and is able to improve students' skills in problem solving. To make learning more meaningful teacher also needs to implement a method of directing students to play an active role and explore the potential that exists on students, so that students are able to develop skills - specific skills.

Moreover, Problem based learning (PBL) is a model which is based on problem in teaching and learning. Learning based on problem is one of strategy which gives a problem being meaningful, contextual, and real to learners and provide resources and tutoring in solving these problems so that the knowledge and problem-solving skills of learners can develop (Filippatau and Kaldi, 2010 ; Jeong So and Kim, 2009). By studying the model group PBL students not only acquire knowledge but also some good characters such as communication skills, collaboration skills, problem solving skills, skills in information

sharing, a sense of responsibility, respect for others, critical properties, analytical and creative. In addition to Problem Based Learning (PBL), other models that require students in problem solving is the model of Guided inquiry, according directed inquiry is the inquiry that a lot of interference from the teacher. Inquiry learning model is something that is very challenging and creating interaction between the child believed previously to a new evidence to reach a better understanding, through the process and methods to lower exploration and test new ideas (Bilgin, 2009 ; Kubicek, 2005). Obviously, it involves attitudes to seek clarification and appreciate other people's ideas, open to new ideas, critical thinking, honest, creative and lateral thinking. The essence of inquiry learning model is to give students learning to deal with the problems they faced with when dealing with the real world.

Based on research Praptiwi dkk (2012) on guided inquiry learning shows average percentage of working class students experiment by 82.50% and 81.40% of the control class. In the experimental group obtained classical completeness 82% and 68% of control class. In addition Sulisthia dkk (2014) revealed the results of his research that shows the percentage of students' motivation average value in the first cycle was 69.4% in middle category, increased in the second cycle becomes 80.3% classified in the high category it is concluded that the application Guided Inquiry learning model computer aided animation media can increase motivation and learning outcomes. It explains that the model of Guided Inquiry learning increase student creativity.

While learning models that improve learning outcomes Students published by Dewi dkk (2013) in his study of social interaction and student achievement with the model Problem Based Learning (PBL) showed a significant increase. Increased social interaction can be seen from direct observation and questionnaires social interaction, whereas the increase in learning achievement can be seen from the results of tests of cognitive, affective and psychomotor. Percentage of students' social interaction, the results of tests of cognitive, affective and psychomotor in the first cycle, respectively result of 45.32%; 18.75%; 34.38% and 50.00%, while the results obtained in the second cycle in a row that is 76.57%; 90.63%; 53.13% and 53.00%. While Sinaga dkk (2013) reported the results of his research which concluded that there is a significant correlation between the results of studying chemistry and character values are spreading among students taught with problem based learning model integrates guided inquiry with the computer media with direct instructional model and methods of problem-based learning is integrated inquiry guided. The purpose of this research is to know the learning outcome and character of students taught using learning model Inquiry Guided - Problem Based Learning (I-PBL) and Problem Based Learning (PBL) using a combination of media virtual and real laboratory on the subject of acid-base titration.

2. METHOD

The population in this study were all students of 2nd grade of Natural Science, amounting to two classes. Each class average amounted to 41 students. And the sample in this study consisted of two classes taken by purposive sampling. The first class used as an experimental class that learned to use the model Inquiry Guided - problem based learning (I-PBL) by using a combination of virtual media and real lab and a second class used as a control class that learned to use the model of problem-based learning (PBL) using a combination of media virtual and real lab. The variables in this study were divided into variable. The first, independent variable in this research is the application of learning models Inquiry Guided - problem based learning (I-PBL) and a model of problem based learning (PBL). The second, dependent variable in this study is improvement of learning outcomes, Creativity and Cooperation. The last, control variables in this study are the teachers teaching, media used, the material being taught, the student handbook, time spent and about (pretest-posttest) the same.

In this study the research instruments consisted of the test instrument and non-instrument test. The test instrument is an objective test (multiple choice questions) and non-test instrument is observation sheet assessment questionnaire cooperation and creativity as well as creativity. The test instrument used in this study is a chemistry student achievement test the pretest and posttest. Pretest is given to the sample prior to treatment (treatment) in order to determine homogeneity and normality of similar characteristics or prior knowledge of students. Posttest given after completion of the treatment process (treatment) in order to determine improved student learning outcomes.

3. RESULT AND DISCUSSION

Data Analysis Test Instruments

A total of 50 items of instrument tests validated by validator expert and declared valid by expert judgment were then conducted trials to test instrument 36 respondents to know the different power, level of difficulty, the validity and reliability of each items. Based on calculations of data can be seen that there are 35 items declared valid by the $r_{Count} > 0.279$. Based on the level of difficulty of questions there are 48 questions that qualify with category 4 easy questions, 34 questions have a moderate difficulty level and 10 questions otherwise difficult. Based on the different power tests are 32 questions to qualify the criteria have about 19 different power enough, about 13 are categorized either. Based on the analysis of the importance of the 28 questions that have been valid, qualifying test different power, level of difficulty, which can then be forwarded to test reliability tests, researchers took 20 questions from 28 questions that have been qualified to do then test reliability tests with the formula Kuder Richardson - 20 (KR - 20), of the test results showed that the $r_{Count} = 0.8757$, see r_{Table} to N 36 are 0.329 and $r_{Count} > r_{Table}$ ($0.8757 > 0.329$) it can be stated that the matter of the instruments have a high level of reliability and fit for use as a data collection tool in the study.

Analyses' of Data Research

This study begins with the treatment of the initial test is a pretest to determine the initial ability of students in the second grade as the samples. Pretest conducted one week before the process of learning to do this is because to know the distribution of students normality and homogeneity of data. Based on the calculation, the calculation of second grade as the samples had normal distribution and homogeneous. Furthermore Researchers divided into 5 groups of students in a class where each group consists of 8-9 students who have different capabilities. The research was carried out four times meeting and end with one meeting for awarding evaluation of learning outcomes that posttest.

Based on an analysis conducted by researchers at the experimental class and control class can be seen that an increase learning outcomes in these two classes, it can be shown based on the value of pretest and posttest (figure 1). In the experimental group before being treated using the inquiry model of guided - problem based learning (I-PBL) with an average student score of 23.05 and increased after the experimental class were treated with guided inquiry models - problem based learning with an average value of student learning outcomes at 84.63 with an average gain of learning outcome by 0.80 points.

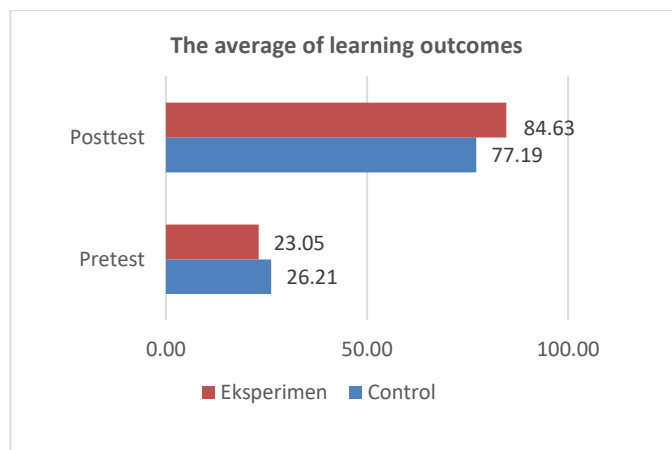


Figure 1. The average of students learning outcomes

Furthermore, the same thing also happened to control class where before treatment with study model of problem-based learning, the average value of student learning outcomes and increases amounting to 26.21 after treated by using a model of problem-based learning with an average value of 77.19 with the study results mean average gain learning outcome by 0.69 points. This is consistent with the results of research Sinaga (2013) which states that the significant differences between students taught with problem based learning model that integrates seamlessly with the model of the inquiry of the students taught using only problem based learning and the students taught with methods conventional. Based on the results achieved by the researchers in the study concluded that there are differences in student learning outcomes before and after the treatment was given and there is an increasing learning results due to the integration model of the inquiry into the model problem based learning. This is reinforced by the results of research Praptiwi dkk (2012) concerning the learning of guided inquiry showed that the averages percentage of working class students experiment by 82.50% and 81.40% control class. Gain on experimental class is higher than the gain of the control class. From the research results show that the classical completeness Praptiwi grade students experiment by 82% and 68% of control class. Their integration guided inquiry learning model in the model of problem based learning model learning improved student learning outcomes are higher than the students who only taught learning model of problem-based learning course.

It is known that the learning model of problem-based learning is a learning approach where students work on problems that authentic with the intention to construct their own knowledge, in addition to the problem based learning designed and developed to help students develop thinking skills, problem solving skills and skills intellectual, studied the role the role of adults with experience through a variety of real and simulated situations become independent learners and autonomous (Jeong So, H and Kim, 2009). Besides the integration of learning model inquiry in syntax learning model of problem-based learning is an additional form of syntax organize students to examine the make students more critical in thinking that requires students to solve the problem is not only based on the surgical literature but also doing research in the laboratory to get answers to hypothetical and problem to be solved. This is evidenced by the results of student learning increased significantly from the results of the student before being treated with the result value after being treated by giving the gain good learning outcome. In addition to improved learning outcomes, other improvements were shown by students that learned with inquiry guided learning model - problem based learning (I-PBL) is the value of the attitude of cooperation and creativity of the students shown in Figure 2.

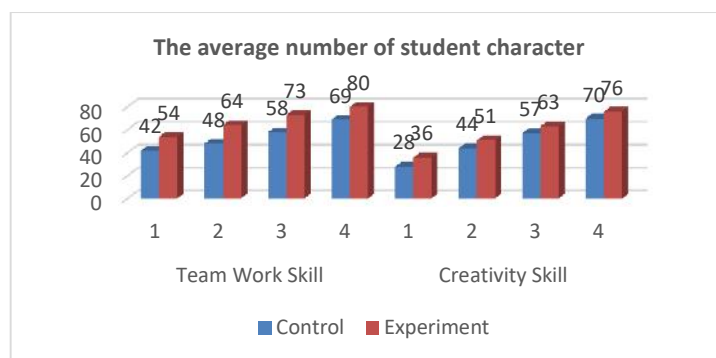


Figure 2. The number of student improvement on team work and creativity

Based on Figure 2 above shows that the creativity of the students taught by inquiry guided learning model - problem based learning to show a good improvement of the students taught by learning model problem base learning. Students are taught by learning model of problem-based learning is not only acquire knowledge but also got the values of good character in the form of communication skills, collaboration skills, problem solving skills, skills in information sharing, a sense of responsibility, respect for others, nature of the critical, analytical and creative. From this model the students from both classes to get the value of the character value brought by the learning model of problem-based learning, but increasing the value of cooperation attitude grade students experiment is higher than the value of cooperation attitude control class, this is due to the model-based learning Inquiry guided are integrated into learning model of problem-based learning in the experimental class, it looks at the percentage increase in the value of the average value of cooperation attitude the students at the first meeting by 54% and increased at the meeting II to 64%, and 73% at the meeting III as well as increased quite significant is shown in IV meeting of 80%. Of this increase is seen that guided the inquiry learning model - problem based learning increases student cooperation attitude.

Based on Sulisthia dkk (2014) research revealed that students' motivation to show the percentage of value - average in the first meeting amounted to 69.4% in middle category and has increased in the second meeting of 80.3% belong to a high category this case concluded that the application of the model guided inquiry learning computer aided animation media can increase motivation and learning outcomes. It is also clear that guided inquiry learning model can improve students' creativity. Based on the results of the study researchers, researchers found an increase in the value of creativity of students in the experimental class that learned by using model inquiry guided - problem based learning which is shown in Figure 2. It shows that the increase in the value of creativity of the students were pretty good look at the experimental class at the first meeting where the value of creativity graders experiment by 35.37%, in the second meeting an increase of 50.81% and continues to increase at a meeting to III at 63.41% and the fourth meeting of 76.02%. Of this increase is seen that there is an influence on the creativity of the students with applied learning models. Moreover, the improving of student learning outcomes are high at 0.80 in the experimental class with value - average student category of good cooperation attitude and creativity of the students quite well be influenced by the media used is a virtual laboratory that provides overview constructing students' thinking in the form of processes that occur in titrating the acid - base. Students are able to illustrate what he sees, and he became jobs noticeable in the process of real laboratory, the presence of 3rd syntax in the learning model inquiry guided - problem based learning is organizing students to examine as illustrated by the virtual process provides convenience to the students in designing research, problem solving based on the hypothesis that students develop hypotheses based on the projection of the virtual lab in view. This is in line with the opinion of Riana (2011) which states that the presence of virtual lab students are able to collect data quickly stimulate them in order to design a hypothesis to be solved it have an impact on cognitive development of students towards a positive, creative and innovative. In addition, research Mousavi and Sweller in Saguni (2013) revealed the presence of such a juxtaposition of visual and audio media a positive effect on students' cognitive load is large cognitive load and effective cognitive capacity.

In addition, the virtual Media lab provides convenience and creativity and cooperation more students in the next stage of 4th syntactic in the model of guided inquiry - problem based learning that helps students in independent investigation and groups applied in a real laboratory. Students become more aware of what the problems are solved so that students are able to optimize and develop itself. This is consistent with the findings of researchers where students in the experimental class given inquiry guided-learning model of problem based learning to show as much as 41.46% of the students have a high learning outcome with an attitude of cooperation and creativity enough and as much as 17.1% of students had increased yield higher learning, creativity and cooperation attitude quite well and as much as 21.71% of the students have a high learning outcome, attitude quite good cooperation and creativity. So it can be concluded that the application of guided learning model inquiry - problem based learning is applied using virtual media and real laboratory is able to improve student learning outcomes and provide a good student character development.

5. CONCLUSION

The conclusion in this study were :

1. The improving student learning outcomes are taught by inquiry guided learning model - problem based learning (I-PBL) is higher than on improving student learning outcomes taught learning model of problem-based learning on the subject of acid-base titration using virtual media and real laboratory.
2. The average number of cooperation attitude of students who are taught by learning model inquiry guided - problem based learning (I-PBL) is better than the average number of cooperation attitude of students who are taught by the teaching model of problem-based learning on the subject of acid-base titration using media virtual and real laboratory.
3. The average number of creativity of students taught by learning model inquiry guided - problem based learning (I-PBL) is better than the average number of creativity of the students taught by the teaching model of problem-based learning on the subject of acid-base titration using virtual media and real laboratory.

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