The implementation of lesson study to improve the teaching skills of chemistry teacher candidates

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Abstract. The development of teacher competence is to be an important issue in many countries and is to be a focus of study at many universities. Chemistry Education Department of Islamic University of Indonesia have committed to produce graduates as a competent chemistry teacher candidate. One of the course that was held to prepare the competence of teacher candidate was Microteaching. Microteaching course is very important for teacher candidates. This course needs strategy to fulfill the learning achievement. The appropriate strategy to teach Microteaching course is lesson study. This study aims to describe the implementation and the effect of lesson study on Microteaching course. The study used a descriptive approach. Subject were Chemistry Education level three in academic year 2016/2017. Implementation of lesson study consists of 4 stages such as planning, implementation and observation, reflection, and follow-up. The research instruments include performance assessment, student questionnaire, and self-assessment. The research data shows that lesson study gives positive impact on teaching skills. Percentage of students who mastered learning achievement of 97.2%. The average score of performance assessment and student questionnaires were 80.3 and 85.4. Observation during the lecture showed a positive response from the students. The application of lesson study led to significant progress in student teaching skills.

1. Introduction

Teachers play an important role in the education system. Efforts to improve the quality of education should begin with the preparation of a competent teacher. Increased teacher competence becomes an important issue and focus of study at many universities [1, 2, 3, 4]. Indonesian legislation states that teachers must have required competencies, namely pedagogic, personality, social, and professional competence. Chemistry Education Department of Islamic University of Indonesia as one of the educational institutions for teacher candidates has committed to produce graduates as a competent chemistry teacher candidate.

One of the subjects that support the development of teacher competence in students is Microteaching. The Microteaching course is a course given in the 6th semester with a weight of 2 credits. Microteaching is the last pedagogy cluster course given before students undertake an teaching practice at school. This course is a practical course; students undertake teaching practice on a small scale. Students are guided to display the accumulated abilities and skills possessed in previous pedagogical courses, for example Learner Development, Teaching and Learning Strategies, Learning Media, and Curriculum Review. The learning outcomes of the Microteaching course include: 1)
students are skilled in designing lessons, 2) skilled in applying basic teaching skills, 3) skilled in developing learning media, 4) skilled in applying active and innovative learning.

This course is very important and crucial because in Microteaching the lecturers must ensure the students have skilled teaching before the students do the teaching practice in school. In general, the teaching of Microteaching is conducted by dividing some of the skills or stages in teaching, which is then practiced individually by the students. For example, the first meeting of practical students to open lessons, the second meeting they should practice asking questions, and so on. At the final meeting, students will practice teaching from opening to closing lessons. This method is less effective for achieving learning outcomes of the Microteaching course because students are less facilitated to conduct reflection and improvement of teaching. In the conventional learning, students are asked to practice one-on-one teaching and then the lecturers give suggestions. Frequently, students are less able to follow up their weakness and difficult in determining the efforts to further improvements in teaching practice. This is certainly effects the achievement of learning outcomes.

Appropriate strategies that can used in order to fulfill learning outcomes Microteaching is lesson study. Lesson study has been widely used by teachers, but still limited use in educational institutions for teacher candidates. Lesson study is commonly used by a group of teachers. The implementation of Lesson Study in Microteaching course is expected to provide a positive impact on achievement learning outcomes. Lesson study causes students to customize collaboratively in a group to plan, implement, reflect, and improve learning. Through collaboration, students can find out more details of deficiencies in teaching practice and make it easier for students to determine improvement measures. This research is a descriptive research that focused on: 1) the application of lesson study in Microteaching courses, 2) the effect of lesson study on Microteaching course.

2. Literature Review
The concept and practice of the lesson study was first developed by the teachers of primary education in Japan. Currently, there is a tendency for lesson study to be widely applied to secondary education and even higher education. Lesson study can improve teacher competence and learning quality [5, 6, 7, 8]. Lesson study is not a model or method in learning, but it is one of the coaching efforts to improve the learning process carry out by a group of teachers collaboratively and sustainable in planning, implementing, observing and reporting learning outcomes. Lesson study is an activity that can encourage the formation of a learning community that consistently and systematically perform self-improvement both on individual and managerial level [5].

The points out the essential features of the lesson study: 1) common goals for the long term, lesson studies are preceded by agreement of teachers on common goals to be improved, 2) focus on important subject but it s considered difficult by students, 3) student learning is the main focus of lesson study, not only on the way teachers teach, 4) direct learning observation [9]. Cerbin and Kopp argued that lesson study has four main objectives, namely: 1) gaining a better understanding of how students learn and teachers teach, 2) obtaining certain results that can be utilized by other teachers except the lesson study participants, 3) improving systematic learning through collaborative inquiry, 4) building a pedagogical knowledge, where a teacher can gain knowledge from other teachers [8].

There are six stages in the lesson study, namely: 1) form a team: formed a team of 3-6 people consisting of teachers concerned and other parties who are competent and have interests, 2) develop student learning goals: team members discuss what will be taught to students as a result of lesson study 3) plan the research lesson: teachers design learning to achieve learning goals and anticipate how students will respond, 4) gather evidence of student learning: one a team teacher conducts learning, while others make observations and collect evidence from student learning, 5) analyze evidence of learning: team discusses results and assess progress in achieving student learning goals, 6) repeat the process: group revises learning, repeats stages from the 2nd to the fifth stages as mentioned above, and the team performs sharing over the existing findings [5].

In summary, it can be concluded that the stages in the lesson study consists of planning, implementation, reflection, and follow-up. First is planning, teachers who are members of lesson study
collaborate to develop lesson plan. Planning begins with an analysis of the needs and problems encountered in learning. Furthermore, teachers determine the solution. The selected learning strategy is expected to improve the quality of learning. The second is the implementation of two activities, namely the implementation of learning activities undertaken by one of the teachers to practice the lesson plan that has been prepared and observations made by other members of the lesson study. During the learning activities, observers are not allowed to interfere the course of learning activities and disrupt the concentration of teachers and students, observers undertake observation carefully at all aspects of learning. The third stage is a reflection conducted by all participants of lesson study. All teachers held discussions related to the implementation and observation of learning that has been going on. Teachers who teach can express experience, difficulty, or ease when teaching based on lesson plan made. The observer presented the results and analysis from the observation stage. The fourth stage is follow up. From the results of reflection can be obtained a number of plans and remedial measures for improving the quality of learning.

3. Methods
The research is descriptive research. The study focused to describe the implementation and the effect of lesson study on Microteaching course. The subject of the research is the students of Chemistry Education Program UII 6th semester of academic year 2016/2017 as many as 9 people. Research stages include: 1) development of learning documents, 2) development of assessment instruments, 3) lecturing, 4) data collection and analysis.

The learning documents include syllabus, lesson plan, and hand out. Instrument assessment process and learning achievements are prepared based on the indicators. Instrument construction validation is performed by colleagues and corrected if there are any shortcomings. Quality assessment of lecturing process instrument used student satisfaction questionnaire and sheet observation. Instrument assessment of learning achievement used performance and self assessment.

The lecture was held 14 times. Students are divided into groups of 3-5 members. The group formed is heterogeneous. Each group collaborates on a lesson plan. Furthermore, each student performs instructional practice in turn with material topics according to the division within the group and the member of group observed. From the observations, reflection on the teaching practice is done. Furthermore each group under the guidance of the lecturer determines the corrective steps to improve the next teaching practice. All activities in the lesson study are documented in portfolio form.

4. Results and Discussions
The research was carried out according to the stage that has been planned. The skills taught and practiced in 14 meetings include: 1) skill in preparing lesson plan, 2) opening learning, 3) providing basic and advanced questions, 4) managing class, 5) explaining material, 6) using media, 7) organizing variations, 8) providing rewards and motivation, 9) closing learning, 10) teaching STEM, 11) teaching for the development of 21st century skills.

Lecture used lesson study strategy. Lecturer provide material outline about the skills in teaching. Students are divided into groups of 3 members. The group formed is heterogeneous. Each group conducts lesson study. Each group collaborates on planning the lesson. Each student performs instructional practice in turn, with material topics according to the division within the group and the member of group observed. Students from other groups act as students. From the observations made, reflection on the practice of teaching is done. Furthermore each group under the guidance of the lecturer determines the corrective steps to improve the next teaching practice.

Basic teaching skill begins by arranging lesson plan; opening to closing was practiced by students in turn. Teaching practice is conducted 8 times. Assessment of teaching practice and final assessment used performance assessment. Performance assessment is an assessment done by observing activities in doing something. Performance assessment is appropriate to be used to assess the achievement of the competence of practical activities. The assessment instrument developed in the form of check-list performance. The average score of student performance is 80.3 (maximum score 100). Data
assessment of student performance indicated the high achievement of learning outcomes. The average percentage of achievement learning outcomes is 97.5%. The achievement of learning outcomes is shown in Table 1.

**Tabel 1.** The achievement of learning outcomes

| Learning Outcomes | Achievement (the percentage of students who achieve learning outcomes) |
|-------------------|-------------------------------------------------------------------------|
| LO 1. Competent on designing lesson plan | |
| Sub LO1A | Able to design chemistry material based on learning objectives | 100% |
| Sub LO1B | Able to choose learning strategy based on the learning objective, student characteristic, and material | 100% |
| Sub LO1C | Able to determine appropriate media | 100% |
| Sub LO1D | Able to design assessment instrument | 100% |
| Sub LO1E | Able to design lesson plan of STEM | 100% |
| Sub LO1F | Able to design lesson plan for developing 21st century skills | 100% |
| LO 2 Skilled at applying basic teaching skills | |
| Sub LO2A | Able to open the learning | 100% |
| Sub LO2B | Able to give basic and advance question | 100% |
| Sub LO2C | Able to manage the class | 100% |
| Sub LO2D | Able to explain the material | 55.6% |
| Sub LO2E | Able to give motivation and reward | 100% |
| Sub LO2F | Able to close the learning process | 100% |
| LO 3 Skilled to develop learning media | |
| Sub LO3A | Able to develop learning media based on objective, student characteristic and material | 100% |
| Sub LO3B | Skilled to use learning media | 100% |
| LO 4 Skilled on applying active and innovative learning | |
| Sub LO4A | Able to create variation on learning | 100% |
| Sub LO4B | Able to variation on learning model | 100% |
| Sub LO4C | Able to practice learning STEM | 100% |
The first learning outcome is skilled to prepare lesson plan, 100% controlled by student. Students have been able to arrange chemistry material in accordance with the learning objectives in chemical curriculum at school. From the lesson plan, it can be seen that the students are able to choose the learning strategy according to the learning objectives, the characteristics of the students and the material. The learning strategy used by the students is quite varied. Strategies that are widely used by students include cooperative learning, project learning, problem solving, and problem based learning. In addition, students are also able to determine the media used in accordance with the learning objectives to be achieved and material characteristics. Students can also develop assessment instruments according to the learning objectives in chemistry curriculum at school. First stage in the lesson study is planning, demanding students to perform need analysis before doing teaching practices. Planning collaboratively also develops student social skills. This is in accordance with the reality of the working world, namely the preparation of lesson plan by a group of teachers at the school level.

The second learning outcome is skilled to apply basic skills of teaching which has not been fully mastered by the students. Assessment of teaching practices undertaken by students show that students are skilled at opening lessons, giving basic and advanced questions, managing classes, giving motivation and rewards, and closing the learning. Sub learning outcomes that are low level in the achievement the skills to explain the material. First teaching practice until the third practice shows that the student is still weak in professional competence, the compulsory competence for teachers in terms of mastering the material. Still found misconceptions when students explain the chemistry material of high school, students have not been able to convey the material contextually and giving inappropriate apperception. However, the existence of a reflection stage in the lesson plan effectively helps students determine the improvement measures. The fourth teaching practice began to show improvement in the way to explain the material.

The third learning outcome is skilled to develop learning media has been achieved by all students. Lesson plan that made by students shows the ability of students to choose and develop learning media according to the objectives, characteristics of students and materials. The media selected by the students are varied, such as video, visual aids, and mind map. Teaching practice shows that students are skilled using learning media.

The fourth learning outcome is skilled on application of active and innovative learning, as a whole has been achieved by the students. The lesson plan as well as the teaching practice conducted by the students showed the variation of the students in the learning process. These variations include variations of learning model used, voice, position, teacher expression, and interaction patterns.

Observations during the lectures show a positive response from students. Students are very enthusiastic during lectures. Discussions when planning and reflection runs dynamically. Each group is active to evaluate and plan corrective actions on teaching practices. Some of the benefits for students include: 1) students are able to know the progress of their work, 2) the students are able to get feedback from other members, 3) the students collaboratively determine the step improvement of teaching practice. Implementation of lesson study also led to the progress of student achievement significantly. In the first and second teaching assignments there were still many shortcomings in basic teaching skills. However, starting with the third assignment, students’ teaching skills increased. In fact, the case encountered in a student, the first and second teaching practices of the students appeared with many shortcomings. Starting from the intonation of the voice, the feeling of not confident, unable to apply basic skills of teaching. However, in the third practice, the student performed very well. Principally, with lesson study students used to reflect and improve collaborative teaching practices. Observations also show an enthusiasm during the lectures, lectures are not boring because of several variations of activities undertaken by students.

Student feedback is obtained through questionnaire, self assessment, and observation during lectures. The student questionnaire was developed to assess aspects: 1) the competence of the lecturer,
2) the effectiveness and benefit of the lesson study, 3) the quality of the lecture material. The average student score is 85.4 (maximum score 100). At the end of the questionnaire, the students were asked to describe independently about the level of satisfaction on the Microteaching subject. All students expressed satisfaction on the lectures that have been held. The general reason given by the students was because the lectures that have been done directly provide direct illustration and experience to the students about the main task of teachers. Self assessment data strengthen the data of assessment performance. Students asserted that they have been able to practice basic skills of teaching, but difficulties encountered is on aspects of understanding of chemistry material especially to contextualize the material.

The results of the study generally indicate the positive influence to the application of lesson study on learning outcomes achievement. The main rationalization is that the lesson study facilitates the students to actively analyze and perform the improvement of teaching practices. The research conducted through 17 teachers at SMP Negeri 1 Srandakan, Yogyakarta, it shows that lesson study can improve teacher’s competence. Because lesson study facilitates teachers to be creative and keep learning [7]. Lesson study is appropriate to be used by teacher candidates to get used to doing lesson study when entering work world. Currently the use of lesson study as a strategy to improve the quality of learning began to be widely applied among teachers.

5. Conclusion
Implementation of lesson study consists of 4 stages; there are planning, implementation and observation, reflection, and follow-up. Lecturers provide material outline about the skills in teaching. Students are divided into heterogeneous groups of which 3-5 members. Each group conducts a continue lesson study that begins with a learning plan. Each student performs a teaching practice in turn while other member observed. Students from other groups act as students. From the observations made, reflection on the practice of teaching is conducted. Furthermore, each group under the guidance of the lecturer determines the corrective steps to improve the next teaching practice. Performance assessment, student questionnaire, and self assessment show the positive influence on the application of lesson study in Microteaching Course. The percentage of students achieving learning outcomes of 97.5%. The average score of performance assessment and student questionnaires were 80.3 and 85.4, respectively. Observation during the lecture shows a positive response from the students. Students are very enthusiastic during the lectures and lectures run dynamically. The implementation of lesson study led to significant student achievement.

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