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An Action Research about an Activity Integrating Science and Engineering

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The activity is about constructing a Chinese Balance. It is a university-school partnership project, in which a university teacher collaborated with teachers of a primary school in designing the activity, planning the lessons and monitoring the learning of students. Primary 6 students of that school were asked to construct a Chinese balance after learning the topic 'Lever'. The construction activity has been repeated twice in 3 consecutive years. The findings from the assessment tool each year were used as the starting point of the study in the following year.

In the first year (2014-15 academic year), the aim of the construction activity was to introduce the engineering design process (EDP) to students. The teaching did not facilitate students' understanding about the EDP. A questionnaire survey also showed that students did not understand those critical stages in EDP, such as testing and re-designing. However, a post-lesson interview gave us a hint that generalization might be a possible approach to let students construct their own interpretation of EDP. This approach was adopted in the construction activity in the following year (2015-16). In the pre-lesson test, all students drew the flow charts of their EDP as a linear process. After the lesson, some students could successfully generalize their experiences in the balance construction with another similar scenario to construct their own EDP, which was non-linear and included terms like testing, re-designing and improving. In the third year (2016-17), the research focus was shifted to explore whether students could think in a way similar to proportional reasoning in explaining the principle of the balance and debugging any faults during the construction.

This presentation will consist of two parts. The first part will describe what we did in those 3 years and the performance of the students. The second part will report what we learned based on our observation on the relationship between learning and teaching and the reflections of other participating teachers.

Improvement of Lesson Study (LS) Implementation for Developing Instructional Skills of Universitas Negeri Malang Lecturers who Attended Pekerti 2016

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A research has been carried out in order to describe the improvement of the implementation of Lesson Study (LS) conducted by lecturers of Universitas Negeri Malang (UM) as participants of Basic Skills Improvement of Instructional Techniques Program (PEKERTI) in 2015 and 2016. Descriptive research method was conducted by comparing PEKERTI reports composed by 24 people (out of 40 people or 60%) of 2015 PEKERTI participants with those by 30 people (out of 37 people or 81.1%) of 2016 PEKERTI participants. In 2015 as well as 2016 LS has been implemented in courses facilitated by each lecturer as PEKERTI participant. Some of learning models developed by lecturers in 2015 were Expository, Inquiry, Cooperative Learning, and the combination of several learning models, and Collaborative Learning. Learning Models developed by lecturers in 2016 were Kolb's Experimental Learning Cycle, Direct Instruction, Cooperative Learning (STAD, NHT, Jigsaw), Role Playing, Make a Match and Collaborative Learning. Each lecturer in 2015 within 2 months conducting two open classes as a model lecturer, while in 2016 each lecturer within 3-4 months conducting three to four times of open class. Implementation of LS conducted in 2015 as well as in 2016 then at the level of learning to implement Lesson Study in the sense of learning to prepare the Course Program Plan (RPP), to discuss and refine the RPP through the Plan stage, observing student learning activities as observer at Do stage and doing reflection on the learning activities undertaken by the model lecturer on the See activity. The valuable lessons learned by lecturers in 2015 and 2016 were the awareness that well-designed learning can improve the quality of the process, each student has different character and learning needs, the use of various kinds of learning media facilitate students' learning activities and understanding. The limitation of LS implementation in 2015 was the time provided for only 2 months. It has been added to four months or one full semester in 2016. In 2015 lecturers find it difficult to manage large classes and improve the quality of lectures in such short periode. The conclusions obtained by lecturers in the year 2015 was that LS implementation activities increased the lecturer's instructional skills in the form of improving the process and learning outcomes. The conclusion obtained by lecturers in 2016 was LS gave many facilities to lecturers in designing learning, LS implementation stages are easy to implement because very simple. It can improve profession of lecturers, and build professional learning community can improve lecturer's instructional skill. LS can be the main capital to realize more effective and quality learning because of the many aspirations, suggestions, and input from various parties. The recommendation given by lecturers in 2015 was the need for sharing their experience in LS implementation activities in scientific meetings and the need to use other models of learning and more effective learning resources. They also mention the need for continues LS implementation with colleagues lecturer holding the same courses for the development of innovative learning in the future. Lesson Study also needs to be done continuously. The recommendations given by lecturers in 2016 were that LS would be

better if used to evaluate a particular model of learning or application being piloted. The researchers suggested that the LS implementation is further enhanced in the form of PEKERTI facilitators as a team to model quality learning at the time of the four days workshop during material presentation, it is necessary to guide the preparation of reports so that reports have the same standards, and the need to use LS as a means of developing students' particular 21st century life skills.

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A Case of The Teaching of Angle in Primary School

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For sixth graders, the concept of angles is considered difficult concept because it's abstract representation. Therefore, it is necessary that in learning process, teachers need facilitate students in visualizing this material. This paper discusses an attempt to foster students' understanding by means of contextualizing the idea of the angle through concrete tasks of measurement through group work. The series of lesson study conducted in BPI Elementary School mathematics team brought a major change in the thought process in designing, conducting and reflecting on a lesson. In doing so, a cycle of lesson study was conducted to: 1) design visual representation of various pizza cut aiming to; 2) explore diverse students' ideas; and 3) reflect on students' ways of thinking. In the planning sessions, the team tries to do a lot of in-depth discussion on the objectives, learning materials, learning media from design visual representation of various pizza cut, predicted responses by learners, learning material, conceptual development, learning sequence, and student collaboration which is occurred. Moreover, the team tries to predict the possibilities when is occurred related to the child's response, and trying to anticipate. Classroom observation reveals that students used the application of the angle circle, protractor and even guessing. In retrospect, our lesson study not only engage students' thinking but also engage them in the realm of collaborative learning. In the reflection session, the team evaluates the achievement of learning objectives and determines the follow-up needs to be done to improve the lesson. Various opinions were delivered during these discussions that enrich the way of teachers thinking. In these activities, we learn from students about how they manage group work and how they initiate fruitful discussion. Overall, we recognize that if we want to create a successful learning, it should start from teacher planning that focuses on the students' viewpoint and considers students' perspectives. In addition, if we want to engage students to learn collaboratively, it should start with teachers who are designing and pondering lessons collaboratively as well.

Keywords: lesson study, elementary school mathematics, thinking process, collaborative learning.