The Effect of Project Bases Learning Model With Learning Collaborative Toward Student’s Achievement

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Abstract
This research has the purpose to know the student’s achievement in Acid-Base topic by implementing Project Based Learning model. The population of this research are all Senior High School students grade XI in Berastagi, which the samples are 2 classes X11th grade chosen by purposive sampling. 1st as experiment class was taught by Project Based Learning Model while 2nd class as control class was taught by Conventional model. The instrument test had been standardized by expert validator and empiric validity process. The result of test standardization is 20 multiple choice questions with reliability 0.865. The research resulted that the data is normal distributed and samples are homogenous. The result data showed that student’s achievement taught by Project based learning with lesson study gave higher significance different compared with student’s achievement taught by conventional model. The statement supported by the result of hypothesis testing is \( t \text{count} (5.78) > t \text{table} (1.67) \).

Keywords: Acid-Base, Lesson Study, Project Based Learning, Student’s Achievement

Introduction
Based on the survey conducted by United Nations Educational, Scientific and Cultural Organization (UNESCO), against quality education in developing countries in Asia Pacific, Indonesia ranked 10th out of 14 countries. As for the quality of teachers, Indonesia is at level 14 of 14 developing countries.

In addition, the method lectures also often make students confused in learning a material which is indeed an abstract object or rarely encountered by students, as with teacher lecture methods tend not to be able to present the object into the classroom during the lesson. In learning with lecture method, students are not required to be more creative and critical thinking to what is learned, but the students only as a listener what is delivered the teacher without understanding it well. (Suyanti, 2010)

The essence of education is essentially human interaction, coaching and developing human potential, lasting a lifetime, in accordance with the capacity and level development of students, and improving the quality of human beings. The quality of human resources (HR) can be improved by education. Improvement of HR through education objectives is clear, so that each generation can follow the development of science and technology and be able to anticipate changes. (Retno Dwi Suyanti and Efrida Sormin, 2016)

There are several aspects of education that have recently emerged in several discourses related to the problems of education in Indonesia, namely: (a) curricula whose implementation has not been relevant to the demands of society, (b) the cost of education is expensive, (c) the purpose of education in the process has been deviant, (d) the controversy over the implementation of the National Exam, and (e) many inadequate educational facilities. All these things are basically passed on to the honesty of education executors in carrying out this nation’s education.

One way to overcome this problem is to change the learning strategies used by teachers in the classroom, ie from conventional learning into learning strategy that is to the activity of students. Based on that, the teacher is required to change the paradigm of teaching is just to deliver the subject matter into an activity to regulate the environment for students to learn. The primary objective of the action research study was to identify an alternate pedagogical approach to improve student engagement and academic performance.
in this researcher's psychology courses. These findings emphasized the importance of the student's perception of learning and its influence on academic performance and motivation. Based on the findings, PjBL has the potential to improve student engagement and their academic performance. (Iwamoto D.H, et.al., 2016)

Chemistry is one of the subjects at High School level (SMA) in accordance with the principle of the Scientific Approach. Chemistry is experimental science means that in studying chemistry is not enough just to hear and read it, but it is necessary to do learning activities such as lab work that will help build students about the material being studied. As a result, students were unable to establish a fundamental understanding of chemical concepts at the beginning of their study of chemistry. Learning activities that can make students' memory of material last longer is a learning that makes students active in building and linking material concepts. Therefore, it is necessary to use instructional model supported by learning media that can actively involve students actively.

Learning model is one component of the defense system. Learning model that can make learners active or in accordance with the Scientific Approach such as Inquiry model, Project Based Learning (PjBL), Problem Based Learning (PBL), and Cooperative Learning. Some of the learning models are government-emphasized learning models to be used in learning in the Curriculum 2013. However, the application of learning models is not merely to comply with the rules, but also needs to pay attention to several factors, including the material characteristics to be conveyed. The PjBL model is one of the suggested models applied in chemistry learning in the Curriculum 2013. In this PjBL model create projects that require students to (1) solve real problems and issues of interest to others; (2) actively engaging in their learning and choosing important matters during the project; (3) show clearly that they have learned key concepts and skills. The project provides an opportunity for students to produce observable evidence that they have mastered strict curricular standards as they apply their learning and solve problems at hand. By applying the PjBL model, the principle of learning activities can be achieved that is, (1) centered on the learner; (2) develop the creativity of learners; (3) to create favorable and challenging conditions; (4) having value, ethics, aesthetics, logic, and kines-tetika; (5) provide diverse learning experiences through the application of fun, contextual, effective, efficient and meaningful learning strategies and methods even though the time required is longer. (Wurdinger et al., 2007)

Judging from my experience of a three-month integrated field experience program at SMA N 1 Berastagi, I observed that some teachers still apply conventional methods in the learning process, which leads to more teacher-centered learning, whereas in the 2013 curriculum it is emphasized that students who are centers of learning during the learning process. Based on interviews with chemistry teacher grade XI SMA N 1 Berastagi, acid-base material is less interesting material for students. This is because students are generally difficulty in understanding the concept of acid bases. So that required learning model and the right teaching materials to solve the problem faced by the student.

Based on the above problem, Based on the background above the writer identifies the problem as follows : The low quality of education and the quality of teachers in learning that can increase interest in student learning; Lack of variation of teaching methods which is conducted by teachers, in which teachers too dominate the learning process in the classroom that causes students become passive. The objectives of this study are to know :

The student's achievement in learning acid-base taught by project based learning model based on lesson study compared by student's achievement in acid-base solution taught by conventional model.

Method

Research Design

This research involves two classes of experimental class and control class which both of them are treated differently. Experimental class will be treated through project based learning model based on lesson study and other control class will be treated through conventional model.

<table>
<thead>
<tr>
<th>Samples</th>
<th>Pre-test</th>
<th>Treatment</th>
<th>Post-test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experiment Class</td>
<td>$T_1$</td>
<td>$X$</td>
<td>$T_2$</td>
</tr>
<tr>
<td>Control Class</td>
<td>$T_1$</td>
<td>$Y$</td>
<td>$T_2$</td>
</tr>
</tbody>
</table>

Description:

$T_1$ = pretest score of experimental class and control class  
$T_2$ = posttest score of experimental class and control class  
$X$ = teaching treatment with PjBL model using animation based on lesson study  
$Y$ = teaching treatment with conventional model.
Techniques of data analysis that used are normalized gain, homogeneity test, normality test, and hypothesis testing.

Normalized Gain

An alternative is to normalize the gain score to account for the variance in pretest scores. Such a measure is $g$, the normalized gain, which is the absolute gain divided by the maximum possible gain:

$$ g = \frac{\text{post test score} - \text{pre test score}}{\text{maximum score} - \text{pre test score}} $$

(Meltzer, 2002)

Where, the values of normalized gain are:

- $g > 0.7$ = High
- $0.3 < g \leq 0.7$ = Medium
- $g < 0.3$ = Low

Hypothesis criteria that we used in research (Sudjana, 2005)

The value of $t_{count}$ is compared with the value of $t_{table}$ which is obtained from list. If $t_{count} > t_{table}$ at level $a = 0.05$ and degree of freedom (df) = $(n_1 + n_2) - 2$ in meaning receives $Ha$ or $Ho$ rejected. $Ha$ received or $Ho$ rejected if the value of $t_{count} > t_{table}$ and $Ha$ rejected or $Ho$ received if $t_{count} < t_{table}$ at level $a = 0.05$.

Results and Discussion

Enhancement learning outcomes can calculated from average gain value all of student for each class that is enhancement learning outcomes control class is 0.52 or 52 % and experiment class is 0.70 or 70 %. Result of the gain obtained is difference between posttest and pretest. Based on learning outcomes data then obtained average, standard deviation, and variance from each class can seen in following table.

<table>
<thead>
<tr>
<th>Class</th>
<th>Average</th>
<th>Standard Deviation</th>
<th>Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control class</td>
<td>0.523</td>
<td>0.125</td>
<td>0.016</td>
</tr>
<tr>
<td>Experiment class</td>
<td>0.708</td>
<td>0.129</td>
<td>0.017</td>
</tr>
</tbody>
</table>

Hypothesis testing was conducted to test the test hypothesis that has been done explained in chapter 2. This test will test the hypothesis whether the alternative hypothesis ($Ha$) is accepted or rejected. If $Ha$ is accepted means $Ho$ is rejected.

The hypothesis is tested by $t$ – test one tail from the average of posttest of both classes. The result of the hypothesis in Table bellow

<table>
<thead>
<tr>
<th>Class</th>
<th>Average</th>
<th>Standard Deviation</th>
<th>$T_{count}$</th>
<th>$T_{table}$</th>
<th>A</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experiment class</td>
<td>0.708</td>
<td>0.1443</td>
<td>5.78</td>
<td>1.67</td>
<td>0.05</td>
<td>$Ha$ is accepted and $Ho$ is rejected</td>
</tr>
<tr>
<td>Control class</td>
<td>0.523</td>
<td>0.1241</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The result of calculation shows that $t_{count} > t_{table}$ (5.78 > 1.67) and it is up to standard it means that **$Ha$ is accepted and $Ho$ is rejected**. So, it could be conclude that the student achievement that be taught by PjBL model Based on Lesson Study is significant higher than student achievement that be taught by Conventional model.
Cognitive aspect improvement was measured in experiment class to know if the cognitive aspect of student will be improved. The average gain of cognitive aspect improvement in experiment class will be shown in bellow table.

<table>
<thead>
<tr>
<th>Level of Cognitive Aspect</th>
<th>C1</th>
<th>C2</th>
<th>C3</th>
<th>C4</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.57</td>
<td>0.85</td>
<td>0.86</td>
<td>0.80</td>
<td></td>
</tr>
<tr>
<td>Medium</td>
<td>High</td>
<td>High</td>
<td>High</td>
<td></td>
</tr>
</tbody>
</table>

The result of Apply Lesson study learning collaborative can be seen here:

After the research and doing analyzing data, its show the students achievement that taught by PjBL model based on Lesson Study is higher than students that taught by conventional model in Acid Base topic. The result can be obtained from the average of pre-test and the average of post-test that indicate the increasing of student’s achievement before and after teaching treatment. The average of pre – test in control class (43.7) is not significant different with experiment class (42.2). Based on the pre – test value show that the students in SMA N 1 Berastagi are still not understood yet about the topic of Acid-Base. It’s different with the value of average post – test that is 83.4 in experiment class is significant different average post – test of control class that is 73.7. From this value show that the students understand the topic of Acid-base after giving the different teaching treatment for both of class. The result of calculation shows that $t_{\text{post}} > t_{\text{table}}$ (5.78 > 1.67) and it is up to standard. So, it could be conclude that the student achievement that be taught by PjBL model Based on Lesson Study is significant higher than student achievement that be taught by Conventional model. The analysis of gain in level of cognitive aspect is improved by conduct the PjBL model based on Lesson Study in experiment class and it is obtained C1 (Knowledge) aspect was 0.57 categorized as medium improvement, C2 (Understanding) was 0.85 categorized as high improvement, C3 (Application) was 0.86 categorized as high improvement, C4 (Analysis) was 0.80 categorized as high improvement. And in experiment class show that the most improve is in level of cognitive aspect of C3 (Application) with the average gain was 0.86. Project Based Learning on Students’ Performance in the Concept of Classification of Organisms Among Secondary Schools in Kenya. This study revealed that project based learning technique enable students to improve in academic. The project based learning model has positive effect on student’s attitude toward classification. The study recommends to the Ministry of education and its agencies to adopt project based learning technique among other student centred instructional techniques for teaching of practical oriented concepts like Classification of Organisms. (Wekesa and Ongunya, 2016)

Based on the relevant research that was done by (Chiang,C.L., and Lee, H., 2016) was aimed to explore the effect of PjBL on learning motivation and problem solving ability of the vocational high school students. The treatment-group students are given project-based teaching method and control group students are given traditional teaching method during four week period of courses. The research results showed project based learning not only could enhance vocational school students’ learning motivation, but facilitate their problem-solving ability. The contribution of the teachers a real exemplar of PjBL.
The relevant research aimed to determine the performance of the students on several measures and tested for the significant difference between the scores of the two groups. The findings of the study showed significant improvement on the performance of the two groups in their posttest, chapter test, and in the outputs. This implies that project-based learning is an effective approach in the teaching and learning of Chemistry. (Tadifa, F.G., 2015)

The hypothesis conclude that students’ achievement which is implemented the inquiry strategy based on collaborative is higher significantly than direct instructional. In addition the cognitive aspect which is improved by implementing the inquiry strategy based on collaborative is C2 (Comprehension) is 0.76 included as high category. (Suyanti and Nasution, 2015)

**Conclusion**

Based on result of research obtained conclusion as follow:

1. The improvement of student’s achievement in chemistry which is get project based learning model based is higher than the improvement in student’s achievement which get conventional model learning on acid-base material. Learning taught by project based learning model based on lesson study more effective than learning taught by conventional model.
2. The most developed cognitive domain in the experimental class, which is get project based learning based on lesson study is the cognitive domain of C3 (application).

**Suggestion**

As for suggestions that the writer can give are:

1. For teacher and prospective teacher, it is expected to be able to use project based learning model based on lesson study to improve student’s achievement of chemistry.
2. For students are expected to improve their learning experiences and interest using model and learning media so can improve their learning outcomes.
3. For further researchers who will conduct further research can make this research as a material for consideration and reference.

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