TEACHERS AND STUDENTS' TRAINING STRATEGY THROUGH A MODEL OF PROBLEM BASED LEARNING (PBL) INTEGRATED TO LESSON STUDY TO TRAIN THE STUDENTS' CRITICAL THINKING ABILITY

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ABSTRACT

This study aims to describe senior high school students' critical thinking ability who had been taught through a model of PBL integrated to lesson study. This study was carried out in six stages: (1) preliminary study of learning condition; (2) the development of hypothetical strategies; (3) tryout in order to validate training strategy and prototype of PBL instruments; (4) modelling; (5) implementation; and (6) experiment in order to test the practicality and the effectiveness of training strategy. The teacher training strategy in this study is described in lesson study, on the other hand, the student training strategy is described in PBL process in the classroom. PBL learning activity integrated to lesson study was carried out for six cycles (six lesson plans). The results of the study show that; (1) the implementation of PBL integrated to Lesson Study can improve students' critical thinking ability; (2) students' critical thinking ability for six cycle has improved from cycle to cycle. PBL barriers are mainly caused by the limitation of IT facilities and time allocation. The results showed that the teachers and students training strategy through model of PBL integrated to lesson study can improve the teachers' skills to design and manage PBL and improve students' critical thinking ability.
***Keywords**: teachers and students training, PBL, lesson study.*

A. INTRODUCTION

Human development needs to be completed, including the construction of the body, intellectual, and character (UUD 1945, Law No. 20 of 2003 and Government Regulation No. 32 year 2013). That constitution stated that every Indonesian people are people with high quality in terms of intellectual, emotion, and spiritual. It is also in accordance with Depdikud vision 2005-2025 to build competent and strong character of human resources. In order to acomplish the goal, it is important to have transformation tool, in this case education. Education is a fundametanl and strategic effort which can be implemented formally and informally. Specifically, formal education at school is aimed to develop *critical thinking*.

Thinking critically has become a need, it is because many of that critical thinking strategy value can make someone become independent. The ability of critical thinking that possessed by someone can be a tool to solve problems for his/her life. Critical thinking and the ability to think is two things that connect each other. Critical thinking is defined as a way of thinking systematically and independently which result an interpretation, analysis, conclusion over something, evaluation, and given explanation of something. On the other hand, thinking ability is a tool in life for a longtime. Fisher (2008) stated that critical thinking ability is an ability to interpret, analysis, and evaluate arguments. Critical thinking ability is an absolute thing which needs to be possessed by human being, because critical thinking

obviously is a tool to build the future not only personally but also socially. Quality of human is very needed to achieve wealthy life. Critical thinking that is possessed by someone can give a right direction in a way of thinking, working, and helping in order to determine connection between things to other things accurately. In this modern era, human beings are facing life challenges to achieve a better future. Without having perfect critical thinking ability, it can be sure that someone will have difficulties in using information that she/he get. So, our education must focus on a curriculum which can accommodate students' need in order to preparing a generation to face the challenge of information and globalization which is unavoidable (Kemdikbud, 2013).

The preliminary study which was conducted at senior high schools in 2013 resulted three main problems; (1) the result of students' learning to their critical thinking ability on Biology subject was still low; (2) teachers' low ability in implementing PBL, and; (3) forum Musyawarah Guru Mata Pelajaran (MGMP) had not optimally functioned well in teachers' empowerment. Due to the lack of teachers' understanding in implementing PBL, *lesson study* then has been choosen as one alternative to solve it. The goal of *lesson study* in this research is to enforce effectivity of learning using PBL, socialise when students need to practice working together in group and individually, and also to train students when they have to act as an adult. Susilo (2013) stated that *lesson study* is an effort to develop teacher profession through study collaboratively and sustainably based on principals to build students in learning.

The best way to learn Biology is when the learning is done like where it is found (Leslie dan Briggs, 1987). Just like another science, Biology was found and has been built through scientific method by the use of scientific process ability. Therefore, Biology learning that is suggested is putting scientific method as learning strategy. The decision in chossing PBL in grhis study based on the PBL characteristic it self, which PBL uses authentic problems in learning pocess. From long ago, Dewey (1916) stated that school is a society lab to train students so that they can be success in life. For that purpose, learning process in the classroom is conducted by bringing authentic problems in society to the class as a learning material. Learing model that suits for that matter is PBL.

B. METHOD

This research is a research development because it develops teacher training strategy with student training through doing a synthetic between PBL and *lesson study*. In this

research PBL learning model is integrated to *lesson study*, then its' effectiveness through teachers' performances in designing PBL learning, managing PBL learning, and students' achievement which is critical thinking ability. Syntaxis for PBL learning are as follow; (1) students' orientation to authentic; (2) organizing students to study; (3) guiding individual/group observation, and; (4) analysing and evaluating process of problem solving. Syntaxis of *lesson study* are as follow; 1) planning learning (*Plan*), 2) conducting and observing learning process (*Do/See*), and 3) reflection/discussion (*Reflection*).

The syntax of PBL and *lesson study* are then integrated to be teachers and students training strategy product of PBL learning model which is integrated to *lesson study* with the following steps; (1) operationalization of PBL on the prototype of PBL learning instruments; (2) socialization of prototype of the PBL instruments to the teachers, and workshop of PBL instruments development by the; (3) modeling PBL learning; (4) reflection and discussion; (5) preparation of learning; (6) PBL implementation by the teacher at the class; (7) reflection and discussion, and; (8) for the next learning meeting, repeating is done in terms of preparation stage, PBL learning by the teachers in the class, reflection and discussion.

The total number of the teachers who were trained in this research were18 teachers, and they are from three senior high schools in Kendari, 10 teachers from SMA Negeri 4 Kendari, 4 teachers from SMA Negeri 2 Kendari, and 4 teachers from SMA Negeri 6 Kendari. The data about teachers' ability in designing PBL learning was done in percentage, in this case data was computed by seeing the amount of steps which score 3 and above and then it was divided by every steps X 100%, and other data about obstacles were recorded and then made tabulation. Data about teachers' ability in organizaing PBL learning in class was analyzed by describing the result of observers' score for each phases by calculating the amount of stages which were done in each phase and then they are divided by all stages in that phase X 100%.

A try out to test the effectiveness of teachers' and students' training strategy in PBL learning model integrated to *lesson study* (*Do/See*) was conducted in three senior high schools with 311 students of tenth grade. SMA Negeri 4 Kendari 120 students, SMA Negeri 2 Kendari 111 students, and SMA Negeri 6 Kendari 90 students.

PBL learning activity in the class is as:

O_1 X O_2

O_1 = pre-test

O_2 = post-test

X = PBL learning model

Learning activity in the classroom was conducted for six cycles, and for each cycles started with pre-test and ended with post-test. N-gain technique was used to analyse the data to find out the improvement of students' critical thinking ability from cycle I to cycle VI.

C. RESULT AND DICSUSSION

Product resulted from the teacher training is learning instruments (syllabus, lesson plan, LKS, observation sheet, and test of critical thinking). Students' achievement in terms of cirtical thinking is determined through indicator of interpretation, analysis, making conclusion, making evaluation, and giving explanation.

a. **Indicator of interpretation**

The learning result of N-gain of Senior high school students in Kendari in terms of interpretation indicator for six cycles PBL learning can be seen as follow.

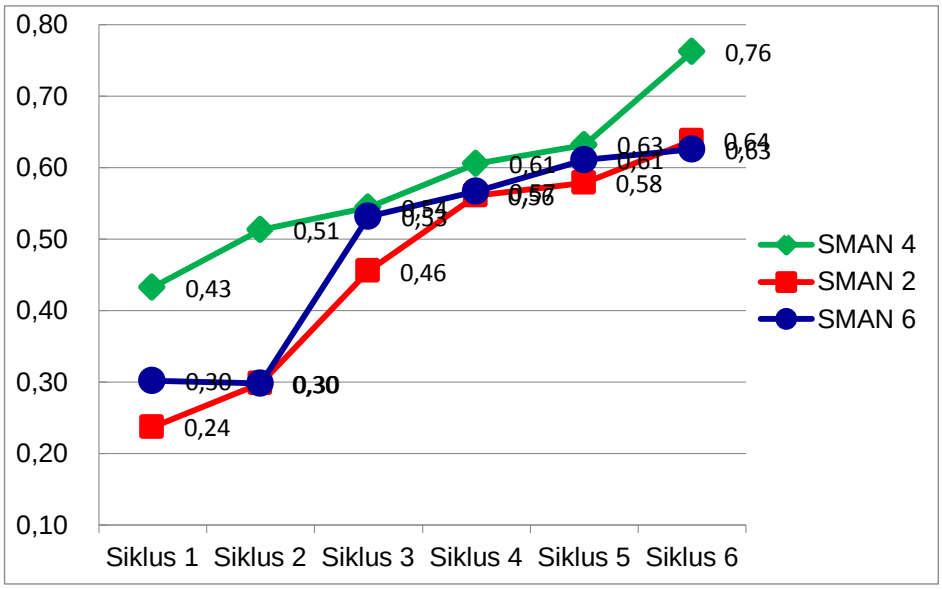

Figure 3.1 N-gain graph for interpretation indicator

Students' ability in interpreting for six cycles of PBL learning shows there is significant improvement of N-gain for each schools. Learning achievement in terms of students' interpretation ability at senior high school in Kendari has been increased for each cycle. First, N-gain achievement of students of SMA 4 Kendari in terms of interpretation ability for cycle I is 0.43, cycle II is 0.51, cycle III is 0.54, cycle IV is 0.61, cycle V is 0.63, and cycle VI is 0.76. Second, N-gain achievement of students of SMA 2 Kendari in terms of interpretation ability for cycle I is 0.24, cycle II is 0.30, cycle III is 0.46, cycle IV is 0.56, cycle V is 0.58, and cycle VI is 0.64. Third, N-gain achievement of students of SMA 6 Kendari in terms of interpretation ability for cycle I is 0.30, cycle II is 0.30, cycle III is 0.53, cycle IV is 0.57, cycle V is 0.61, and cycle VI is 0.63.

b. Indicator of Analysis

The learning result of N-gain of Senior high school students in Kendari in terms of analysis indicator for six cycles PBL learning can be seen as follow.

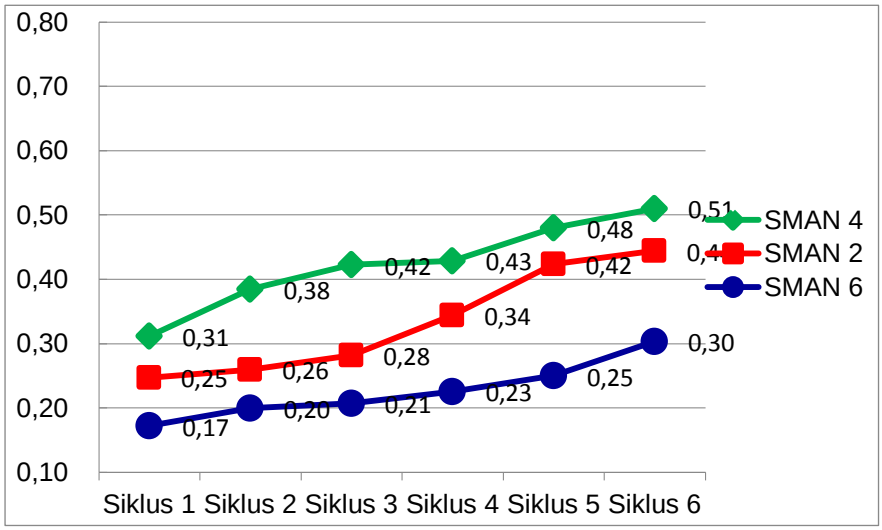

Figure 4.2 N-gain graph for analysis indicator

Students' ability in term of analysing for six cycles of PBL learning shows there is significant improvement of N-gain for each schools. Learning achievement in terms of students' analysis ability at senior high school in Kendari are increase for each cycle. First, N-gain achievement of students of SMA 4 Kendari in terms of analysis ability for cycle I is 0.31, cycle II is 0.38, cycle III is 0.42, cycle IV is 0.43, cycle V is 0.48, and cycle VI is 0.51. Second, N-gain achievement of students of SMA 2 Kendari in terms of analysis ability for

cycle I is 0.25, cycle II is 0.26, cycle III is 0.28, cycle IV is 0.34, cycle V is 0.42, and cycle VI is 0.44. Third, N-gain achievement of students of SMA 6 Kendari in terms of analysis ability for cycle I is 0.17, cycle II is 0.20, cycle III is 0.21, cycle IV is 0.23, cycle V is 0.25, and cycle VI is 0.30.

c. Indicator of Making Conclusion

The learning result of N-gain of Senior high school students in Kendari it in terms of making conclusion indicator for six cycles PBL learning can be seen as follow.

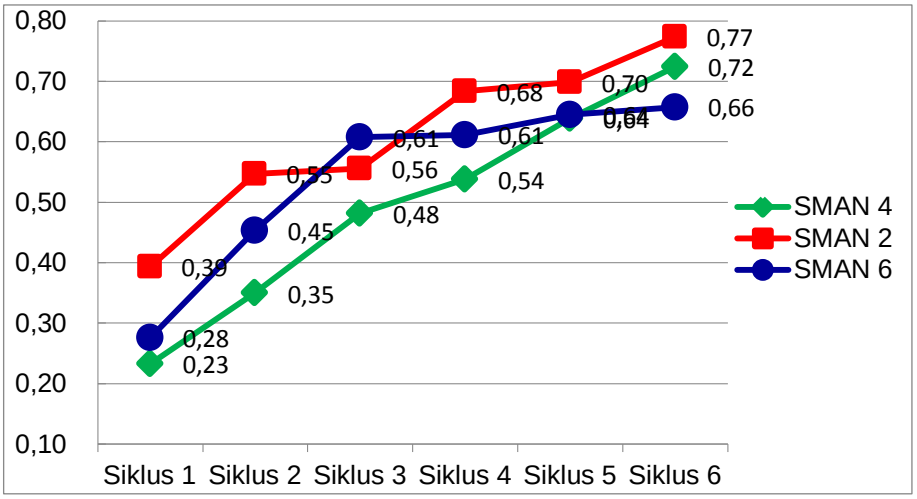

Figure 4.3 N-gain graph for making conclusion indicator

Students' ability in making conclusion for six cycles of PBL learning shows there is significant improvement of N-gain for each schools. Learning achievement in terms of students' making conclusion ability at senior high school in Kendari are increase for each cycle. First, N-gain achievement of students of SMA 4 Kendari in terms of making conclusion ability for cycle I is 0.23, cycle II is 0.35, cycle III is 0.48, cycle IV is 0.54, cycle V is 0.64, and cycle VI is 0.72. Second, N-gain achievement of students of SMA 2 Kendari in terms of making conclusion ability for cycle I is 0.39, cycle II is 0.55, cycle III is 0.56, cycle IV is 0.68, cycle V is 0.70, and cycle VI is 0.77. Third, N-gain achievement of students of SMA 6 Kendari in terms of making conclusion ability for cycle I is 0.28, cycle II is 0.45, cycle III is 0.61, cycle IV is 0.61, cycle V is 0.64, and cycle VI is 0.66.

d. Indicator of Doing Evaluation

The learning result of N-gain of Senior high school students in Kendari in terms of doing evaluation for six cycles PBL learning can be seen as follow.

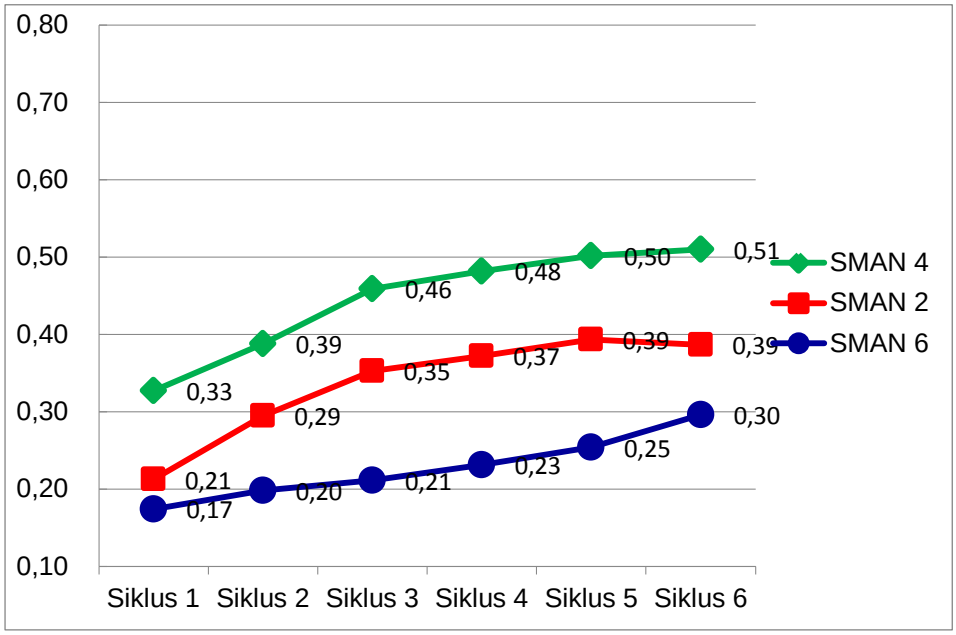

Figure 4.4 N-gain graph for doing evaluation indicator

Students' ability in doing evaluation for six cycles of PBL learning shows there is significant improvement of N-gain for each schools. Learning achievement in terms of students' doing evaluation ability at senior high school in Kendari are increase for each cycle. First, N-gain achievement of students of SMA 4 Kendari in terms of doing evaluation ability for cycle I is 0.33, cycle II is 0.39, cycle III is 0.46, cycle IV is 0.48, cycle V is 0.50, and cycle VI is 0.51. Second, N-gain achievement of students of SMA 2 Kendari in terms of doing evaluation ability for cycle I is 0.21, cycle II is 0.29, cycle III is 0.35, cycle IV is 0.37, cycle V is 0.39, and cycle VI is 0.39. Third, N-gain achievement of students of SMA 6 Kendari in terms of doing evaluation ability for cycle I is 0.17, cycle II is 0.20, cycle III is 0.21, cycle IV is 0.23, cycle V is 0.25, and cycle VI is 0.30.

e. Indicator of Giving Explanation

The learning result of N-gain of Senior high school students in Kendari in terms of giving explanation for six cycles PBL learning can be seen as follow.

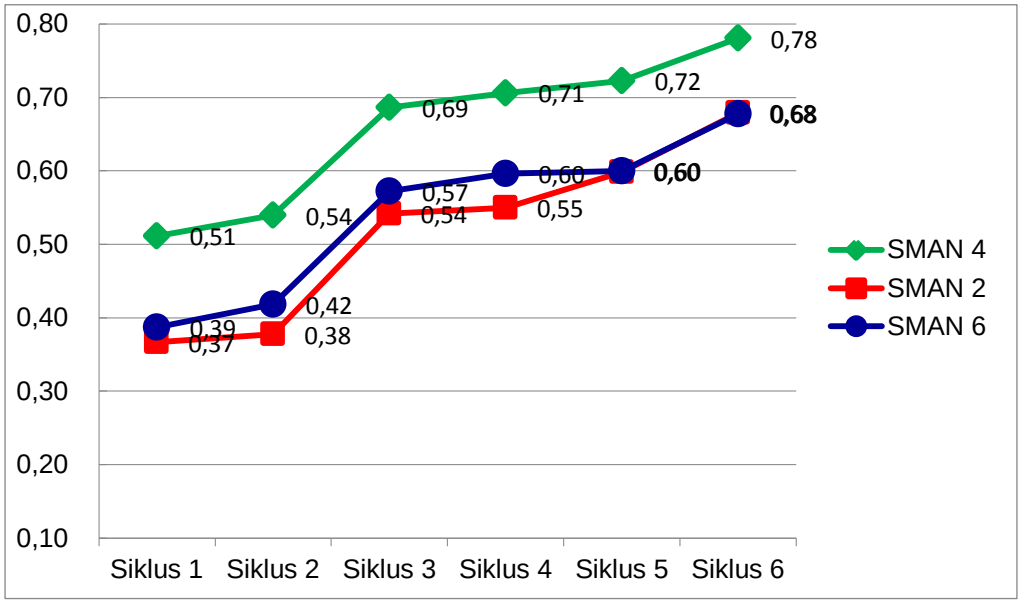

Figure 4.5 N-gain graph for giving explanation indicator

Students' ability in giving explanation for six cycles of PBL learning shows there is significant improvement of N-gain for each schools. Learning achievement in terms of students' giving explanation ability at senior high school in Kendari are increase for each cycle. First, N-gain achievement of students of SMA 4 Kendari in terms of giving explanation ability for cycle I is 0.51, cycle II is 0.54, cycle III is 0.69, cycle IV is 0.71, cycle V is 0.72, and cycle VI is 0.78. Second, N-gain achievement of students of SMA 2 Kendari in terms of giving explanation ability for cycle I is 0.37, cycle II is 0.38, cycle III is 0.54, cycle IV is 0.55, cycle V is 0.60, and cycle VI is 0.68. Third, N-gain achievement of students of SMA 6 Kendari in terms of giving explanation ability for cycle I is 0.39, cycle II is 0.42, cycle III is 0.57, cycle IV is 0.60, cycle V is 0.60, and cycle VI is 0.68.

The result of the study shows that in general, indicators of critical thinking variable in each schools are increased in N-gain in moderate category. The achievement of N-gain improvement in critical thinking ability in moderate category is suspected because of time limitation in doing the research (this research is conducting only for six months). However, the result of this research has proved that there is a significant improvement of students' critical thinking ability from cycle to cycle as a contribution from teachers and students

training strategy PBL learning model integrated with *lesson study*. From the result, it can be predicted that teachers and students training through PBL learning integrated with *lesson study* when it is implemented by more than six months, there is a chance of N-gain improvement much better from now.

The existence of reflection activity in *lesson study* done by the teachers to make students and teachers' lackness right in PBL learning process is one of the reason of the improvement of students' critical thinking ability. This statement is accordance with cognitive theory which is pointed by Piaget (as cited in Santrock, 2009), in this case he stated that concepts which constructively have been thinking by students are not appear instantly, but they appear through set of achievements that bring to more understandable thought. Teachers and training strategy PBL learning model integrated by *lesson study* to train critical thinking ability is not merely has significant improvement, but it needs process and time. Students need to be trainind by teacher frequently in PBL learning, and not merely administration fulfillment. So that students will have high ability in critical thinking.

Results of reflection in *lesson study* activity is guided by the teachers in fixing learning process from cycle to cycle. This training strategy can improve critical thinking ability for each indicators and it proves can increase N-gain from first cycle until six cycle. The result of this study is in accordance with Baba (2009), he stated that *lesson study* is done in cycle which contained problem statement activity, preparing collaborative experimental learning, implementing and and observing learning, reflecting learning, improving quality of learning based on reflection, implementing and observing developed learning, reflection of learning, and summarizing the activity. Kauchak adn Eggen (2012) also stated that PBL learning model is aimed to bring real world to the class to be investigated and analyzed by the students.

The differentiation of N-gain achievement for each indicator in each schools because of the school location and limitation of supporting facility for PBL learning. SMA Negeri 4 Kendari is a school which located in mid-town of Kendari and it is also near to TELKOM, in this case it makes the students of SMA Negeri 4 Kendari to access internet easier for PBL learning compares to SMA Negeri 2 Kendari and SMA Negeri 6 Kendari. This result shows the highest N-gain and the lowest N-gain from each schools. The highest N-gain which is earned by students of SMA Negeri 4 Kendari in six cycle is indicator of the ability of giving explanation and the lowest N-gain is indicator of analysis ability. The highest N-gain which is

earned by students of SMA Negeri 2 Kendari in six cycle is indicator of the ability of making conclusion and the lowest N-gain is indicator of doing evaluation ability. The highest N-gain which is earned by students of SMA Negeri 6 Kendari in six cycle is indicator of the ability of giving explanation and the lowest N-gain is indicator of analysis ability. It happens because the ability of analysis and evaluate in Taxonomy Bloom is high level knowledge comparing with other indicators. The same result is also stated by the previous researcher which is stated that PBL learning model can improve critical thinking ability in science subjcet (Padmavathy & Mareesh, 2013; Sungur, *et, al*., 2006, ; Karantzas, *et, al*., 2013; Araz, 2007).

This result also can enhance the previous research because there is integrated PBL learning factor with *lesson study* which is desgined by the researcher to become effective teachers and students training strategy. Partner teacher is firstly trained by model teacher about the concept and implementation of PBL learning in Biology. The main goal of model teacher is the ability of teacher to design learning instruments such as syllabus, lesson plan, LKS, and assessment instrument (*plan*). And after that, partner teacher implements PBL learning in the classroom with another teacher as the observer (*do/see*). Based on the observation result from the teacher toward PBL learning in the classroom, then it is discussed and reflected together in order to get input for repairing the next PBL learning. Ono (2013) stated that there are three main elements of *lesson study* which support the improvement of students' achievement, they are learning collaboration design, implementation of design with observation, and the reflection of the product with the repairing. This is the advantage of training strategy, it also can improve students' achievement in crticial thinking. Hendayana, *et al*., (2007) stated that *lesson study* is a model of teacher training proffesion through collaborative study and sustainable based on principles of *collegues* and *mutual learning*. Teachers are expected to learn how students behave when they are learning in class, so that they can acquire new information about students thinking. Students can increase their analysis ability in learning with the effort that has been done by *lesson study* team.

Baba (2009) stated that *lesson study* is done in cycle which contained problem statement activity, preparing collaborative experimental learning, implementing and observing learning, reflecting learning, improving the quality of learning based on reflection, implementing and observing developed learning, reflection the learning, and summarize the activity. The phases which are done in teachers and students training strategy through PBL learning integrated to *lesson study*, whereas researcher as a model teacher prepares partner teacher in workshop activity in order to be able to have ability in designing and managing

PBL learning. The experience of partner teacher in terms of designing and managing PBL learning starts at socialization and workshop which is held by model teacher, next, partner teacher gets an opportunity to design and managing PBL learning at class. The presence of teacher at *do/see*, partner teacher can have opportunity to get accurate information related to students' behavior or partner teacher behavior in PBM. Information that noted by observer such as good things need to be sustained and things that need to be repaired will change next meeting.

PBL learning which has been implemented by the teacher in this study specifically to teach the way how students solve authentic problems (real world problems). One of PBL characteristics in this study is the students are free to look for and find out alternative way in solving authentic problem. The freedom of thinking in solving authentic problem by the students becomes a chance to assimilate prior knowledge so that the critical thinking can be improved. Studens feel more confident in the way to solve the aunthentic problem because they are facilitated by partner teacher which has been trained in *lesson study* activity. This finding is in accordance with Lewis, (2012) which stated that *lesson study* focus on teaching and it can improve teacher ability towards mastery of learning, and improving the quality of learning. Teachers observe students' behavior when they study in the class, so that teacher can acquire information about what students' think. It is proven by students awareness when they are working an assignment to solve aunthentic problem. For example, students still can complete PBL learning assignment eventough the learning time is over.

Teachers and students training strategy through PBL learning intergrated to *lesson study* which has been developed has an advantage in improving the ability of critical thinking because in *Do/See* phase, teacher can detect how far is students ability in critical thinking. If observer teacher finds out mistakes or error done by students in critical thinking, after reflection step the findings can be an input to be fixed in the next meeting. Things which become findings and become weakness of the students in critical thinking become observer teachers' note in order to be discussed on reflection phase. Ono (2013) stated that there are three elements of the *lesson study* which support the improvement of students' achievement, learning collaboration design, design implementation with observation, and reflection to product. So, the preparation of partner teacher in the next PBL learning has been prepared well as a result of reflection of *lesson study* team. Robinson (2009) stated that the most important thing of *lesson study* activity is teacher can develop learning vision related with students need in class. In this case teachers are expected can learn how students behave when

they are studying at class. The preparation effort which is done by *lesson study* team so that it can improve students in interpreting data.

D. CONCLUSION

a. The result of validation of researchers'/model teachers' learning instruments which was evaluated by five experts can be said valid and worth to use in modelling or real life teachin in class.

b. Validation result of learning instrument by partner teacher is assested by five expert can be said valid and worth to be used in modelling or real life teachin in class.

c. The ability of partner teaching in designing and managing PBL learning for six cycle was well conducted.

d. The implementation of teachers and students training strategy PBL learning model intergrated to *lesson study* can improve students' critical thinking ability.

e. Facilitator/researcher which becomes model teacher needs to complished modelling activity and also give example to other teachers related to the ability of teacher in designing and managing PBL learning.

f. Teachers and students training of PBL learning model integrated to *lesson study* needs to be implemented continuously at school and becomes one important strategy in MGMP activity.

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