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Lesson Study as a Vehicle to Promote Active Learning in College Physics in the USA and Japan

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To educate citizens for the rapidly changing society of the 21st century, active learning is emphasized both in the U.S.A and in Japan at the college level. However, when it comes to teaching, university faculty members are often isolated and many of them are looking for effective instructional strategies alone to help students overcome difficulties in understanding the abstract concepts they present, especially in large lecture classes.

This study examines how Lesson Study can help both students and faculty in introductory physics courses in US and Japanese colleges. Lesson Study is a collaborative lesson planning and discussion model mainly for teachers in K-12 education. As in the K-12 model, one Lesson Study cycle consists of three phases: lesson planning, teaching/observing, and debriefing. To adapt the scheme at the college level, the following modifications were included: 1) Discussion in the planning session is focused on the content in physics so that the participating faculty members can identify student difficulties of the concept and dissect the concept into small components, 2) The planning session also includes discussions on the active-learning type instructional strategies, such as the use of clickers and group discussions with white boards, and 3) Lesson Study cycles go at the higher pace so that every participating faculty members can experience teaching.

Student achievement was measured by administering pre/post-test of the internationally established instruments. Faculty's attitudes towards collaboration and active learning strategies were measured by pre/post-program survey (N=14). The results of the post-test showed an impact of the physics course on the performance of the low-achieving students. The preliminary faculty survey results indicate that the process helped faculty members feel more comfortable asking their colleagues questions about their teaching. The results also indicate that Lesson Study helped faculty see teaching in a more student-centered way. The effect of a content-rich discussion in the Lesson Study process will be further analyzed as a key factor for making the college-level program sustainable.

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The Implementation of Learning Cycles 7e to Train the Critical Thinking Skills of Biology Education Students through Lesson Study Activities

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Biology Education Students are expected to be able to solve the problems that exist in the environment. Therefore the students need to be equipped with critical thinking skills. One of the ways is by using Learning Cycles 7E learning model. Student activities with Learning Cycles are going to make students build their existing ideas, so that they can construct their own knowledge. The aims of this study were to measure the students' critical thinking skills after they were taught by using the Learning Cycles 7E (elicit, engagement, exploration, explanation, elaboration, evaluation, and extend) on the topic of Photosynthesis through lesson study.

In this study, 14 lecturers of Biology Department were involved to follow the activities of plan, do, and see. The participant of this study was 25 the biology education students in the 2015 academic year. There were two meetings. The first meeting was the learning stage of elicit, engagement, exploration, explanation, where the students worked on the students' worksheet based on 7 E. The second meeting was the students' presentation and elaboration, evaluation, and extend stages. The observers recorded the implementation of learning, the students' responses and activities during the learning process. The critical thinking skills measured were formulating problems, formulating hypotheses, defining variables, conducting experiments, presenting and analyzing data, drawing conclusions. At the first meeting, before study, students are given a preliminary test to measure the initial ability of critical thinking skills. Pre test result of critical thinking ability 2,65 with good enough category. Critical thinking skills that have not been mastered by students are analyzing data (score 1.08), and the highest is making a conclusion (score 3.32). Data were analyzed descriptive qualitative and quantitative analyses.

Results of this study showed that the Learning Cycles 7E learning model can be used to measure students' critical thinking skills. The learning was implemented with a percentage of 98.6% (very good). There were interactions between students within groups and between groups, and there were also interactions between students and lecturers, and between students and learning resources. The students gave positive responses toward the learning activities that had been done. The results of the students' critical thinking skill score was 3.91 with very good category, with the details of formulating problems 3.96; formulating hypothesis 3.92; determining variables 3.84; conducting experiments 4; presenting data 3.96; analyzing data 3.72; and drawing conclusions 4 (very good). The lesson study conducted in Biology Department of Faculty of Mathematics and Natural Sciences of Universitas Negeri Surabaya can improve students' critical thinking skills and creative thinking skills, broaden student and lecturer's insight about the photosynthesis material, improve the learning quality continuously, and improve the professionalism of lecturers.

Key words: Learning model, Learning Cycles 7E, Critical thinking skills, Photosynthesis, Lesson Study

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Innovation of Animal Anatomy Learning on Biology Students 2016 through Lesson Study

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Animal anatomy is a compulsory subject for Biology students and Biology Education students in the second semester. Animal anatomy has many subject to study so that lecturers often find it difficult to make the students master the learning material. This can be seen from the low average of students' concept mastery. The responses of the students who programmed Animal Anatomy class in the previous year showed that the difficulties the students had in the Animal Anatomy class were high memorization level, a lot of learning materials, not much learning time in class, preparation facilities is less, no time and place for re-learning (Self-retention), and lecturer's evaluation too difficult. The lack of competence of the lecturers who teach Animal Anatomy in the science of education makes the lecturer teams still require discussion among lecturers in the scope of Developmental Structure to interact about the learning preparation which includes learning strategy and learning method, improving learning material and analyzing previous evaluation. The research procedure including Plan, Do and See. This research was conducted in Room C-10 of the Structure and Development laboratory of Biology Department of Universitas Negeri Surabaya from September 15th to October 10th, 2016. Result of plan show that are as an effort to prepare the learning to improve the students' concept mastery, in order that the number of the students who pass the course increases, and to find a suitable learning model and learning material. The results of discussion (Do) produced an improvement of the learning strategy. At the beginning it was written by using multi model learning, and then it was replaced with cooperative strategy and direct learning, which was more directed to the discovery of guided concepts one by one. During the implementation (Action), some weaknesses of lecturer during the learning process were immediately addressed, such as when the students' concentration was not focused on the learning, when the lecturer left the class to take something during the learning process and asked the students to have group discussions. The result of See, as follows some of the strengts that can be adopted during the learning process were that the voice was loud and clear, the media was prepared, the explanation toward the students' questions was quite clear, giving opportunities for the less active students, guiding and motivating students to get answers to the questions, the learning process was enjoyable, so that it made the students feel relaxad, there was a good interaction between the lecturer and the students, patient, friendly, and smart in organizing the class, able to give explanations in a good sequence and used appropriate media images and preparations. The results of the student's response were that 100% students said that the learning was fun, 100% could understand the learning material constructively, 100% were motivated in learning by studying the learning material extensively (arguing that they wanted to get good scores, could measure their comprehension, could master the material, and when they were given a quiz, they could answer it well, the material was not boring, and in order to understand the material deeper), 43% students had difficulties in understanding the content

of the material, because the material was quite a lot (29%). The results of the sub summative test score still produced completed score with above 56 as much as 89%. While the scores of task 1 and task 2 were completed 100%.

Keywords: Innovation, Animal Anatomy, Biology, Lesson study