The Implementation of Problem Based Learning (PBL) Model Improving Student’s Oral Communication Skillthrough Lesson Study

A A Najah, A F Rohmah, Usratussyarifah, and H Susilo
Biology Department, Universitas Negeri Malang, Jalan Semarang 5, Malang, Indonesia

amaliaainun@gmail.com; herawati.susilo.fmpa@um.ac.id

Abstract. The action research was conducted in the odd semester of 2017/2018 using Lesson study as a tool to investigate collaborative and continuous learning processes, based on the principle of collegiality. Through Lesson Study students are expected to have communication skills both verbally and in writing. Communication skills can be improved through problem based learning (PBL) learning models. This study aims to determine the improvement of students' oral communication skills through application of problem-based learning. This research was conducted on February 8, 2018, March 8, 2018, April 12, 2018. The subjects were all students who attended the Action research in the field of Education. Data was collected using the same PBL model with different learning media. Learning media used are emoticon points, interactive videos, and game points. Students’ communication skills are measured using an observation sheet and an assessment column for oral communication skills. The results show that the assessment of students' communication skills is measured in group in the first cycle. In the next cycle, it is done individually and shows that 22% of students have poor communication skills, 11% of students have good communication skills, and 67% have good communication skills. Then, in the third cycle, 27% of students in the excellent category, 55% in the good category, and 18% in the fairly good category. Based on these results it can be concluded that the learning model of Problem Based Learning based on Lesson Study can improve students' oral communication skills.

1. Introduction
The development of the 21st century world is characterized by the use of information and communication technology in all aspects of life, including in the learning process. Learning in the 21st century should be adjusted to the progress and demands of the times. Likewise, the curriculum developed by education providers is required to change the learning approach that is centered on the teacher/educator (teacher centered learning) into approach student centered learning. This is in accordance with the ability of the future to be possessed, namely the skills of communication, collaboration, critical thinking and creativity. One of the lessons that can be applied to improve communication skills in class of classroom action research (CAR) is the learning model Problem Based Learning (PBL).

The main reason for implementing the PBL method in class action research courses (CAR) is because of the superiority of PBL itself, its advantages according to [1] are: (1) students obtain basic knowledge...
(basic sciences) that are useful for solving problems encountered; (2) student-centered namely students learning actively and independently (as adult learners) with integrated material presentation (horizontal and vertical) and relevant to real setting (professionalism); (3) students are able to think critically, develop initiatives; (4) there is a change in the paradigm of the teacher as a facilitator; (5) learning focuses on meaningfulness, not facts (not just memorizing but using information to solve problems so that the information is more meaningful); (6) increasing the ability of students to take the initiative (because there are opportunities for independent learning and group work and discussion); (7) develop students' skills and knowledge both in seeking information and problem solving skills using their knowledge to construct new knowledge; (8) development of interpersonal skills and group dynamics through group discussions and group collaboration; and (9) increasing the level of attainment of learning levels with the skills and other knowledge acquired in addition to achieving material understanding such as; cooperation, independence, opinion skills and confidence.

According to [2] the learning model Problem Based Learning can train and stimulate students to think, solve problems, be able to answer questions, add and understand student knowledge, and make joint decisions verbally. According to [3] PBL helps students develop their skills in giving reasons and thinking when they are looking for data or information to get solutions to solve problems. But in reality there are still many students who are not yet good at oral communication, so their verbal communication skills are not good enough. Low communication skills can be improved through Problem Based Learning. According to [4] communication skills must be possessed so that students can understand the problems given and express solutions to problems not just ideas to draw conclusions about reasoning abilities, and provide arguments for ideas expressed. These communication skills can be improved through the learning process in the classroom. The learning process in the classroom can be improved in quality through Lesson Study [5]. Students are expected to have skills through activities lesson study including the ability to communicate, both orally and in writing.

According to [6], lesson study provides an opportunity to improve the quality of learning. Lesson study has been carried out in Indonesia since 2006 and in its development, lesson study in Indonesia was defined as a model of educator professional development through collaborative and sustainable learning based on collegiality and principles mutual learning to build learning communities [7]. Lesson study is a form of practitioner research in which teachers investigate the problem of teaching and learning in their own classroom. This can be a method to produce not only practitioners' knowledge but also professional knowledge [8] (Cerbin, et al, 2006).

Based on the above background it is necessary to do an action research with the title "The Implementation of Problem Based Learning (PBL) Model Improving Student’s Oral Communication Skill through Lesson Study ".

2. Method
This research qualitative descriptive research method. Subjects were students of postgraduate class action research (CAR) State University of Malang Biology Education Study Program 2017 with 21 students. (1) We took data from the implementation of LS activities with the application of Problem Based Learning (PBL) model as the first, second, and third lesson study implementation, (2) data on students' oral communication skills and (3) data from the reflection of Lesson Study. The data in this study were obtained based on the results of observations conducted by 3 observers in the learning process, reports on LS implementation results and arguments from other students regarding the ability of the model lecturer in the learning process.

This research was carried out in three stages: the stage (Plan) planning, (Do) implementation and (See) reflection of implementation. Stage (Plan) planning is an activity of students in compiling data and collaborative learning tools which are guided by the lecturers. At this stage, students make papers on the topics given, presentation slides, learning process plans, lesson design, chapter design and student worksheet.

Stage (Do) implementation is the implementation stage of Lesson Study carried out in the 2017 postgraduate biology class action research class (CAR). Lesson Study is carried out in 3 stages. At stage
1, 2, 3 using model PBL that uses media differences, in stage 1 using emoticon points, stage 2 uses interactive video and stage 3 uses PPT media and game points.

The last stage (See) is to reflect on the learning process carried out. The reflection process is carried out at the end of the learning process by asking arguments from model lecturers, observers, students and professors.

3. Result and Discussion

3.1. Results

3.1.1. Cycle I (February 8, 2018)
Cycle 1 is carried out on three stages, lesson study namely plan, do, and see. In the planning stage (Plan) was held on 6, February 2018, the material that will be discussed in the first cycle is the essence of action research, preparing Events Unit Class (SAP), set up an observer sheet format, chapter design, lesson design, pretest, posttest, assessment rubric for oral communication skills to measure student communication skills. Other learning sets that used in this study are Power point (PPT) as interactive learning media, emoticon points, MFIs, learning resources in the form of international and national articles related to action research.

In the implementation stage (Do) is carried out in one meeting or once open class for the topic of development of the nature of action research. At the observation stage, data collection was carried out with assistance from observers. The implementation phase was held on February 8, 2018 at 10.30-11.30 WIB in O3 Building Room 207 FMIPA Malang State University. At the stage, it is do carried out in accordance with the Lesson Plan that has been made before, namely an introduction containing greetings, asking for news, absent students, apperception by giving a number of questions related to student knowledge about the nature of research. Furthermore, the core activities which contain discussions consist of group division, distribution of articles related to the nature of research, work on student worksheets by analyzing articles that have been given, student worksheets presentations and discussion questions and answers between groups. In the discussion session, the question and answer group will discuss the results of the student worksheets that have been done. After that, other groups have the duty to respond or ask questions. For groups who respond or ask, they will get points are used in this session Emoticon points. At the end of the learning, which group will be calculated the most active/successful in collecting the points most will get reward from the model lecturer. Next is the cover which contains reinforcement from the model lecturer and the class of classroom action research (CAR) lecturer.

The reflection phase (See) of the implementation activities is lesson study carried out after the implementation of the Do ends. At the reflection stage, the implementation team discussed all the implementation that had been carried out at the stage do with the classroom action research lecturer (CAR). Based on observations made by observers there are still shortcomings that need to be corrected in the learning process. The shortcomings that have been revealed in the reflection phase of the first cycle are then corrected in cycle II. The following are the results of the reflection of the activities Lesson Study of the cycle I.

1. Amalia Ainun Najah (Model Lecturer)
   a. The time span nervous but so far has tried hard to overcome his nervousness
   b. Still need suggestions from other students and observers

2. Usratusyarifah (Observer 1)
   a. Students learn well
   b. Model lecturers ask each group to work on the student worksheet and remind them of the time and ask what is not understood.
   c. Learning is good enough. Starting from prayer and motivation.
   d. Apperception is improved again
   e. Learning objectives should be at the beginning of learning
f. Time management is good enough

g. Presentation process is very good

h. Model lecturers give rewards to increase motivation

i. Model lecturers should ask some students to conclude

j. Lecturers have good time management and confidence

3. Aida Fitriyatur R (Observer 2 and 3)

a. Model lecturers are good for time management

b. Students can discuss well

c. Model lecturers come to each group and ask if there are difficulties

d. Becoming a model lecturer carries heavy responsibilities

e. Model lecturers are very patient and have tried to create enjoyable

f. Learning objectives should be delivered early learning, content of PPT is not in accordance with the student worksheet, one of the objectives is that various types of research are still not achieved, there is no explanation about the work of student worksheet, conclusion should be conveyed by students first.

4. Student responses

a. As early learning whether there opening?, at the end of the lesson less no explanation of what the benefits of the current learning.

b. Is there opening or not?, during the discussions it helps lecturers to provide reinforcement, should the conclusions of the students as well, has been a systematic learning and fun

5. Feedback from lecturer Prof. Dra. Herawati Susilo, M.Sc., Ph. D.

a. LS that is applied in accordance with the Indonesian community

b. Will be better when given foreign articles

c. Reference list added in RPP

d. Mind map in enrichment from papers and other sources

e. Excellent time management

f. Observer added from other groups

g. Valuable lessons from the model lecturer must be put forward

h. 21st century Life Skills raised in learning: oral communication

i. At reinforcement there is still one direction, whereas actually it can show oral communication by opening a question session

3.1.2. Cycle II (March 8, 2018)

Cycle II carried out on three lesson study stages, namely plan, do, and see. At the planning stage (Plan) carried out on March 6, 2018, at this stage the lesson study team composes the material "Research Focus Action" in the form of chapter design and papers, lesson design and SAP that describe the learning process, learning devices in the form of power point (PPT), student worksheets, observer sheets, observation sheet for assessment of verbal communication skills. Other learning tools in the form of videos related to the focus of action research to provoke students' initial knowledge so that students can guess the topic of learning to be learned. Power point (PPT) as an interactive learning media, student worksheets, learning resources in the form of international and national journal articles. All learning devices and teaching media are used on the basis of evaluating the shortcomings of the cycle 1.

In the implementation stage (Do) carried out in one meeting or once open class for the topic of development of the nature of action research. At the observation stage, data collection was carried out with assistance from observers. The implementation phase was lesson study held on March 8, 2018 at 10.30-11.30 WIB in O3 Building Room 207 Biology Department State University of Malang. At the stage, it is do carried out in accordance with the lesson plan that has been made before, namely an introduction containing greetings, asking for news, student absences, apperception by playing video related to the focus of action research. Furthermore, the core activities which contain discussions consist of group division, article sharing related to the focus of action research, work on the student worksheets by analyzing the articles that have been given, student worksheets presentations and question and answer
discussions between groups. In the discussion session, the question and answer group will discuss the results of the student worksheets that have been done. After that, other groups have the duty to respond or ask questions. Give questions / quizzes to see how far students understand. Give awards to students who answer the best questions and groups. Next is the cover which contains reinforcement from the model lecturer and the class of classroom action research (CAR) lecturer.

The reflection phase (See) of the implementation activities is lesson study carried out after the implementation of the Do ends. At the reflection stage, the implementation team discussed all the implementation that had been carried out at the stage do with the classroom action research lecturer (CAR). Based on observations made by observers there are still shortcomings that need to be corrected in the learning process. The shortcomings that have been revealed in the reflection phase of the second cycle are then corrected in cycle III. Here are the results reflect activities Lesson Study of the second cycle:

1. Usratussyarifah (Lecturer Model)
   a. Clumsy, but trying the best
   b. Poor time management
   c. Students take teaching activity

2. Aida Fitriyatur R (Observer 1)
   a. All students have learned well.
   b. A model lecturer is chill and undertone.
   c. Apperception is good, class atmosphere is quiet but when the discussion is better the group seating has not been arranged.
   d. Group members have their own discussions during the presentation.
   e. Lecturers provide opportunities for students to answer questions before being answered directly by the model lecturer.

3. Amalia Ainun Najah (Observer 2)
   a. All students have studied well, but there is one student who plays cellphones during presentation.
   b. The model teacher's voice is not loud enough,
   c. Lecturers help students who have difficulty when working on student worksheet, sitting positions need to be arranged.
   d. Other group members should also give a response from the answers during the question discussion.
   e. Posttest is given a time limit.

4. Hanifah Rahmawati (Observer 3)
   a. Voice is too soft.
   b. The position of the lecturer should be in the middle to be the center of attention.
   c. Active and collaborative students between friends

5. Student responses
   a. When the closing activities of the model lecturers forgot to pray.
   b. There were groups who were confused in the method of assessment.
   c. Because the award was not explained clearly enough, the affirmation for the next topic The lecturer could explain pleasantly and smoothly, the lecturer was patient and calm.
   d. Lack of feedback from lecturers.

6. Input from lecturer Prof. Dra. Herawati Susilo, M.Sc., Ph. D:
   a. Not reported: LS results today, whether learning objectives are achieved, analysis of the work of students, describe how the learning process plays a role in achieving learning outcomes and 21st century abilities, reports still assess per group not individuals, we need to teach and develop instruments of 21st century capability, do not need to enter blank sheets (existing student worksheet are better written or scanned clearly), fill out lesson sheet for observers and lecturers.

7. Discuss in the report:
   a. Achievement of student learning outcomes: “why and how”
b. Accuracy of the assessment

c. Suitability of the learning strategy used and supported by related articles

d. Observation of observers must be closer to the group

e. Instrument should be validated so that it is appropriate to be used to assess the desired ability.

3.1.3. Cycle III (April 12, 2018)

Cycle III is carried out on three lesson study stages, namely plan, do, and see. At the planning stage (Plan) carried out on April 10, 2018, at this stage the lesson study team compiled material "Analysis and Interpretation of Action Research Data" in the form of design chapters and papers, lesson design and lesson plan that describe the learning process, learning devices in the form of power points, student worksheets, observer sheet, observation sheet assessment of communication skills. Other learning tools in the form of images that present action research data to provoke initial knowledge so that students can guess the topic of learning to be learned. Power point (PPT) as an interactive learning media, MFI, learning resources in the form of international and national journal articles. Questions about the pretest and posttest to see how far students understand. All learning devices and teaching media are used on the basis of evaluating the shortcomings of the cycle 1.

In the implementation stage (Do) carried out in one meeting or once open class for the topic of development of the nature of action research. At the observation stage, data collection was carried out with assistance from observers. The implementation phase was lesson study held on April 12, 2018 at 10.30-11.30 WIB in the O3 Building Room 207 biology department State University of Malang. At the stage, it is do carried out in accordance with the SAP that has been made before, namely an introduction containing greetings, asking for news, student absences, apperception by displaying action research data and giving pretest questions. Furthermore, the core activities which contain discussions consist of group division, article sharing related to learning topics, work on MFIs by analyzing articles that have been given, student worksheets presentations and question and answer discussions between groups. In the discussion session, the question and answer group will discuss the results of the student worksheets that have been done. After that, other groups have the duty to respond or ask questions. Post to see how far students understand. Give awards to students who answer the best questions and groups. Next is the cover which contains reinforcement from the model lecturer and the class of classroom action research (CAR) lecturer.

The reflection phase (See) of the implementation activities is lesson study carried out after the implementation of the Do ends. At the reflection stage, the implementation team discussed all the implementation that had been carried out at the stage do with the classroom action research lecturer (CAR). The following are the results of reflection on activities Lesson Study from cycle III:

1. Aida Fitriatur R (Lecturer Model)
   a. Time allocation for discussion and test is too long

2. Amalia Ainun Najah (Observer 1)
   a. Group 1 brave to start student worksheet discussions, good group discussions but the most passive group discussions from other groups
   b. Lecturers lure students to give responses
   c. Lecturers can mediate differences of opinion between students
   d. Loud lecturer voices and lecturers are patient in explaining

3. Usyratussyarifah (Observer 2)
   a. Lecturers and students are good enough to carry out learning
   b. Color combination there are slides that are not good.
   c. Discussion is smooth and lecturer is successful demanding that students be active.
   d. Lecturers give feedback.
   e. All students learn well
   f. Learning objectives are achieved well
   g. Lecturers ask for difficulties when the work of a teaching and learning activities
   h. Lecturer can maintain good condition of class
4. Hanifah Rahmawati (Observer 3)
   a. Students learn according to the topic well learn.
   b. Lecturers visit the student desk to ask about difficulties
   c. Communication is very good when discussing
   d. Working with teaching and learning activities for too long
   e. Lecturers master the reinforcement material well
   f. Students analyze the articles well
5. Response of Students
   a. Lecturer can bring a relaxed but serious learning
   b. Using the appropriate greeting words for students
   c. Learning is good
   d. Given ice-breaking so that students are bored
6. Input from lecturer lecturer Prof. Dra. Herawati Susilo, M.Sc., Ph.D
   a. Learning is very exciting even though the article with English
   b. Small class with supportive students so that learning can be done easily.

4. Discussion

4.1. Plan
Activities in cycle 1, cycle 2 and cycle 3 include results of Chapter Design, Lesson Design, Classroom Design, Learning Tools, Selection of Learning Media. But results of planning from cycle 1, cycle 2 and 3 have differences in cycle 1 the results of chapter design discuss the nature of action research, Classroom Design Class is designed to U form with 3 large groups, each consisting of 3 members supervised by 1 observer, Selection of Learning Media uses Emoticon points designed to respond when discussions take place with emoticon smile rules for agreed responses, emoticons ideas for giving questions, answering questions and other responses to answers to questions. Learning resources in the form of national journal articles.

While in cycle 2 results of chapter design discuss the Focus of Action Research. Classroom Design class is designed to U form with 3 large groups, each consisting of 3 members supervised by 1 observer. Selection of Learning Media using Video when apperception about how to find the root of problem and determine focus of solution taken to overcome problem, learning resources in the form of national journal articles were conducted pre-test and post-test. From cycle 1 to cycle 2, there is an increase in quality of lesson plan.

Furthermore, in cycle 3 results of chapter design discuss analysis and interpretation of research data. Classroom Design class is designed to form U with 3 large groups, each consisting of 3 members supervised by 1 observer. Selection of Learning Media uses data of a study to provoke students' initial knowledge so that students can guess the learning topics to be studied and also use Power points (PPT) as interactive learning media, student worksheet, learning resources in form of books and international journal articles and Game points. The pretest and posttest were conducted. From cycles 2 to 3 there is an increase in the quality of lesson plan, and quality of articles used.

4.2. Do
After designing learning plan, next step is to apply learning design. At this stage model lecturer applies learning design in accordance with tools previously prepared. In cycle 1, cycle 2 and cycle 3 implementation is almost same because learning model is equally using Problem based Learning. The difference in learning media used is in cycle 1 using emoticon points, selecting national journal articles, cycle 2 using interactive video, selecting national journal articles, and cycle 3 uses game points, selection of international journal articles. The assessment instrument in first cycle topic of nature research is a tool used by model lecturer to assess student learning outcomes. The assessment instrument used activities is lesson study at student worksheet, and observation sheet assesses communication skills of each group. Learning resources form of national journal articles. The assessment instruments used lesson
study topic of action research focus in form student worksheets, pretest posttest questions and observation sheets assessing communication skills of each individual which is an improvement in cycle 1 that does not use communication tests and assessments that are still assessed by each group. Learning resources form of national journal articles. The assessment instruments used activities lesson study topic analysis and interpretation of action research data form of student worksheet, pretest posttest questions and observation sheets assessing communication skills of each individual.

The improvements made in cycle 3 are selection of international journal articles that can help improve student communication skills. With the learning this time, it was seen that students were motivated in taking part in learning, because they considered that learning was a cool learning. Learning steps are generally the same, namely opening learning by conveying learning objectives and motivating students, followed by core activities in the form of submitting work procedures, giving and working on class exercises, group presentations and closing with assignments. The implementation of learning from stages 1, 2 and 3 shows improvement of quality, especially in student communication skills. Assessment of student communication skills uses a communication skills assessment rubric that is designed by analyzing learning objectives. The criteria for assessment of communication skills are very good = 86 - 100, well = 71-85, good enough = 51-70, not good = ≤ 50. The results of assessment first cycle communication skills cannot be commented on because they still use assessment rubric in groups, so data what is obtained not valid so it needs to be repaired rubric of communication skills with individual assessments in cycle 2. The results of assessment of communication skills in cycle 2 can be seen in Figure 1.

![Figure 1. Results of Assessment of Communication Skills of Students in Cycle 2 Action Learning Research Subjects](image)

Based on assessment results student communication skills in action research subjects in cycle 2, it can be seen that students' communication skill were good enough (11%), good (67%) and even some very good (22%) (Figure 1). This result is certainly an improvement from previous learning. In previous learning we assessed by group. However, in this study we assess per individual student. Furthermore, results assessment of 3rd cycle communication skills can be seen in Figure 2.
Based on results of student communication skills assessment cycle 3 action research subjects on topic of Data Analysis and Interpretation can be seen that student discussion communication skills are good enough, good and even very good (Figure 2). Assessment of student communication skills obtained results that as many as 3 students (27%) have ability to communicate high, as many as 4 students (55%) have ability to communicate moderately and remaining 2 students (18%) have ability to communicate adequately. Based on results from cycle 1 to cycle 2 there was an improvement in assessment of communication skills per group into an individual assessment. From cycle 2 to cycle 3 there was an increase in student communication skills with very good criteria, namely from 22% to 27%. This means that application of learning models problem based learning can improve students' oral communication skills through lesson study. This is consistent with results of research from [9] that students' oral communication activities with metacognitive learning approaches based on lesson study have increased, average student activity is only 23.75%, cycle I 31.6%, to 51.6% in cycle II.

Based on the results of the assessment of student communication skills, the action research subjects obtained results of cycle I to cycle II did not experience improvement because they were not measured using the communication rubric, and cycle II to cycle III increased by 5% for excellent communication skills. Students' oral communication skills are measured using the communication rubric. The results of the assessment of communication skills in cycle 2 to cycle 3 can be seen in Figure 3.

Figure 2. Results Assessment Communication Skills of Students in Action Research Subjects in Cycle 3 Learning

Figure 3. Results Assessment Communication Skills of Students in Research Action Subjects in Cycle 1, Cycle 2, and Cycle 3 Learning
The application of lesson study in the learning process is a good step to achieve educational goals as stated in Law number 20 of 2003 concerning the National Education System. In the Law, it is stated that national education functions to develop capabilities and shape dignified national character and civilization in order to educate the life of the nation. Education aims to develop the potential of students to become human beings who believe and fear God Almighty, are noble, healthy, knowledgeable, capable, creative, independent, and become citizens of a democratic and responsible. Lecturers are required to be professional to be able to achieve these educational goals. The professional attitude of the lecturer is not just to have knowledge of technology and management but also to have an attitude that can direct and guide students to be able to learn in the real sense. The main task of a lecturer is to hold learning activities. In order for these activities to be carried out effectively, a lecturer must know the nature of learning, teaching, and learning strategies. A lecturer must recognize the potential and ability of students, master the learning strategies chosen and adapted to the conditions of students, master the material or teaching materials well, and always evaluate to improve the quality of learning.

According to [10] the implementation of lesson study has following impacts (1) collaboration, collegiality, and communication between teachers and lecturers are formed. Learning contextual mathematics based on lesson study can improve mathematics learning skills. The results of research conducted by [11] that communication skills and student learning outcomes increase after applying learning lesson study with higher Mind Mapping media (72.88%) than those taught by conventional learning models (68.97%) in the subject of the colloidal system. The results of research conducted by [12] show that the application of Lesson Study can improve students' mathematical communication skills. This is seen from the average test scores in Cycle I, which is 69.83 and Cycle II is 84.84.

4.3. Reflection
Phase reflects the implementation after applying the learning design. In this case, the model lecturer responds to the learning that has been carried out. In addition, the observers gave comments on the results of observations that had been made and there were also comments given by students as a reflection of learning. The strengths that we found should be maintained in the future, while the weaknesses we found should be minimized. The activities lesson study that have been carried out can be reflected that in using model the Problem Based Learning lecturer needs to strengthen the work of students so that students can correct which ones should be improved.

5. Conclusion
The conclusion of this study is the application of a problem-based learning model (Problem Based Learning) through lesson study to improve students' oral communication skills in action research courses in education which is increased by 5% of very good communication skills.

References
[1] Harsono & Dwiyanto, D. (2005). “Pembelajaran Berpusat Mahasiswa”. Kumpulan Naskah Pembelajaran Pusat Pengembangan Pendidikan UGM. Yogyakarta: Aditya Media Yogyakarta Bekerjasama dengan PPP UGM
[2] Rahayu, dkk. (2012). Pengembangan Pembelajaran IPA Terpadu dengan Menggunakan Model Problem Based Learning Melalui Lesson Study. Jurnal Pendidikan JPII 1 (1).
[3] Suyanto. (2008). Model Pembelajaran Problem Based Learning. Jakarta: Grafindo
[4] Bernard, Martin. (2015). Meningkatkan Kemampuan Komunikasi dan Penalaran Serta Disposisi Matematik Siswa Smk Dengan Pendekatan Kontekstual Melalui Game Adobe Flash Cs 4.0. Jurnal Ilmiah Program Studi Matematika STKIP Siliwangi Bandung, Vol 4, No.2, September 2015.
[5] Sudrajat, A. K. 2017. Meninjau Lesson Study Sebagai Sarana Pengaplikasian Kurikulum 2013. Pros. Seminar Pend. IPA Pascasarjana UM Volume 2 2017
[6] Sujadi, I. (2011). Penerapan Blended Learning pada Perkuliahan dengan Kurikulum Berbasis Kompetensi. Prosiding Seminar Nasional Matematika dan Pendidikan Matematika UNS
2011.

[7] Susilo, H. Chotimah, R. Joharmawan, dkk. (2010). *Lesson Study Berbasis Sekolah*. Malang: Bayumedia.

[8] Cerbin, William, Bryan. (2006). Lesson Study as a Model for Building Pedagogical Knowledge and Improving Teaching. *International Journal of Teaching and Learning in Higher Education* 2006, Volume 18, Number 3, 250-257 http://www.isetl.org/ijtme/ ISSN 1812-9129

[9] Susanto, Dr. Herry Agus. (2015). Improving Students Activity in Mathematics Communication Through Metacognitive Learning Approach Based On Lesson Study. *International Journal of Education and Research* Vol. 3 No. 2 February 2015

[10] Karim, Muchtar Abdul. (2006). Implementation of Lesson Study for Improving The Quality of Mathematics Instruction in Malang. *Tsukuba Journal of Educational Study in Mathematics. Vol.25.*

[11] Fadhilah, Annisa. Dewi, Ni Putu Laksmini C. Ridlo, Dimas. (2016). The effect of application of contextual teaching and learning (CTL) model-based on lesson study with mind mapping media to assess student learning outcomes on chemistry on colloid systems. *International Journal of Science and Applied Science: Conference Series P-ISSN: 2549-4635 Int. J. Sci. Appl. Sci.: Conf. Ser. Vol. 1 No. 2 (2017) 101-108 E-ISSN: 2549-4627 International Conference on Science and Applied Science 2016 doi: 10.20961/ijsascs.v1i2.5128*

[12] Manulang, Rita Yemema. Widada, Wahyu. Herawaty, Dewi. (2016). Implementation of Lesson Study in Undergraduate to Improve Mathematics Communication Ability. *International Journal of Science and Research (IJSR) ISSN (Online): 2319-7064 Index Copernicus Value (2016): 79.57*