

# Mathematics Teachers' Professional Development through Lesson Study in Indonesia

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Observable practices of mathematics teaching in the period of the year 2001-2003 also indicated that many teachers still have difficulty in elaborating the syllabus; a number of mathematics topics are considered to be difficult for teachers to teach; a significant number of children consider some mathematics topics as difficult to understand; teachers consider that they still need guidelines for conducting teaching process by using science process skills approach. Results of the initiated Lesson Studies significantly indicated that there are improvements of the practice of secondary mathematics teaching learning processes in term of teaching methodology, teacher competencies, students achievements, alternative evaluation, teaching learning resources and syllabus. However, in term of the longer term for teacher development program, the result of initiated Lesson Studies can be perceived as merely a starting point. There are still many things to be done in order that mathematics teachers develop their professional development.

*Keywords:* Mathematics Teaching, Professional Development, Lesson Study

## INTRODUCTION

Lesson Study activities let the teachers to reflect and evaluate, in cooperation with lectures or other teachers, their paradigm of teaching. Herawati Susilo (2003) indicated that approaches of Lesson Studies covered (a) students cooperation with others in their learning, (b) contextual teaching and learning, (c) life-skill, (d) hands-on activities, (e) interactive process oriented curriculum and syllabi development, and (f) teachers and students autonomous. From those three sites of study, there can be produced the notions of educational improvement, in term of teacher, student and lecture.

The objectives of those Lesson Study activities were to contribute the improvement of secondary mathematics education by pursuing good practice of mathematics teaching (Marsigit, 2003). Lesson Studies

for secondary mathematics were carried out by mainly Classroom Action Research approach. They carried out to improve the teaching learning practices and to find more appropriate methods for facilitating students learning. Teachers' experiences have been shared with other teachers and the lectures. The specific objectives of Lesson Study activities are:

- (1) to develop instrument and equipment for teaching learning process,
- (2) to develop teaching method and model for teaching learning process,
- (3) to develop teaching material for teaching learning process, and
- (4) to develop teaching evaluation for teaching learning process.

Isoda (2006) indicated that in the process of pre-service teacher education, it is important to develop teacher's perspectives; and, learning to listen is a key word for this approach. He added that, in the case of Japan, lesson study usually begins by developing a lesson plan in which teachers solve and pose problems from students' perspectives. Further, he claimed that: By analyzing problems, teachers develop good ways of questioning. For writing the description of the VTR, it

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is very important to ask why? Why did students say this? Behind their words, there must be so many kinds of ideas. Why did the teacher say that? Through these questions, we can better know and understand the hidden features of the lessons being observed through VTR (Isoda, 2006)

Then, it is very important to add the format of such kinds of descriptions from the view points of original lessons from different context e.g. Indonesian context. Even if we add descriptions we should be critical because re-contextualization is done by VTR users.

## METHOD

### Teacher Professional Development Activities

Since the early of 2000, there are collaborations among universities, teacher training institutes and Ministry of Education of the Directorate of Secondary Education to improve teachers' competencies to support the implementation of the proposed competent-based curriculum (DGSE, 2002). The data of teachers' professional development coming up from various activities such as (Marsigit, 2003): Validation and Socialization of the Guideline of Syllabi and Evaluation System of Competent-Based Curriculum, National Workshop for Socialization the Development of Competent Based Curriculum for Junior High School Mathematics, National Level of Training of Trainer (TOT) for Basic Science, Monitoring and Evaluation of the Piloting of Competent-Based Curriculum for Mathematics in State Junior High School.

### Case Study: Observing Japanese Lesson Study through VTR

In each of those activities, the author played the Japanese VTR of Lesson Study produced by CREAM (2000) of DIRECT NETWORK NICHIBUN, to reflect teachers' perceptions and to understand the extent it influences teachers' following activities. From the seven activities of workshops, there are totally 440 participants who observed the VTR and gave the inputs. In each of those workshops, there are some steps of

reflecting those teaching: Firstly, observing the VTR without any comment from the trainer, Secondly, collecting the general comments from the audiences, Thirdly, repeating the observation of the VTR with some comments from the trainer, Fourthly, discussing the more specific aspects of the teaching

VTR : Produced by CREAM, Direct Network  
 Nichibun  
 Lesson : Choosing Tasks according to Pupil's  
 Interests (4th grade)  
 Teacher : SAITO, Kazuya  
 School : Ookayama Elementary School, Yokohama  
 city  
 Unit : The area of plane figures

In the highlighting the VTR, teachers observe and reflect on how the teacher facilitate their students (Isoda, 2006): to appreciate the formulas for the area of figures and are willing to use the formulas in order to find the area; to find the area making the best use of their prior knowledge and experience; to formulate the methods to find the area of parallelograms; to find the area of fundamental Figures efficiently; to understand the methods of finding the area of fundamental figures.

### Initiating Lesson Study

Under cooperation between Government of Indonesia (GOI) and JICA-Japan, three universities UPI Bandung, UNY Yogyakarta and UM Malang carried out project called IMSTEP-JICA for pursuing good practice of mathematics (and sciences) teaching by empowering and developing teacher education (Herawati Susilo, 2003). Starting in 1999 and lasting in 2005, the extending of the project resulting piloting activities through Lesson Studies for good practice of secondary mathematics teaching in three cluster site West Java, Central Java and East Java.

The piloting activities were carried out in three clusters i.e. West Java (Bandung), Central Java (Yogyakarta), and East Java (Malang). Table 1 below shows the number of classes, teachers, and lecturers in each site.

**Table1. Three cluster sites of Lesson Studies of Mathematics Teaching (IMSTEP-JICA Project)**

|                       | West Java<br>(Bandung) |           | Central Java<br>(Yogyakarta) |           | East Java<br>(Malang) |           |
|-----------------------|------------------------|-----------|------------------------------|-----------|-----------------------|-----------|
|                       | Year                   | Year      | Year                         | Year      | Year                  | Year      |
|                       | 2001/2002              | 2002/2003 | 2001/2002                    | 2002/2003 | 2001/2002             | 2002/2003 |
| Classes<br>(schools)  | 1                      | 2         | 1                            | 3         | 1                     | 1         |
| Teachers<br>involved  | 1                      | 2         | 3                            | 3         | 1                     | 1         |
| Lecturers<br>involved | 4                      | 4         | 4                            | 3         | 4                     | 4         |

The Lesson Studies were developed in which the teachers, in collaboration with Lecturers and Japanese Experts, tried out some teaching models at schools (Gorman, 2005). The Lecturers of Teacher Training Program and School Teachers worked collaboratively, composes some numbers of Lesson Studies. The grounds of the Lesson Study activities were reflecting and promoting the new paradigm of the secondary mathematics and science education, in which learning activities are not only perceived pragmatically and short-time oriented but also to be perceived as a long-life time purposes.

## RESULTS

In general, the activities of reflecting Japanese context of mathematics teaching through VTR in the training program were perceived as good and useful by the teachers. The teachers perceived that such activities need to be socialized to other districts in order that more teachers can learn it. They perceived that the teaching reflected in the VTR was a good model that can also be implemented in Indonesian context. However, they perceived that it is not easy to implement it.

The teachers viewed that to implement good model of mathematics teaching, as it reflected in the VTR, there are some constraints coming from: lesson plans, students' worksheets, teachers' competencies, students' readiness, educational facilities and equipments, teaching methodologies, allocation of time, number of students and budgeting. Teachers need to improve their competencies of teaching and competencies of teaching contents. They perceived that they need to improve their competencies in preparing the lesson plans and producing students' worksheets.

There were strong evidences that Lesson Studies activities improved students' enthusiasm, motivation, activities, and performance. It also improved teachers' professionalism in terms of teaching performance, variation of teaching methods/approaches, collaboration. Lecturers got to know more about the problems faced by teachers. It was take time for teachers to shift from teacher-centered to student-centered. Teachers developed teaching methods based upon more hands-on activities and daily life utilizing local materials. Students were active learning and involved in discussion to share ideas among classmates.

Students enjoyed learning science and math during Lesson Study activities due to some reasons. According to students' respond, the lesson was not so formal, the contents were easier to learn, the students were able to express their ideas, the students got much time to discuss with their classmates, and the students got more experiences in science and mathematics. Further, the teachers developed alternative methods for letting their

students to learn and to construct their own concepts. However, teachers needed more time to get used to develop teaching model by their own.

The Lesson Study project was proven to be very effective in lifting students' enthusiasm in learning mathematics, in helping students to develop their experimental and discussion skill, in giving opportunities to students in developing their own scientific concept by themselves. It was also documented that by employing constructivism approach, the students may find out their best style of learning. Competition rises among groups of students in presenting the results of their work and defending their presentations. This encouraged the students to learn more theory on their own. As a result of Lesson Study activities there were many teaching material has been developed either by lecturers or by teachers.

The results of Lesson Study activities and exchange experiences come to a suggestion that to improve mathematics and science teaching in Indonesia; it needs to deliver obvious messages to the government, teachers and head-teachers or schools. It learned from the study that to promote good practice of mathematics and sciences teaching, the teachers need to en-culture their efforts in inovating teaching learning processes which meet to academic students needs, encouraging students to be active learners, developing various strategic of teaching, developing various teaching materials, and in developing teaching evaluation. In developing teaching learning methods, the teachers perceived they need to: plan the scenario of teaching, plan students activities, plan teachers' roles, distribute the assignments, develop assesment methods, and monitor the progress of students achievements.

According to teachers, most of the students are not ready or not able to present their ideas; it takes time for them to accustom to do that. The teachers indicated that most of the schools are lack of educational facilities and teachers need to be able to develop teaching media. According to teachers, the most difficult to implement good model of teaching practice is about time allocation. They perceived that it is not easy to take in balance between achieving students' competencies and considering their processes of learning. Meanwhile, they claimed that a teacher still should facilitate a lot number of student i.e. forty students per class.

## CONCLUDING REMARKS

This research lead to the conclusion that to develop teaching experiences, teachers need to participate frequently in Lesson Study activities. By developing teaching materials teachers may conduct the teaching and learning process more efficiently. In Lesson Study activities, the students enjoyed mathematics learning because they were involved in observing and doing

things. Developed teaching materials also improved students' motivation and interest in learning mathematics. Although there are many kinds of teaching materials that have been developed through those Lesson Study activities, there are still more topics that need to be better equipped with teaching materials. This research concluded that lecturers from three universities need further collaborative work to develop more teaching materials in the future.

It was indicated in this research that the teachers hoped the schools and government to support their professional development including the chance to get training, to participate the conferences, to participate in teachers club. The teachers perceived that in the teachers' club they will be able to discuss and develop lesson plan and students worksheet. Teachers suggested that teachers' professional development programs should be based on teachers' need; and therefore, it needs such a need assessments prior the programs. They also hoped that the schools and government procure educational facilities and improve their salary.

The study also recommended that to encourage educational innovations, the head-teachers need:

- (1) to make good atmosphere for teaching and learning,
- (2) to promote to implement various teaching methods and teaching learning resources,
- (3) to give the chances for the teachers and their students to perform their initiatives,
- (4) to promote cooperative learning,
- (5) to promote research class as a model for educational innovations (as Japanese teachers do),
- (6) to support the teachers to be the developer/maker of the curriculum,
- (7) to promote teachers' autonomy in developing model of teaching learning activities,
- (8) to implement school-based management,
- (9) to encourage students' parents participations, and
- (10) to promote cooperation with other educational institutions.

Further, the study also recommended that to improve the quality of mathematics education, the central government needs to:

- (1) implement more suitable curriculum i.e. more simple and flexible one,
- (2) redefine the role of the teachers i.e. teachers should facilitate students' need to learn,
- (3) redefine of the role of principals; principals should support the professional development of teachers by allowing them to attend and participate in scientific, meetings and trainings,
- (4) redefine the role of schools; schools should promote school-based management,
- (5) redefine the role of supervisor; the supervisors need to have similar background with the

teachers they supervise in order to be able to do academic supervision,

- (6) improve teachers' autonomy to innovate mathematics and science teaching and learning,
- (7) promote better collaboration between school and university; communication among lecturers and teachers should be improved; these could be done through collaborative action researches and exchange experiences through seminars and workshops,
- (8) redefine evaluation system, and
- (9) extend project for promoting new paradigms and educational innovations.

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