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Applying lesson study in basic physics-6 to improve students' achievement

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Abstract. The study was aimed at describing: the quality of lesson study; the quality of student learning activities; and the improvement of students achievement before and after lesson study. The subject of study was 4 lecturers majoring in physics education and one class of students of Physics Education Department, Ganesha University of Education. The object of research was quality lesson study, learning activities, and students' achievement at basic physics-6. The type of research was case study with qualitative description analysis. The quality of lesson study was measured by observation of plan, do, and see. The improvement of learning activity was measured by observation and interview, and students' achievement quality in basic physics-6 was measure by test. The results showed: the quality of lesson study is good category; the student learning activity during the lesson study as active category; and the students' achievement at basic physics-6 after lesson study improved with good category (before lesson study : $\bar{x}_1 = 41.2$ bad category and after lesson study: $\bar{x}_2 = 73.8$ good category)

1. Introduction

Lesson study is a model of professional education through collaborative and sustainable learning based on the principles of collegiality and mutual learning to build community learning [1,2]. Lesson study is not a method or learning strategy but lesson study activities can apply various methods or learning strategies that are appropriate to the situation, condition, and problems faced by the teacher. Lesson study is potential for enhancing an instruction and enriching classroom activities [3].

Excess lesson study is: 1) lecturer can formulate long-term learning and development objectives; 2) Collaboratively design a research lesson; 3) Implementing the lesson by assigning a lecturer to teach and other member team to observe to collect data on classroom learning events; 4) Discuss learning events that have been observed during the learning process, using the information to improve the quality of learning; and 5) Implementation a revised learning program in other classes, and if necessary review and refine the learning program [4]. This means that with the use of lesson study it is expected that the lecturer will facilitate the students to be actively involved in the learning, so that the learning atmosphere will be more meaningful. The position of the lecturer is as facilitator and mediator, while the students learn to find their own problem solving skills. Application of lesson study approach can also develop problem solving skills in mathematics [5].

Different things are found in Basic Physics-6 course in the Department of Physics Education. So far various innovative learning models have been applied by lecturer, among others through teaching grants programs. However, from the observation results, it is found that achievement of student learning outcomes on average still less satisfactory. Where as only about 15% of students who are able to obtain an A grade in Basic Physics-6 academic year 2013/2014 [6]. In general, there are many



lecturers who teach by using teacher centered learning because it still holds the assumption that knowledge can be transferred whole from the mind of the lecturer to the mind of the student. This requires serious attention from all parties to mitigate the factors that cause it.

The results of observations made related to the factors causing the lack of quality of Basic Physics-6. Some of the factors are caused by the teaching pattern of lecturers; including lecturers still incline to do the learning process that is centered on their own. In classroom learning, only lecturers know the processes that occur in the classroom so that the lecturer has felt himself good and lacks the competence; lack of ability of lecturers in understanding the world of learners and lecturers teaching Basic Physics-6 only to pursue material achievement so that it is textbookish; lecturers pay less attention to the way students learn and less developing learning strategies to improve learning outcomes, especially learning outcomes and student learning activities.

Based on the identification of the problem, it is deemed necessary to try out a physics learning approach that can improve the quality of Basic Physics-6, can increase the activity and learning outcomes of students through the effectiveness of the learning process in the classroom. This can be done if the lecturer forms a lesson study team. Instructional quality that is achieved by a teacher depends very much on the teacher's knowledge base for teaching [7].

Successful application of learning with lesson study has been found by many researchers. They show that lesson study is an effective model to develop teacher competency. Sumarti [8] shows that lesson study can develop the mastery teacher candidates' professionalism. Marsigit [9] concludes that lesson study activities enhance teacher professionalism in teaching performances, variations of instructional methods, and collaborative work. Cheng & Yee [10] conclude that lesson study motivates teachers to reconstruct students' thinking and planning lessons that discuss students' misconceptions based on their thinking models. Furthermore, Lewis, Perry, & Hurd [11] state that teachers use lesson study to develop mathematics knowledge and its instruction, cooperative capacity and instructional material quality. This means that lesson study lectures allow lecturers to see their own learning outcomes through student responses and colleague's responses, so that lecturers can see how students experience effective learning to improve the quality of education. Observing the description above, it is believed by applying lesson study can improve the quality of lectures in the Basic Physics-6.

The purpose of this study was (1) to describe the quality of the implementation of the lesson study, (2) increase student's learning activity, and (3) improving student learning outcomes in Basic Physics-6 courses through lesson study.

2. Methods

This type of research is case study. The subject of this research is one group of lecturer majoring in physics education with one lecturer model and one student class. The number of subjects are 4 physics lecturers and one class consist of 21 students. The technique of taking the subject was done purposively. Data collection was done by using, test, questionnaire, observation and interview. Quality data of lesson study and student learning activity were collected through observation, student achievement data was collected through test given before and after lesson study. The results of the observations were then reinforced by interviews. The analysis was done descriptively qualitative. To determine the level of qualification of implementation lesson study as shown in Table 1 were used.

Table 1. Criteria of qualification of implementation lesson study

Skor range	Category
85- 100	Very Good
70- 84	Good
55- 69	Sufficient
45-44	Bad
Less than 45	Very Bad

3. Result and Discussion

3.1 Result

In general, the results of the study described in this section is the quality of lesson study implementation at the stage of the plan, do and see, and score of student activity and achievement before and after the lesson study.

3.1.1 The Quality of Lesson Study Implementation

Implementation of lesson study in Basic Physics-6 was conducted in Department of Physics Education Universitas Pendidikan Ganesha. This study was started with a workshop to provide the teachers with the concept and practices of lesson plan. At this time the writer played the role as a resource person. After they had some understanding of the concept and practice about *lesson study*, the activities continued with the implementation of lesson study at Basic Physics-6 class by following the steps in lesson study, namely planning (plan), action (do) and reflection (see) [12].

3.1.2. Implementation Lesson study in Plan Stage

Based on observation, it is generally found that the first stage of the implementation of the plan is well run. This is indicated by several agreements at the stage of the plan, among others: the determination of the model lecturer, the lesson plan collaboratively prepared by the lesson study team, and all team members participate in the discussions; all learning tools are well discussed; discussed the next learning agenda. In the second plan the lesson study team experienced stability in terms of attendance.

3.1.3. Implementation Lesson study in Do Stage

The essence of the implementation of the stage the lesson study was the implementation of the lesson plan that has been made, where a lecturer acts as a model lecturer bringing lesson plan in real class, while the other lecturer as an observer. The observers make observations on the performance of students. Activities lasted until the time limit has been set, that is two hours of lessons. To document the research lesson using camera, student work, student response questionnaire, and narrative observation note.

3.1.4. Implementation Lesson study in See Stage

The third stage of lesson study is see (reflection). Participants of this reflection activity are all team of lesson study. Discussion activities at the reflection stage are led by moderators. In open class activities invited by consolidator team are: lecturer, team of lesson study of faculty, head of department and administrator.

3.1.5. Quality of implementation lesson study

The effectiveness of the lesson study was observed using observation format consisting of 42 items of statement as follows: 11 plan stages, stage do 17 grains and see 14 stages. The quality of the lesson study observed by the observers can be seen from the percentage of observers who gave positive responses at each stage of the lesson study. Table 2 describes in general the quality of the implementation of the lesson study cycle.

Table 2. The average value of cycle lesson study

Lesson Study Cycles	Results	
	Means	Category
<i>Plan</i>	81.52	Good
<i>Do</i>	80.88	Good
<i>See</i>	84.66	Good

Table 2 shows the activities of the lesson study running well. Each stage of the lesson study showing good qualifications with an average score in the range 70 – 84.

3.2. Effectiveness of Lesson Study on Student Learning Activities

In this study the indicators used to determine the learning activities undertaken by students during lecture activities include: (1) the enthusiasm of students in following the lectures, (2) student interaction with lecturer, (3) student interaction in group, (4) interaction of students between groups, and (5) student activity in class discussion. All activities are observed during lectures. The learning activity scores obtained at each meeting are disclosed with the following Table 3.

Table 3. Score of Student Learning Activity Each Lesson Study Meeting

Value Range	Category	Activity of Lesson Study							
		Cycle I		Cycle II		Cycle III		Average	
		F	(%)	f	(%)	f	(%)	f	(%)
12.51 – 15.01	Very Active	4	19.0	6	28.5	12	57.1	6	28.5
10.84 – 12.50	Active	16	76.2	14	66.7	8	38.1	14	66.7
9.17 – 10.83	Sufficient	0	0	1	4.8	1	4.8	1	4.8
7.50 – 9.16	Unactive	1	4.8	0	0	0	0	0	0
4.99 – 7.49	Very Unactive	0	0	0	0	0	0	0	0
Mean		11.7		12.0		12.5		12.1	
SD		5.0		0.8		0.9		0.8	

Based on Table 3 can be seen, the average score of student learning activities observed during the first cycle of 11.7, cycle II of 12.0 and cycle III of 12.5, all three are categorized active. Numerically shows an increase in student activity on each cycle, although the same category is active.

3.2.1 Effectiveness of Lesson Study on Student Learning Achievement

Learning achievement is the result of a scoring in the field of knowledge, skills and attitudes as learning achievement expressed in the form of scores. In this study, learning achievement is the score obtained by students through achievement test. Scoring on student achievement was done two times before and after learning with lesson study. Descriptive statistical analysis techniques for student achievement using average score or mean, and standard deviation before and after lesson study. The description of learning outcomes from Basic Physics-6 achieved by the students as stated in Table 4.

Table 4. The Results of Student Learning Before and After Lesson Study

Value range	Category	Before lesson study		After lesson study	
		Fo	%	fo	%
85.0 – 100	Very Good	0	0	0	0
70.0 – 84.9	Good	0	0	19	90.4
55.0 – 69.9	Sufficient	2	9.5	1	4.8
40.0 – 54.9	Bad	12	57.2	1	4.8
0 – 39.9	Very Bad	7	33.3	0	0
Mean		41.19	100	73.81	100
Standard Deviation		10.2		8.9	

fo= frequency observation

Based on Table 4 then it can be describe that, before implemented lesson study average score of learning achievement achieved by 41.2 students have bad category, and after following lesson study average student achievement that is equal to 73.81 with good category.

3.3. Discussion

In general quality of the implementation of the lesson study includes good qualifications. The successful implementation of the lesson study in the field of physics education proves that lecturers are able to implement collaborative learning innovations. This can be seen from the seriousness of

lecturers to implement the stages of lesson study so that it causes fellow physics lecturers to be more open both in accepting advice or criticism that is solutif. With the lesson study activities lecturers become more focused on learning activities and the relationship between physics lecturers become more positive. Because in lesson study activities the lecturers share opinions and always collaborate to find solutions related to teaching and learning process. The improvement of the students' concept mastery, independent thinking, and social knowledge building were the results of discussions with collaborative [13].

The implementation of lesson study in this study has been referring to the understanding of lesson study that is a model of professional education through collaborative learning and sustainable learning based on the principles of kolegalitas and mutual learning to build the learning community as a form of improving the quality of learning and professionalism of teachers with the format of analysis of learning [12,14].

The lecturers' competence is strengthened in the implementation process of their own lesson study consisting of 3 (three) meetings, each meeting consisting of three stages: plan, do, and see. Each step adjusts to the existing stage according to the views of Susilo [12] and Lewis [4]. The lesson study stages were then analyzed for their impact on classroom management skills and the quality of classroom interactions.

Stage of the plan (goal-setting and planning), lecturers complement each other both in the identification of goals, determine the boundaries of the material to be taught and the composition, choose the learning method used to achieve the indicator, the selection of learning models, learning media to be used, and share the word instructional good to use. Learning tools developed through lesson study effective to be applied. This stage will improve the professional competence of lecturers [15].

In the process of do (research lesson) the teacher who has been appointed and agreed to become a model lecturer perform the task to carry out the learning that has been planned together. For lecturers model of professional competence aspect that is influenced is consistency mastery of lecturer material between content with performance. Where model lecturers try to convey and or deliver understanding of students to master the material in a complete, integrated, and contextual in the teching and learning process. It encourages lecturers to do better and more effective learning.

At the stage see (lesson discussion & consolidation of learning) lesson study group discusses and analyzes research lesson. This stage improves professional competence in all aspects of both material mastery, structure, concepts and thinking patterns that support basic physics-6 courses. Improved professional competence of teachers not will directly increase student activity and achievement. This fin ding is consistent with the results of research conducted by Marsigit [9] states that the application of lesson study has a positive impact on the improvement of professional competence of teachers.

Because lesson study provides opportunities for lesson study participants to discuss and practice lesson study, to deepen the study of the material to be given, to determine the instructional media in accordance with the nature of the teaching materials, to determine the learning method, and to make the learning activities more effective and efficient. Copriady [16] states that the development of learning process using lesson study can be used as an improvement program of professionalism teacher. Lesson study can also change in attitudes and beliefs of teachers [17]. While, Shahren [18] in his research report stated that lesson study provides space for teachers to improve and reflect on their learning process to improve their professional competence.

The results of research are in line with the findings of Sumarti [8] and Marsigit [9] stated that lesson study activities led to an increase in the professional competence of teachers. With the increased competence of teachers will certainly improve the quality of learning in the classroom during the implementation of the stage do which will increase student activity and achievement.

4. Conclusion

Based on the results of research and discussion can be concluded, (1) the quality of lesson study implementation in Basic Physics-6 included in good category, (2) student learning activity on lesson

study is in active category, and (3) student achievement on Basic Physics-6 through lesson study has increased, before lesson study average score of learning achievement 41.2 with defficient category and after lesson study average score of 73.8 with good category.

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