IMPROVING THE QUALITY OF SECONDARY MATHEMATICS TEACHING THROUGH LESSON STUDY IN YOGYAKARTA, INDONESIA

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There are many ways to improve the quality of mathematics teaching in Indonesia. Evidence and experiences from other country indicated that Lesson Study can be the one of the method for supporting teachers' professional development. From 2004 to 2005, in collaborations with IMSTEP-JICA Project, the Faculty of Mathematics and Science, the State University of Yogyakarta introduced and implemented lesson studies activities in two district Sleman and Bantul.The results of lesson studies activities indicated that there were significantly improvement of teaching learning of secondary mathematics in term of teachers' competencies and students' motivation. Amongst the success results there were also difficulties how to implement lesson studies continually in term of budgeting.

Introduction

There are many factors influencing the quality of mathematics teaching at schools such as teacher, learner, facilities, laboratory completed with experiments kits, environment, management, and so on. In this paper, it is focused on teacher as the most important factor in influencing the improvement of teaching quality instead of other factors mentioned. In Indonesia, in term of teachers' professional development, the improvement of teaching quality have caried out by various programs such as in-service training such as equivalency, training, seminar or workshop, and some the like. After completing the training, teachers are expected to implement it in teaching their students in class.

For a certain teacher training that has been conducted by Indonesian government need a large amount of budget which was taken from national budget or international loan. There was adequate feedback resulted from those trainings toward the improvement of teaching quality. Following the programs for teachers' professionalism development, they need monitoring activities to picture the impacts of the improvement on teaching quality. Program for in-service teacher training has its aim to improve the teacher quality, however, it was difficult to serve the trainee to have the chance to get "concrete experience of teaching" in training activities. There were evidences that the trainees sozialize their results of training in teachers' club.

Since 2002, Indonesian education system is more decentralized rather than centralized. It makes the schools and the teachers to have the new chalenges how to improve their quality of teaching otonomously. Schools and teachers are now to have the chance to develop their own curriculum with a few and flexible guideline from the central government. Currently, national curriculum was simply developed containing the outline

of competency standard, basic competency, and achievement indicator. Teachers have their right to describe it into detailed syllabi based on students' characteristics, school resources, and environment.

In decentralization era, teachers have to be more active and creative to create and develop their ideas without unintended interventions from central government. Teachers are now to have a chance to deconstruct their old paradigm of teaching. They are not just as the implementer of curriculum but they tend to be developer of curriculum. It is not caused by bad input outside but teachers will have a freedom to explore their role professionally in class. Teachers are challenged to have trained competency to prove their profession as professional teachers. Briefly, now, teachers are the implementer of what has been decided by bureaucrats as well as challenged to think logical, critical, creative, and doing reflection in improving teaching quality. However, the central government still has their important role in facilitating teachers' professional development. One of the way to support the teachers is to introduce lesson study program to improve the quality of their teaching.

Lesson Study

Japanesse experts indicated that Lesson study is considered as: 1. intiative of a teacher or group of teachers to improve themselves in teaching, and to get any input to make innovation based on the result of good plan and implementation (open for other teachers/observers to visit their class); 2. medium for learning of teacher or other participant including the teacher as presenter; 3. medium for discussion or sharing experience to improve teaching quality.

Meanwhile, we define Lesson Study as an activity carried out by a number of teachers of a certain subjects in collaboration with educational experts to improve their quality of teaching. Lesson Study has three (step) main activities : planning, implementing (teaching & observing), and reflecting toward the planning and implementing to real teaching.

1. Planning

In this step, there is an identification of the problems found in classroom used for lesson study followed with its alternative solutions. The identification and solution taken is related to the teaching material talked in classroom, schedule, students' characteristic, class condition, teaching method, teaching media, experiment kits, and evaluation toward the teaching process and result.

There was discussion about the choosing of teaching material, method, and media based on students' characteristic and evaluation types used. There would be suggestion/input coming from teachers and experts. Experts or senior teachers would gave any opinion about new things to be applied by teachers in classroom including using the teaching approach of constructivism, contextual teaching and learning, life skill, Realistic Mathematics Education, carrying out newest teaching material or others can be brought into discussion.

Other discussion is about the writing of observation sheet especially about determining the indicator of good teaching-learning process seen from the aspect of teacher and students. Those indicators were written based on lesson plan taken and basic competency to reach out by students during the teaching-learning process.

Based on the identification and solution of the problems above, it was carried out into a set of teaching unit consisting of:

a. Lesson Plan
b. Teaching Guide
c. Students' worksheet
d. Teaching media
e. Evaluation sheet of teaching process and result
f. Observation sheet

Lesson plan can be written by one teacher or more who agreed with the aspects of planned teaching. To be more perfect, the result is, then, discussed with other teachers and experts of their group.

2. Implementation and observation

In this phase, a teacher implemented the lesson plan developed while other teachers and expert observed the process using observation sheet prepared. To support it, the observer took video shooting to take the special events during the implementation both teacher and students. There are some phases and in each phase there are some cycles of Lesson Study activities.

3. Reflection

In this phase, the teacher implemented the lesson plan was given a time to state his feeling during the implementation both for himself of his students. Next time was given to observers both expert and other teachers to give their analysis of observation data toward the students' activity during the implementation followed by the play of video. The teacher of presentation, then, was asked to respond the observer's comment. The important thing in reflection is to reconsider the lesson plan developed as the basic to make improvement to next teaching.

Is the lesson plan fit and able to improve students' activeness in learning? If not fit yet, find those are not fit. Is that about teaching method, student's worksheet, media or other teaching aids? This consideration is taken as input for improving the teaching in next phase. Seeing the aspect of planning, implementing, and reflecting on lesson study, it makes lesson study looks similar to Classroom Action Research (CAR).

Methods

In cooperation with IMSTEP-JICA Project, in Yogyakarta, Lesson Studies activities were carried out in some schools that we called piloting schools. In the 1st phase, starting in

the year of 2004 in the district of Sleman, Yogyakarta, the activities of lesson studies were already conducted by some mathematics teachers from 21 secondary schools. The school selection was taken under the aspect of school representation among senior and junior high schools in villages and towns in each regency of Yogyakarta province and headmaster supported much. In conducting lesson studies we also involve the role of teachers club. There are 3 cycles of activities in the 1st phase of lesson studies.

The results of piloting program in 1st phase were enhanced in 2nd phase of Lesson Studies activities. In the 2nd phase, starting in the year of 2005, still in the district of Sleman, Yogyakarta, Lesson Studies were carried out in 42 schools (as the extension from schools numbers in the 1st phase). The use of many schools was aimed to disseminate the results of lesson studies activities to other teachers from other schools. However, because of the limitation of the budget, in the next phase, we should decrease the number of schools that is we concentrate to carry out lesson studies activities in 3 junior high schools and 3 senior high schools. In each lesson studies activities, there are 5-6 teachers in collaborations with university lectures and Japanese experts to carry out the steps of activities. The following phase of lesson studies activities is the results of the previous reflection and the results of improvement based on the inputs from teachers, lecturers and experts. There are 3 cycles of activities in the 2nd phase.

In the 3rd phase, starting in the year of 2005, lesson studies activities were extended to others teachers club from different district i.e. Bantul district of Yogyakarta. In this district, lesson studies activities were carried out in 3 junior high schools and 3 senior high schools. In each lesson studies activities, there are also 5-6 teachers in collaborations with university lectures and Japanese experts to carry out the steps of activities. There are 4 cycles of activities in the 3rd phase. In the 3rd phase we involved more intensively the teachers club.

Results and Discussion

Results of lesson study implementation can be summarized from the activity reports of piloting program were presented in the following table.

Table: The Condition of Student, Teacher, and Supporting Teaching Aids

Aspect	Before Piloting Activity	After Piloting Activity
Student	o Low learning motivation, mathematics and physics were seen as difficult subjects o Passive participation / involvement o Low ability in using laboratory kits o Low ability in organizing data o Not skillful in making conclusion o Low ability on giving question	• Improved learning spirit and happy during the learning process • Active participation / involvement during the teaching learning process • skillful in using laboratoty kits • able to organize data dan making conclusion • able to give question and argument during dicsussion • able to cooperate with friends in

	and argument o low cooperation in group	group
Teacher	o High domination during the teaching learning process o Speech-based Instruction o Low collaboration with other teachers in teaching activities o Low of preparation of teaching material	• Low domination during teaching learning process • Student-based instruction • High colaboration with other teachers in teaching activities • High preparation of teaching material
Supporting Media	o Low in using teaching media/aids	• Good in using teaching media/aids

The results are further stated that there were indications that in lesson studies activities :

1. Students were good on learning motivation, skill-process, knowledge, enthusiasm of doing cooperation, and good communication.
2. High motivation of teacher to follow teaching process since preparation, implementation, and reflection.
3. Most MGMP teachers made good preparation (planning) and teaching performance (implementation) in front of students, university students as well as lecturers.
4. Improved student' role on learning, good teacher's role, available hands-on activity, available minds-on experience reflecting three main characteristics of ideal Scients and Mathematics (MIPA) teachings such as: hands-on activity, group work, and discussion.
5. Teachers accepted any suggestion and critic upon their teaching activity.
6. Headmaster supported much the implementation of lesson study.
7. There was a complete teaching set in each piloting class.
8. There was positive role of leturers toward lesson study as facilitator, motivator for all participants since planning, implementing, and reflecting followed by good understanding about school, collaboration with teachers, and feedback data for their lecturing.

Some problems found in piloting activity was teachers need to work longer and harder to make preparation collaborated with other piloting team. The question, then was how to make the activity become teacher's habit so they will be happily in running piloting activities.

Other problems for schedulling lesson studies activities team were:

1. there were many indifferent schedule among pilot schools causing some activities posthoned or canceled;

2. all member of piloting team were bussy people who difficult to attend all piloting activities on time.
3. How to make good communication and coordination among piloting team and school as well as among teachers would be the key to find good solution for those problems.

Some constrains and problems, however, were found during the implementation, that are:

1. the development of a good system and good communication among schools, and between schools and LPTK in conducting lesson study.
2. the support of policy and finance from goverment, both national and local, or other sponsors.
3. commitment from teacher, especially headmaster as the key word of conducting lesson study.

Recommendation

In training, teachers learn about how to do lesson study while lesson study already implemented was collective work of groups of MGMP teachers, university students, and lecturers. In making lesson plan, it was done collaboratively among them, implemented by one chosen teacher, and evaluated together through reflection. Lesson study means learning a learning activity. Teacher can learn about how to do learning activity through teaching activity (live/real or video). Teacher can adopt the method, technique or teaching strategy, teaching media used by teacher in order to be imitated and implemented by other teachers in their own classes. Other teachers or observers need to make analysis or evaluation toward the teaching activity from minute to minute. The analysis result is important as input for teacher, presenter, to improve his/her teaching while for observers, they can learn about the innovation on teaching done by other teacher.

Considering deeply on the meaning of lesson study activity, it is important to develop it among MGMP teachers. Teacher or school can open their innovative class to other teachers. In future, lesson study is expected to be one model of teacher's training with good planning, by inviting a number of teachers to attend an innovative class. It, therefore, need to improve teacher's competence as teaching agent in creating innovatice teaching activity based on students' characteristics and the demand of the progress of science and technology.

The thoroughly activities of lesson studies lead to formulate the following recommendations:

1. Lesson Study is in the line with teachers motivation to improve their quality of teaching. It need to introduce more effectively in order that the teachers need to implement Lesson Study.

2. Lesson study, with its preparation, implementation, and reflections activities, encourage the teachers to improve their teaching method; therefore it needs to improve those steps.
3. The policy of education decentralization which place teacher as the central key having widely responsibility becomes a vital aspect in developing the teaching conducted. Therefore, it needs to consider lesson study as the way to improve mathematics teaching quality.
4. The existence of MGMP in each regency has its strategic role to socialize lesson studies activities and its results.
5. The heterogen quality of teachers seen form the aspect of commitment, motivation as a teacher and competence enables the improvement its quality from teacher to teacher which automatically improving teacher collegiality in strugling their need to improve the teaching quality.
6. Lesson Study is able to be carried out in each Institute Teacher Training
7. Lesson Study can be a model for teachers' professional development.

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