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Students' achievement and teachers' perception in the implementation of lesson study-based cooperative learning

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Abstract. Lesson study (LS) initially developed in Japan with over a century is a form of teacher inquiry in which teachers in small groups undertake collectively a cycle of “plan-do-see” activities to improve pedagogy and learning practice. LS has been practiced in many countries worldwide as well as developing countries in South East Asia region. This paper reported the implementation of LS on enhancement students' activeness in classroom and concept comprehension in biological class as well as teacher's perception in improving their quality as LS applied. We used cooperative learning model in three cycles of LS practice of this study. The results showed that students' activeness during LS in cycle I was 1.9% of excellent, 46.3% of good, 50.6% of fair and 1.2% of poor. The students' activeness was better in cycle II become 7.4% of excellent, 56.2% of good, 36.4% of fair and 0% of poor. In cycle III students' activeness rise to 11.7% of excellent, 71.6% of good, 16.7% of fair and 0% of poor. Student's comprehension on biological concept in this study was increased from 64.2 to 75.8 and 82.7 in cycle I, II and III of LS, respectively. Those results reflected that LS implementation improved students' activeness on biology lesson and concept comprehension in biology. On the other hand, all teachers evolved in this study perceived that LS implementation can improve teachers' professional quality and promote teacher's professional development. They strongly agreed that LS be beneficial for them to become a better-quality biological teacher.

1. Introduction

The teacher has been educated to master in pedagogic and content knowledge as preparation to generate instructional planning and assignment before teaching and learning process conducted. The instructional plan contains every aspect of teaching, and learning strategy is usually a teacher's solely task that separated from collegial intervention. Individually, the teacher responsible for preparing and deciding how lesson to be conducted, what materials to be used and how students to be evaluated. Hence, teaching quality in regard to effectiveness and efficiencies mostly rely on individual teacher quality.

Teachers' experience contributed to their quality of pedagogic and content knowledge [1]. Heterogeneity of students such as social background, culture and academic ability are challenge for teachers to innovate in developing their professional's quality to achieve lesson goal. Teacher quality has significant effect on student achievement. High-quality professional development focusing on higher-order thinking skills and diversity issues does appear to strongly influence classroom practice [2].

The efforts to improve teacher and teaching quality based on their practical experience was useful to improve own quality but limited on tiny scale. Without sharing and collaborating with other parties in lesson practice, the teacher quality improvement will run slowly due to no contribution from their



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colleagues to overcome teaching and learning problems in broader perspective [1]. Therefore, outcome quality improvement i.e. students' achievement in context of concept comprehension, attitude and scientific skill would be slow. Findings at lesson practices at class should be disseminated to public, shareable and can be verified so that everyone can criticize, used and socialized to broader scale to improve teacher quality in context of professional knowledge [3].

One effort to work out this problem is through lesson study (LS) implementation. LS comes from Japanese phrase "Jugyokenkyu" is an approach in the process of teacher's professional which has been practiced by Japanese teachers continuously so that can improve students' learning experience that teachers facilitated [4–6]. LS in Japan is embedded with Japan's educational history in which LS has been overcome to refine either learning process in the class or curriculum development. It has been practiced by teachers in Japan in the 1870s. Nowadays many countries worldwide including Indonesia adopted LS to improve teacher and teaching qualities. LS admit teachers to investigate issues during teaching and learning processes that lead this approach can generate pedagogic and professional knowledge that supports their professional quality. LS considered as fundamental control to develop teacher's professional that admit teachers to learn about many new ideas and assist to develop their expertise to facilitate students contribution actively in class to achieve lesson goal [4,7]. LS involves group of teachers collaboratively in great detail of planning, teaching in classroom, observing and analyzing learning and teaching [8]. Teachers record any finding and analyze it to refine pedagogical approach and finally they share findings to public [9].

It has been considered that schools located in remote area of Indonesia possess students that tend to less active and low motivation to engage lesson in classroom compared to those in big cities such as schools in Java Island. Senior High School of Muhammadiyah 4 Bengkulu represented that case due to generally they came from poor family with low education and narrow future viewpoint. In this condition, teacher needs more creative to design appropriate teaching plan that emphasize on student center learning (SCL). SCL is an instructional approach in which students influence the content, activities, materials, and pace of learning. This learning model places the student (learner) in the center of the learning process [10,11]. The instructor provides students with opportunities to learn independently and from one another and coaches them in the skills they need to do so effectively. In this study we use cooperative learning model through implementation of LS to enhance students' activeness in classroom and concept comprehension in biological class. In addition, teachers' perception on improving teacher quality through LS implementation was also recorded.

2. Methods

The study was conducted at Senior High School Muhammadiyah 4 Bengkulu. Twenty-seven students of grade 10 and five biological teachers participated in this study. Three cycles of LS were employed on topic Reproduction of Mammals to acquire empirical data of students' activeness during teaching and learning processes, concept comprehension of stated topic and teachers' perception on LS in regard of improving their professional quality.

Concept comprehension of students is collected based on the pre-test and post-test at early and late cycle respectively. Students' activeness was evaluated during lesson process using 1-4 Likert scale. Student activity components which were observed consist of visual activities, oral activities, listening activities, drawing activities, mental activities and emotional activities. The instrument to gather insight on the teachers' perception of LS in regard of improving their professional quality was a survey questionnaire adopted from Suhaili [12] with slight modification as guide questions to verify their responses on LS implementation. The data were analysed descriptively.

Before unfolded LS, at first LS was introduced to the teacher-participants, discussed the nature of LS, and oriented them on how it will be conducted. After the teachers understand the concept of LS and agreed to engage in the study, the team arranged for the schedule of activities including the schedule of regular meetings. Three cycles of LS were conducted on this study. Each cycle consisted of three steps i.e. Plan, Do, See. The research lesson used Group Investigation (GI) type of cooperative learning model with topic Reproduction of Mammals in the second semester of grade 10.

3. Results and discussion

3.1. Cycle I

3.1.1. Plan. LS team collaborate designed teaching plan used Group Investigation (GI) learning model, prepared instructional media, learning materials, assessment instruments, and learning activities observation sheet, formulated student worksheet and arranged student seat pattern. The students were planned to be grouped base on heterogeneity concern into five groups. Lesson materials were given to students chairman to be copied as much as formed group a few days before the implementation phase (Do).

3.1.2. Do (research lesson). Teacher model and observers conducted research lesson. Observers bring observation sheet to record students and class activities teaching and learning process. The RL in this cycle I included: (1) conducting pretest, (2) informing lesson goal and steps of lesson in GI model, (3) forming group of students into five groups, (4) Giving student worksheet as guidance to conduct task regarding of lesson topic during learning process, (5) students by groups conducting task, discussing the proposed problems and filling provided worksheet, (6) teacher guided and supervised students activities and appointed groups to present the results of task, (7) observer teachers recorded lesson circumstance and activities of students either within their group or within class that consist of visual activities, oral activities, listening activities, drawing activities, mental activities and emotional activities, (8) student carried out posttest after lesson was done.

3.1.3. See (reflection). As RL of cycle I finished, LS team gathered to analyze finding during teaching and learning process. Reflection aim to review the implementation of lesson that carried out. Reflection was done by model teacher and all observers. One of the observers was appointed as the moderator and the other one as a note taker. The results of this reflection were used to fix and improve of RL at the next cycle. Here are the findings during RL of cycle I: (1) some students were not active in group discussion might be due to lack understanding of concept, (2) some students were not pay attention during class presentation session due to seat/table arrangement was not optimum, (3) one copy materials in form of topic summary for each group was not optimal during lesson implementation, (4) students did not use number or name tag during RL caused observers rather difficult to observe the student activities, (5) time allocation was not efficient especially for presentation sessions was not enough and lesson media using was not effective.

Observers recorded the students' activeness including visual, verbal, listening, drawing, mental, and emotional activities during RL in cycle I were excellent (2%), good (46%), fair (51%) and poor (1%) as shown at table 1.

3.2. Cycle II

3.2.1. Plan. LS team made a lesson design and arranged classroom based on the reflection in cycle I of LS. Those findings lead LS team to formulate efforts to improve the RL process in cycle II as follows: (1) regrouping student that emphasized to heterogeneity and based on the high to low ability of students in each group, (2) Arranging seat/table in presentation session became "U" form, (3) Every student have copy of lesson material, LS material in form of handouts as copy of PowerPoint media were made to replace material form at cycle I (4) students wore number tag to make observers easier to do their task, (5) rearrange time allocation of RL and it was informed beforehand by the teacher before the activity began as well as to maximize of media using during RL. All step must be informed to students before RL begin.

3.2.2. Do (research lesson). Teacher and observers conducted research lesson as in cycle I with many corrections as stated in lesson plan above. Students were regrouped as lesson plan. Teacher explained that at class discussion and presentation sessions seats/tables were arranged in "U" form to make every

group responded to other group so that student activeness distributed among students either within or among groups. Student carried out posttest after lesson was done.

3.2.3. See (Reflection). The students' activeness improved during RL in cycle II become 7% of excellent, 56% of good, 37% of fair and 0% of poor. Generally student actively take part in learning and teaching process. Discussion process got more attention from student who actively responded to solve problems in the lesson topic. Variety view point and deepness of student argument were better than in cycle I.

Among group actively responded to other group during class discussion and presentation. The weakness of student activity that still appear was pointed to lack distribution of students who lively active within group. One or two student within group clearly dominated other member in respond to class and presentation session. This weakness must be corrected at teaching planning in the next cycle of LS.

3.3. Cycle III

3.3.1. Plan. Based on the reflection at cycle II, teaching plan of LS cycle III emphasized strategy to organized lesson implementation that produce the activity of students distributed uniformly both within group and class. Therefore, LS team made a rule in discussion and presentation session. Using number tag of students, teacher randomly call student to respond in class discussion. Thus, all student must ready actively in respond to the problem or topic presented in lesson process. LS team created assignment to evaluate students' concept comprehension as posttest at the end of cycle III. All teacher evolved in LS filled questionnaire to gather insight on the teachers' perception of LS in regard of improving their professional quality to verify their responses on LS implementation.

3.3.2. Do (research lesson). Teacher explained the rule of class discussion and presentation session to make the activity of students distributed uniformly both within group and class. Teacher had to sure that students understand that rule in which any student must ready to make respond such as made a comment, question and answer as teacher call number of them. Teacher also informed student that posttest would be take place after lesson finish. Observer recorded and documented findings during RL as they did at cycles before. Student carried out posttest after lesson was done.

3.3.3. See (reflection). The implementation of cycle III carried out as expected. Students' activeness rises to 11,7% of excellent, 71,6% of good, 16,7% of fair and 0% of poor. Students' activeness among and within group were uniformly distributed. Teacher collected documentation and posttest sheet to be checked afterward. All teacher evolved in LS filled questionnaire to gather insight on the teachers' perception of LS in regard of improving their professional quality to verify their responses on LS implementation.

3.3.4. Students' activeness in LS. Table 1 shows six components of student activities in cycle I, II and III of LS. Percentage distribution of overall activities positively improved in advanced cycle. Students who had excellent and good categories collectively increases from 48% to 63% and 84 % in cycle I, II and III, respectively. In contrast, students who had poor activity decrease from 1% to nil in cycle I to the next cycle. Those distribution reflected that LS implementation improved students' activeness on biology lesson. This result supported previous finding that LS improved students activeness by developing collaboration among students in the group that lead them to communicate actively and to develop a better discussion in the learning process [13,14]. In the lesson processes the teachers who acted as the observer recorded students' activities as part of LS practice. The observers focused to the students learned such as how they responded toward friends and teacher, their activities, and difficulty they faced in learning process. In the open lesson one and two, observers recorded their finding about student difficulty and discussed the solution to overcome those finding and redesign the strategy to better learning process at the next lesson. The processes of LS enables to increase student to learn actively and

collaboratively based on the feedback of observation that conducted by teachers during the series open lessons [15,16].

Table 1. Students' activeness in LS cycle I, II and III.

Components of Student Activity	OPEN LESSON											
	I				II				III			
	E	G	F	P	E	G	F	P	E	G	F	P
1. Visual activities	1	15	10	1	1	18	8	0	0	20	7	0
2. Oral activities	0	8	19	0	2	14	11	0	4	16	7	0
3. Listening activities	0	10	16	1	0	17	10	0	2	20	5	0
4. Drawing activities	2	12	13	0	3	15	9	0	3	22	2	0
5. Mental activities	0	11	16	0	2	11	14	0	4	18	5	0
6. Emotional activities	0	19	8	0	4	16	7	0	6	20	1	0
Sum	3	75	82	2	12	91	59	0	19	116	27	0
Percentage	1.9	46.3	50.6	1.2	7.4	56.2	36.4	0	11.7	71.6	16.7	0

E: excellent, G: good, F: fair, P: poor.

3.3.5. Students' concept comprehension. The improvement of students' comprehension on biological concept in term of reproduction of human as shown in table 1 as impact of improvement in quality of teaching and learning processes in every cycle of LS. Collaborating work among teacher in LS made lesson process better and better and enjoyable by students. Student's comprehension on biological concept in term of Reproduction in human in this study was increased from 64.21 to 75.79 and 82.65 in cycle I, II and III of LS, respectively. Cooperative learning model lead student to accomplish learning concept [17,18] that was strengthened by the practice of LS process that bring teacher to address individual learning needs of student [19]. Therefore, student can learn and achieve better comprehension of learning material effectively.

Table 2. Students' comprehension of biological concept.

Component	Cycle I	Cycle II	Cycle III
1. N	27	27	27
2. Highest score	78	85	89
3. Lowest score	43	62	71
4. SD	10.31	8.55	6.29
5. Mean	64.21	75.70	82.65

3.3.6. Teachers' perception on the impact of LS implementation on teacher quality improvement. Of twenty-two components of questionnaire, the teachers who involved in the LS strongly agreed that LS has influenced teacher professional improvement. Teachers responded that planning a lesson collectively broadened their knowledge of the biology content, helped them understand more on students' way of thinking and learning biology concept, and broadened their knowledge of biology teaching ideas and pedagogy. All of them strongly agreed that collaboratively working together is beneficial for them to become a better biology teacher. They strongly stressed that the experiences and knowledge they gained during the Lesson Study is very valuable and important in order to make a better biology teacher. Thus, 100 % expressed that they are willing to take part again the LS. The process of LS brings teacher to improve their professionalism by collaborating with colleagues that enhancing teaching quality [19,20]. The plan, do and see processes of LS enable teachers to analyze the weakness of learning process through observation of student during course [1,19,21]. Therefore, teacher can make revise the learning strategy that had been applied to become better learning process and outcome to be implemented at the next lesson.

4. Conclusion and recommendation

Findings of the study lead to the conclusion that implementation of LS enhanced student to study actively and lively in the class as center of learning process. It directly impacts to increase student comprehension

on material concepts that they studied. On the other hand, teachers perceive that LS implementation can improve teachers' professional quality and promote teacher's professional development. Hence, we recommend the use LS continuously and more research to be conducted in wider aspect, scope and population to promote the better quality of education.

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