

# COMBINATION OF PROBLEM-BASED LEARNING AND LOVE IMPLEMENTATION IN LESSON STUDY ACTIVITY TO IMPROVE STUDENTS' LEARNING RESULT

Irfan Yunianto, Nani Aprilia, Trikinasih Handayani  
*Biology Education Department, Faculty of Teacher Training and Education,  
Universitas Ahmad Dahlan, Jalan Prof. Dr. Soepomo Warungboto, Yogyakarta, Indonesia  
irfan@pbio.uad.ac.id*

**Abstract:** An effective attempt to improve learning quality is creating good and solid learning community which is also willing to do continuous improvement. This attempt is implemented in lesson study, which covers three main activities, i.e. plan, do and see. The lesson study involves all lecturers belong to the same subject group to work collaboratively based on mutual learning. It has been discovered a root problem of students' learning in animal physiology I course which required prioritized solution. This problem was the students' learning achievement in cognitive domain. Learning strategy implemented in this lesson study activity was problem-based learning (PBL) combined with LOVE (*Lembar Observasi Video/Video Observation Sheet*). This approach aimed to improve students' learning result. Four cycles of lesson study activities was conducted in animal physiology I course in Biology Department, Faculty of Teacher Training and Education, Universitas Ahmad Dahlan, Yogyakarta. The implementation of this lesson study involved a lecturer as a model with 9 observers and 48 students in a class, on March-April, academic year 2012/2013. Data showed that implementation of PBL combined with LOVE improved students' learning result with the average score of 48,64; 52; 71,9 and 71,7 in each cycle respectively.

**Keywords:** problem-based learning, love, lesson study, learning result

## 1 INTRODUCTION

Biology Education Department in Faculty of Teacher Training and Education, Universitas Ahmad Dahlan is one of the Teacher Training Institution that has responsibility for educating professional biology teacher candidates. The major challenge for biology education department was to improve students' knowledge, competences and skills to comply with national education system. Curriculum analysis was continuously implemented to evaluate the needs of external stakeholders, which includes the Senior High Schools. Teacher candidates have always been familiarized with schools' curriculum to better understand the dynamic requirements of those schools. Knowledge and skills are major consideration to be continuously improved. In order to conduct the improvement in learning process, lesson study has been implemented.

In lesson study, lecturers belong to the same group evaluated the learning process in the class collaboratively. This activity was based on collegiality and mutual learning principles among the lecturers themselves to create learning community. Lesson study also serves as a tool to aid lecturers in creating high quality of lesson plan as well as a guidance to implement this lesson plan in the class.

Lewis et al. (2006) stated that teachers or lecturers should produce high quality of lesson plan, observe and analyze the actual learning experienced in the class. In that way, teachers will make better implication for the learning design and actual learning process continuously.

Teachers in Japan have implemented lesson study model for decades to evaluate how they manage learning design in the class. Furthermore, teachers in United States of America also found the fact that students' good score in mathematics subject was related with lesson study that has been implemented previously (Lanski & Caskey, 2009). As reported by Lewis et al. (2006) Lesson study implementation in USA has been the fastest-growing model of teacher professionalism development program. Since 2000, many elementary schools have developed lesson study model for their teachers. This approach helped teachers to create learning community in planning and implementing the lesson plan for their students.

Animal Physiology I is one of the core courses for 4<sup>th</sup> semester students of biology education department. This course is a pre-requisite for animal physiology II which is offered in 5<sup>th</sup> semester. Basic competence for this course is to understand physiology concepts in animal's system and

correlation between each system and its application in the real life. Based on the basic competence formulation, characteristic of this course is in cognitive level C2 and C3 dominantly. However, high order thinking skills have always been a consideration in the learning process.

It has been identified the root problem of students' learning in animal physiology 1 course was learning achievement in cognitive domain. Learning result of this course in the past depicted the students had problem in understanding basic concept and theories of the topic. The difficulties were in extracting information from the textbook or any other learning source which described the topic. Several indicators had been observed to support this conclusion. They were the student's ability to rewrite the concept that has been previously explained was inaccurate, the student's ability to answer short question regarding the concept was low, and the student's presentation of the concepts before their friends was also incorrect. Eventually, their achievements in mid semester examination and or final examination were unsatisfied. However, during the course, some students have shown their best effort to understand the materials by any means, including intensive discussion within student's group. This condition was also observed and considered as the potential answer on the root problem.

Lecturer group discussion as part of the lesson study activity found that Problem-based Learning (PBL) has been considered as a successful and innovative method to assist students in their learning process. This model has opened a new engineering education in accordance with many other learning models with the objective to improve learning quality. Many efforts have been done to clearly define the concept 'problem-based learning'. Howard Barrows, one of the person involved in the development of this model at Mc Master University, Canada, explained the concept in terms of specific attributes as being student-centered, taking place in small groups with the teacher acting as facilitator and being organized around problems (Barrows, 1984 in De Graaff and Kolmos, 2003).

Furthermore, as explained by Hmelo-Silver (2004) that problem-based approach to learning asks the student to experience problem solving so they can learn both content and thinking strategies. PBL is an instructional method in which students learn through facilitated problem solving. They learn complex problem that sometimes does not have single correct answer. They also need to work in group collaboratively to identify what they need to learn in order to solve the problem. Students are engaged in self-directed learning (SDL) and then apply their new knowledge on the problem and the effectiveness of the strategies employed. Teachers role in this method are as facilitator rather than providing knowledge directly to the students.

Ernst & Colthorpe (2008) explained that learning is an active process which involves all learners in many activities to enable them explore and discover ideas to solve the problems. In this case, problem-based learning approach plays its role in the learning process where learners are exposed to the problem first so they would learn to find to solution.

This kind of active learning was proved to be effective in biology learning process as reported previously (Udovic et al., 2002) to develop students' comprehension on essential biology concepts as well as improve scientific discoveries and critical thinking skills.

In addition, students also needed to improve their understanding on the topic. Due to characteristic of animal physiology course which contains many definition and mechanisms of animal system organs, a full pictures and diagrams explanation solely was not sufficient. At this point, video played important role in complementing learning media for the students. As a treatment to encourage students in extracting information regarding the topic independently, student worksheets were given. This worksheet required students to observe video related to the topic to enhance their understanding on the concept. This worksheet was specially named LOVE (Lembar Observasi Video/ Video Observation Sheet). Implementation of PBL combined with LOVE in lesson study activity on animal physiology 1 course was expected to improve students' learning result.

## 2 METHODS

Basically, lesson study was conducted in three main activities, i.e. plan, do, and see (reflection). Several previous studies have described the practice of those activities in the class which involves the teachers or lecturers belong to a group. Nahadi (2007) reported the implementation of school-based lesson study with one teacher as a model accompanied by the other teachers in collaboration with lecturers who served as observers. Similar study has also been conducted by Sriyati (2007) who involved high school teachers to be observers in the lesson study activities in accordance with the implementation of classroom action research.

In this study, lesson study activities to improve students' learning result on animal physiology 1 course was conducted in Class B of 2<sup>nd</sup> year (4<sup>th</sup> semester) student academic year 2012/2013 with the total number of students was 48. There were one lecturer appointed as a model, 8 observers and one cameraman/photographer to record the whole activities in lesson study. Implementation of the lesson study was from March 11, 2013 to April 3, 2013 divided into 4 cycles of *plan, do* and *see*



activities. In plan session, all lecturers involved tried to identify the learning problem. They also designed the lesson plan, student worksheet and observation sheet afterward. The observation sheet was used to collect data regarding the student activities during the lesson. In addition, all student progress and their achievements were also recorded to be analyzed.

The next step was *do*, which means the implementation of lesson study in the class. Also known as open class, a lecturer appointed as model conducted the learning process in the class while at the same time the observers observed the students activities during the lesson. In this session, the role of cameraman/photographer was very important in capturing anything happened in the class as an evident of students responses to the learning model implemented by lecturer.

After the class was over, all observers, a model and cameraman assembled together in lecturer's room to discuss whatever happened during the open class. This session is known as 'see' or reflection. A model was given the first opportunity to express his feeling and thoughts regarding the learning model that had just been implemented previously. The observers gave their opinions and facts they found regarding the student responses, supported by the data they wrote on observation sheets and the video recorded in the class. The discussion in this session produced suggestions for the improvement in learning process on the next cycle.

In this paper, all data were obtained from post-test on each cycle. The test was conducted after the student presentation session so all materials had been delivered and discussed previously within the groups of the students. In order to objectively assess student's comprehension on the topic, all tests were designed as short essays. The Minimum Completeness Criteria (MCC) was defined at score 70. This was based on the average students score on animal physiology I course in the previous year. The MCC described the student ability to fulfill the basic competences on the course.

On the other hand, observation sheet filled by all observers were also taken into consideration. This described the student responses during the learning model implementation in the class. All observer suggestions were also considered carefully to support the problem solving in animal physiology I course. The data were then analyzed using quantitative description.

### 3 Results and Discussion

Four cycles of lesson study activities which cover plan, do and see have been conducted. The implementation of Problem-based Learning (PBL) in combination with LOVE (Lembar observasi Video/Video Observation Sheet) have shown an

increase both in student learning results and the number of student who pass Minimum Completeness Criteria (MMC) as seen in Figure 1.

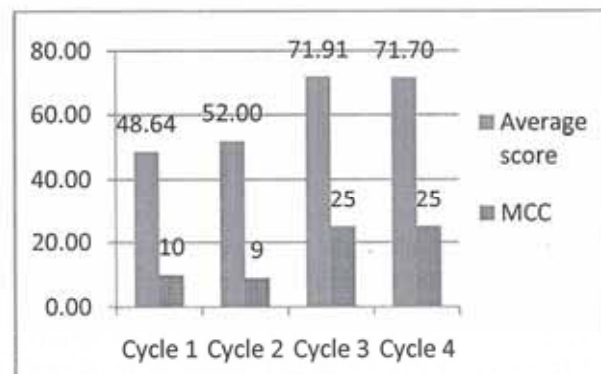


Figure 1. Post-test average score and number of student passing minimum completeness criteria (MCC) on each cycle during lesson study activities in animal physiology 1 course.

Overall, there was an increase in the score average of the students in animal physiology 1 course of 48,64; 52; 71,91; and 71,70 in cycle 1 to cycle 4, respectively. There was also an increase of student number who passed MCC from 10 students in cycle 1 to 25 students in cycle 4.

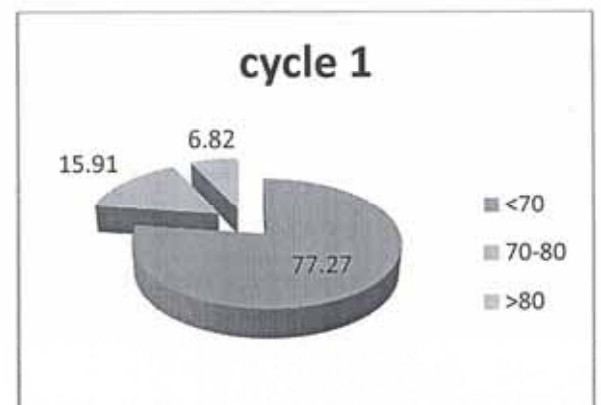


Figure 2. Students score proportion (%) in cycle 1 of lesson study activity.

Post-test average score obtained by students in cycle 1 was the lowest (48,64) with only 10 students pass MCC. This reflected the general capability of the students to understand the materials was low.

In fig.2, score proportion showed that more than 77 percent of the students have not passed the MCC which was set at score 70. Only 15,91 percent of the students got average score in range of 70-80, while only approximately 6 percent of the students had the highest average score of more than 80.

Topic delivered in cycle 1 was about human digestive system. Based on the lecturers discussion in plan activity, it was decided to give the student

general overview of the material first, followed by distributing students worksheets to each group. Focus group discussion (FGD) was undergone intensively under the supervision of lecturer. In this session lecturer acted as facilitator to guide the students working on their assignments. Video material contained brief explanation of the topic was also distributed to each group to help the students answering related questions in their worksheets. It was observed clearly that students' response to this approach was not very satisfied. They seemed to be unfamiliar to learn in such environment that required them to extract information from many learning sources and then discussed it in the group. Conventional learning model that was usually conducted in the class made the students acted passively. This contributed to the lowest achievements of the average scores and number of students achieving MCC in the first cycle.

Reflection discussion on the first cycle found that this approach should be continued in the next cycle. What needed to be improved was the general explanation from the lecturer which should cover details on the topic prior to ask the students extracting information from the video. Post-test was also needed to be more specific to the topic so that students would have less difficult in answering the questions.

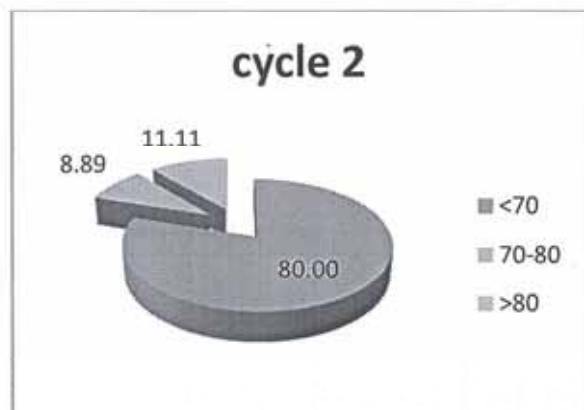


Figure 3. Students score proportion (%) in cycle 2 of lesson study activity.

The second cycle showed an increase in the post-test average score. This depicted that students understanding to the topic was generally improved. They started to be familiar with the PBL approach in learning process. In this way, PBL could serve as an advancement tool in learning as previously reported by Hillman (2003). Video materials were also helpful in supporting the students' comprehension on the topic. However, the student number passing MCC was slightly decline to 9 from 10 in the previous cycle. Only 20 percent of the students completely fulfill the basic competence

of the course (fig. 3). Despite the decline, there was an increase in the percentage of the students obtained the highest average score of more than 80. Topic of this session was about human respiratory mechanism. Complexity of the topic could also contribute to the students difficulties in understanding it.

Reflection discussion of the lecturer and observers recommended the use of more diagram and pictures to assist the students. It was concluded that in explaining mechanisms, video played important role to enhance students' comprehension. Therefore, the next cycle should also deliver the material in the form of video. The LOVE worksheet also described the students' improvement in extracting concepts and theories of the topic more accurately. A group of students was also identified as having difficulties more than any other group. This group showed sluggishness in the process. It turned out the member of this group was the repeater students, who did not successfully pass this course last year. This group needed more concern and guidance from the lecturer that served as facilitator.

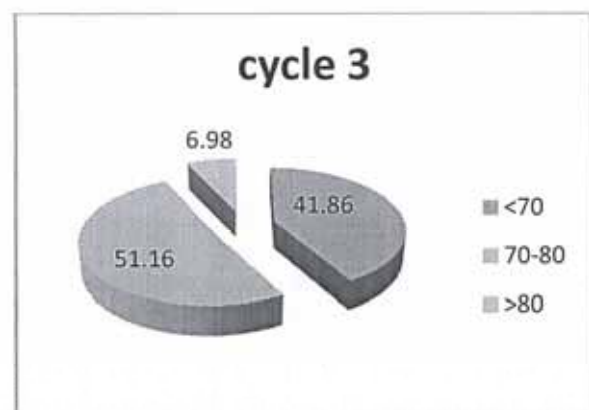


Figure 4. Students score proportion (%) in cycle 3 of lesson study activity.

In cycle 3, as depicted from fig. 1 and 4, students average score reached the highest point at 71,91. Number of students achieved MMC also increased sharply from 9 in cycle 2 to 25 in cycle 3. Students' score proportion described the number of students passed MMC was almost 60 percent compared to the previous cycle which was only 20 percent.

Implementation of PBL seemed to increase not only students' comprehension on the materials, but also the students' independence in learning process. They were no longer entirely depended on lecturer, instead, they experienced the way of extracting information directly from various learning sources, including video. They were also trained on how to express the ideas in the group and combining the concepts they found to understand the topic. At the end of FGD, a representative of each group presented the concept before his/her friends in order



to get feedback. This session was also useful for the lecturer to monitor the students' comprehension and to make any revision when misconception occurred. In this cycle, students seemed to be more prepared in discussing the materials with group members. Topic delivered in this cycle was still about respiratory system, with subtopic lung volume and respiratory regulation. The problem in the worksheet was related to the daily life. In this case, students could get real example of the topic to support their comprehension. There were no substantial misconception or difficulties experienced by the students suggested that this cycle was better than the previous cycles.

PBL approach was helpful for the students in their learning process. However, when setting the students on a problem solving course, they don't know what to do at first. In this case, lecturer needs to provide facilities so they can find out information to solve the problems (Johnston, 1997 in Hillman, 2003). Video served as the best facility to support the explanation of mechanisms or process rather than just images or pictures alone. The video observation sheet (LOVE) was proved to assist students in understanding the topic.

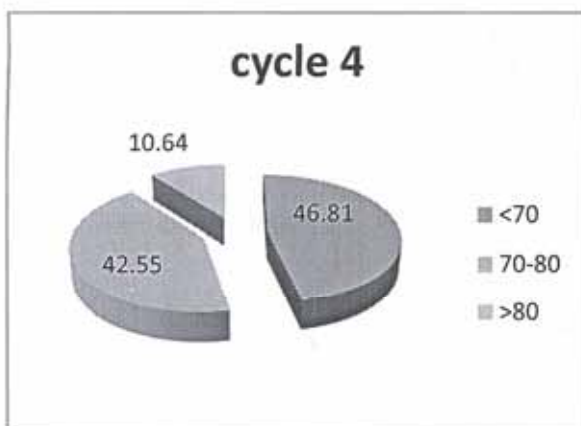


Figure 5. Students score proportion (%) in cycle 4 of lesson study activity.

The fourth cycle of lesson study activity was conducted in the topic cardiovascular physiology. This topic was known to be intricate due to many concepts that required detail observation and thinking from the students. The use of video in explaining the cardio cycle was very substantial. It was found that students' post-test average score was slightly reduced compare to the third cycle (fig. 1). However, the number of students passed MCC was equal to the previous cycle. Score proportion (fig. 5) depicted the increase number of students who obtained the score above 80. The students' number percentage in cycle 4 was decrease in MCC compared to cycle 3 due to the unequal number of total students' presence in those cycles. In last cycle, there were 47 students compared to 43 in third cycle.

In the reflection session, all lecturers evaluated the PBL implementation with the use of LOVE to assist the students achieving the best result. They concluded this approach was significant in improving students' learning result. In accordance to this conclusion, Hmelo-silver (2004) explained that as a matter of fact, PBL can help students develop: flexible knowledge, effective problem-solving skills, self-directed learning skills, effective collaboration skills, and intrinsic motivation.

In order the students to be successfully learn in PBL environment, there are 7 steps that were suggested, i.e.:

1. Students need to clarify the concepts
2. Students need to define the problem clearly
3. Students analysis on the problem
4. Students find the explanation
5. Students formulation of the learning objective
6. Students need to search further information
7. Students need to report and test new information accurately.

Eventually, using PBL, students become lifelong learners who have learned to take responsibility for their own learning process (De graaf and Kolmos, 2003).

In addition to that, determining MCC should be more comprehensive to get the most objective point. Nasirullah (2013) stated that deciding the MCC was complex. Many things should be taken into considerations, such as complexity of the course, facilities that support the learning process and the individual capability of the student. In this case, through lesson study, lecturers have the opportunity to learn and discuss more about setting up the MCC objectively.

At the end, lesson study activity was a significant attempt not only to improve professionalism of lecturers, but also to increase the students' learning quality. As previously explained by Lenski and Caskey (2009), lesson study activity was very helpful to improve lecturers'/teacher's professionalism by constructing, organizing, sharing, and sharpening their knowledge in learning process. Therefore, plan, do and see need to be implemented appropriately to solve students' learning problems and at the same time, help them achieving the expected competences.

## 4 CONCLUSIONS

Combination of PBL with LOVE implemented in lesson study activity improved the students' learning result. PBL approach in learning has opened up students' mind to significantly develop their knowledge, self-directed learning skill,

collaboration skill and also problem-solving skill that made them a lifelong learners. Moreover, lecturers' professionalism through working collaboratively in plan, do and see activities was also improved. In lesson study, there was wide opportunity for the lecturers to develop skills in planning, implementing and evaluating the learning strategies to improve learning quality.

## 5 ACKNOWLEDGEMENTS

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