

IMPLEMENTATION OF LESSON STUDY FOR IMPROVING THE QUALITY OF MATHEMATICS INSTRUCTION IN MALANG

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The purpose of this paper is to describe some advantages of developing and implementing lesson study for mathematics instruction in Malang. FMIPA UM has introduced, developed and implemented lesson study to mathematics instruction in Malang. The advantages that we found as impacts of implementing lesson study are as follows. Usually in the past teacher and lecturer of mathematics have no relationship and never have what the so called collaboration. Now, they work together in a group to plan, implement, and observe, as well as reflect their lesson. Lessons implemented are open to be observed and criticized by others both internally and externally. Mathematics lecturers are directly involved in mathematics instruction in school so they get useful experience. Mathematics teacher association is more empowered. Mathematics teachers and lecturers will be professional.

INTRODUCTION

The Government of Republic Indonesia and Japan International Cooperation Agency (JICA) have collaboratively established the Project for Development of Mathematics and Science Teaching for Primary and Secondary Education. The project has been formally established since October 1, 1998. The name of the project is “ Indonesian Mathematics and Science Teacher Education Project – Japan International Cooperation Agency, (IMSTEP – JICA) ” . There are three universities participated and worked together in the project. The first university is Indonesia University of Education [*Universitas Pendidikan Indonesia (UPI)*] – Bandung – West Java. Faculty of Mathematics and Science Education [*Fakultas Pendidikan Matematika dan Ilmu Pengetahuan Alam (FPMIPA)*] from this university involves in implementing the project. The second university is State University of Yogyakarta [*Universitas Negeri Yogyakarta (UNY)*]. Here, Faculty of Mathematics and Science [*Fakultas Matematika dan Ilmu Pengetahuan Alam (FMIPA)*] plays a role in implementing the project. The third is Faculty of Mathematics and Science [*Fakultas Matematika dan Ilmu Pengetahuan Alam (FMIPA)*] of State University of Malang [*Universitas Negeri Malang (UM)*] – Malang – East Java also has taken part in implementing the project since October 1, 1998.

Since it is established, it has been completed two phases of implementation. The first phase is done from October 1, 1998 to September 30, 2003. Basically, the main purpose of IMSTEP JICA is to enhance the capacities of teachers in mathematics and science both through pre-service teacher training and in-service teacher training. To achieve the purpose, during this period, the activities of the project are mainly related

to providing laboratory facilities, curriculum revision and its subject content, syllabi revision, teaching method development, teaching materials development, evaluation and communication development for both pre-service and in-service teacher training. Communication development in *FMIPA UM* is emphasized on printing and publishing five journals and one Newsletter of *IMSTEP JICA*. The journals are *Jurnal FMIPA*, *Matematika*, *Foton*, *Media Komunikasi Kimia* and *Chimera*.

In performing activities as I mentioned before, four task teams has been establish to handle it out. They are (1) Task Team A: responsible for curriculum and subject contents, (2) Task Team B: responsible for syllabi and teaching method, (3) Task Team C: responsible for teaching materials, and (4) Task team D: responsible for educational evaluation and communication for the project. In addition to the task teams, under the framework of technical cooperation, *JICA* dispatched some experts related to mathematics and science education. They are very useful in conducting and managing the purpose of the project.

After mid-term evaluation conducted in July 2001, piloting activities and exchange experience is introduced. In piloting activities, a teacher - in-service teacher training - can invite other teachers to observe his or her lesson. Other teachers can be teachers from the same school (collegial teachers), teachers or people from outside school, and/or academic staffs (lecturers) from *FMIPA UM*. By doing this, we believe that professional development of a teacher can be achieved. There are four piloting schools in piloting activities conducted in Malang, i.e Public Junior High School 4 of Malang [*Sekolah Menengah Pertama Negeri 4 Malang (SMPN 4 Malang)*], Laboratory Junior High School of State University of Malang [*Sekolah Menengah Pertama Laboratorium Universitas Negeri Malang (SMP Lab UM)*], Public Senior High 2 of Malang [*Sekolah Menengah Atas Negeri 2 Malang (SMAN 2 Malang)*], and Laboratory Senior High School of State University of Malang [*Sekolah Menengah Atas Laboratorium Universitas Negeri Malang (SMA Lab UM)*].

Exchange experience is conducted to let teachers share their experiences. Participants of the exchange experience activities are districts education officers, subject matter supervisors, principals, principals association [*Musyawarah Kerja Kepala Sekolah (MKKS)*], teachers, subject matter teacher association [*Musyawarah Guru Mata Pelajaran (MGMP)*], and academic staffs from university. Therefore, exchange experience is a medium to disseminate the results of piloting activities.

The second phase of the project is the Follow-up Program started from October 1, 2003 and ended in September 30, 2005. Based on the minutes of meeting between Japan International Agency and Authorities Concerned of the Government of Republic Indonesia, the goal and purposes of the Follow-up Program are as follows. The goal is to improve students' scientific thinking and experimental skills as well as their understanding of science and mathematics in lower secondary education in Indonesia through institutionalizing disseminating outputs of the project. While the purposes are (1) the quality of in-service teacher training in mathematics and science education will be improved by the institutionalized participation of university and (2) education to

prospective teachers in mathematics and science at the three universities (*UPI, UNY, and UM*) will be improved.

During Follow-up Program phase, the project introduced and implemented an approach, a technique, or a method of instruction to piloting school, namely lesson study. Lesson study is not only introduced to teachers of piloting schools; but also to students, subject matters teachers association, principals, principals association, and academic staff from university.

Lesson study has been implemented for mathematics instruction in piloting schools. *Puspitasari*, mathematics teacher from *SMPN 4 Malang*, implemented it successfully. Besides, *Arsita* and *Setiawan* – mathematics teachers from *SMA Lab UM* - have also tried this approach to their classroom instruction.

The purpose of this paper is to describe briefly three things. First, describing good practices of lesson study for improving quality of mathematics instruction. Second, describing why lesson study can be good practices for improving quality of mathematics instruction. Third, describing reforms that can be expected from mathematics teachers by implementing lesson study in their classroom lesson.

DESCRIPTION OF GOOD PRACTICES

Lesson study is a method that can be used in pre-service teacher training, in-service teacher training, and on-service teacher training. In other words, it can be used to professional development endeavours to mathematics teachers and instruction. It is true because development and implementation of lesson study is based on the real teaching practices, data observed during lessons done by internal teachers (collegial teachers) and other external teachers (lecturers), and reflection. Therefore we choose lesson study to be developed and implemented in *FMIPA UM*, especially in mathematics instruction.

There are several steps that have been done by *FMIPA UM* to introduce and implement lesson study. The first step is conducting workshop and training for piloting school teachers and academic staffs of *FMIPA UM*. The purpose of this workshop and training is to introduce what, why, and how of lesson study to the participants. There are two separated kind of workshops and training, namely *FMIPA UM* and piloting school level. The participants of workshop and training for *FMIPA UM* level are lecturers and students from mathematics, physics, chemistry, and biology department of *FMIPA UM*. While the participants of piloting school level are mathematics, physics, chemistry, and biology teachers of piloting schools as well as subject matter teacher association.

The second step is conducting workshop and training for planning lesson study. Academic staff from *FMIPA UM*, student from *FMIPA UM*, and teacher from piloting schools for each subject matter worked together in a group. This research lesson planning group usually consists of 5 – 6 members. They select and decide research theme, subject area, topic, unit, and research lesson that will be implemented. They

also decide one of the group members to be a teacher or instructor that will implement the research lesson while others will be observers.

The third step is conducting research lesson. Teacher that has been appointed teaches the research lesson. Other group members observe and collect data related to research lesson implemented. At this step, other invitees can attend and observe the implementation of the research lesson. After completing the research lesson, at the same day – soon after the research lesson finished, all participants discuss data collected from research lesson.

Reflection and revision is the final step in implementing lesson study. Member of research lesson planning group identify and consolidate what they have learnt from the research lesson as well as write up reflections. Based on the result of reflection, the member of the group revise the research lesson and if decide they re-teach the lessons.

From the above description, there are at least five good practices that can be identified from the development of lesson study in my institution. They are (1) relationship and communication between *FMIPA UM* and schools run smooth and efficient, (2) partnership among teachers and lecturers is mutually developed, (3) collegiality among teachers and/or lecturers is developed, (4) mathematics instruction is more effective, and (5) professional development of mathematics teachers is achieved.

WHY I CAN SAY IT AS GOOD PRACTICES

There are several reasons why I said that implementation of lesson study can be good practices.

Before the implementation of lesson study, it was hard and difficult to build relationship and communication between teachers in schools and lecturers in *FMIPA UM*. After implementing lesson study, relationship and communication run smooth and efficient. Teachers and lecturers realize that they need each other to perform lesson study effectively.

In line with the second good practice, partnership among teachers and lecturers is also mutually developed. Teachers and lecturers collaboratively design, develop, and implement their lesson plan, research lesson, observation, discussion, reflection, and revision. On the one hand, mathematics teachers need to collaborate with mathematics lecturers in terms of getting verifications of mathematics instruction they implement. On the other hand, mathematics lecturers can learn how teaching learning mathematics practiced in school. It is useful for both mathematics teacher and lecturer. They can do some reflection to themselves by seeing others in doing this practice.

The third good practice is promoting mathematics teachers and/or lecturer collegiality. Usually collegiality is formed through initiative collaborative works. There is no feeling superior and inferior among them. Teachers can come and see their partners for help at campus without difficulty. They just make a call to make appointment and get their self-fulfilment. Mathematics teachers and lecturers should be opened for others

critics. This is the way how they can learn each other. They have to evaluate and give some critics to their colleagues that performed their lesson in class.

The fourth good practice is the effectiveness of mathematics instruction. The effectiveness of mathematics instruction can be guaranteed due to (1) lesson plan and research lesson prepared by a group of mathematics teachers, (2) one group member teaches research lesson while others observe and collect data, (3) team member discuss data collected, and (4) they do reflection and revise the lesson.

Professional development of mathematics teachers is achieved. It is reasonable due to plan, do (implement), and see (observe and reflect) of lesson study cycle. This is done repeatedly during the implementation of research lesson. Knowledge and skill of teacher will be improved. Consequently, he or she who teaches research lesson can be a professional mathematics teacher.

WHAT KIND OF REFORM IS EXPECTED BY SUCH KIND OF PRACTICES

After several periods of implementations, finally there are found some reformations. Usually in the past, mathematics teachers in school did not collaborate with mathematics lecturers in *FMIPA UM*. Teacher – lecturer collaboration existed only when students of *FMIPA UM* conducted teaching practices at particular school. Due to the implementation of lesson study, collaboration among them is needed. Automatically collegiality among teachers is formed through it. Group of mathematics teachers consult lesson theme, discuss teaching strategies and methodology, decide teaching materials, produce worksheets to be used, and arrange time schedule together with colleagues. The result of this activity is communication among them has been run smoothly.

Now, they work together to plan research lesson. Research lesson implemented are opened to be observed by others. It was rarely happened in instructional atmosphere in my country before. Mathematics teachers did not like to be observed when they performed their teaching in class. Now, teachers are welcome to be observed because they realize that suggestion and critics from colleagues or others are very useful in improving the quality of their instruction.

Mathematics lecturer are directly involved in mathematics instruction in school so they get useful experience to enrich their knowledge and skill. They directly observed the research lesson implemented in classroom instruction. By doing this, mathematics lecturers get a clear insight of how mathematics curriculum and program is implemented. They can use it to prepare qualified prospective mathematics teachers.

Mathematics teachers association (*MGMP Matematika*) is more empowered. They involved in workshop and training on lesson study held by *FMIPA UM*. They have actively and fully participated which started from preparing, implementing, discussing, reflecting, and revising the lesson. Now, lesson study is a part of their program and activities and they like it very much.

CONCLUSION

Lesson study is a method that can be used to improve the quality of mathematics instruction. Lesson study has been chosen, developed, and implemented in mathematics instruction. In developing and implementing lesson study, we use several steps as follows (1) We held workshop and training related to lesson study attended by teachers, lecturers, principals, supervisors, mathematics teachers association, and mathematics education student to introduce the what, why, and how of lesson study, (2) We held workshop and training to make lesson plan and research lesson, (3) Research lesson is implemented, observed, discussed, reflected, and revised in piloting school.

The implementation of lesson study has some impacts as follows (1) collaboration, collegiality, and communication among teachers and lecturers are formed, (2) Implementation of research lesson is opened to be observed by others, (3) Mathematics lecturers directly involved in mathematics instruction in school, (4) Mathematics teachers association is more empowered.

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