The Expectations of Implementing Lesson Study in Mathematics Education in Indonesia

by

Puji Iryanti

SEAMEO QITEP in Mathematics, Indonesia

emelotirto@yahoo.com

Abstract

The Government of Indonesia demands its teachers to have four competences namely competence of pedagogic, personality, social, and professional as mentioned in Regulation of the Minister of National Education number 16 year 2007. Particularly, pedagogic and professional competence should be developed continuously. To meet the need of teachers to develop their professional development, it is suggested that teachers implement Lesson Study. Since 1998, it has been implemented in Indonesia through IMSTEP (Indonesian Mathematics and Science Teacher Education Project), in three Institutes of Teacher Training and Education (IKIP), located in Bandung, Yogyakarta and Malang, in collaboration with Japan International Cooperation Agency (JICA). The project was considered successful in enhancing mathematics and science education. Since then lesson study spread almost everywhere in Indonesia. Because there is a connection between TIMSS (Trend in International Mathematics and Science Study) and the spread of lesson study in the world including in Indonesia, there is a curiosity whether the implementation of lesson study in mathematics education raises Indonesia's position and change students' profile in TIMSS. The facts shows that there is no significant change in the position and the profile. However, considering the benefits of lesson study in mathematics education, Indonesia through SEAMEO QITEP in Mathematics disseminates lesson study in mathematics education to SEAMEO member countries.

Key words: lesson study, professional competence,TIMSS, disseminate

Improving quality of Indonesia human resources is a demand that is a non-negotiable demand. Higher competition, not only in Indonesia but also beyond, demands Indonesia to make every effort to survive and win the competition. It is undeniable that the quality improvement of human resources starts from education. In Indonesia, the term quality education was being discussed for years, but just in 2005 Indonesia has a clear educational standard. The Government of Indonesia released a regulation namely Government Regulation (PP) number 19 on Education National Standards comprising eight minimum standards to reach the quality education. The eight standards are Standard of Content, Standard of Graduate Competency, Standard of Educational Assessment, Standard of Process, Standards of Teacher and Educational Personnel, Standard of Management, Standard of Funding and Standards of Equipment and Infrastructure. The availability of these Standards makes quality education becomes more obvious.

Standards of Teacher and Educational Personnel is elaborated in several Regulations of the Minister of National Education (Permendiknas). One of the regulations is Permendiknas number 16 year 2007 about Standards of Academic Qualification and Competence of Teachers.

Every teacher must have a minimum academic qualification diploma four (D-IV) or bachelor (S1). In addition, teachers are required to have four competences, namely competence of pedagogic, personality, social, and professional. Based on the assumption that teachers already had personality and social competence, this paper will discuss only pedagogic and professional competence.

The pedagogic competence is the ability to manage learning that includes understanding students' characteristic, designing, implementing and evaluating learning, and developing student's potentiality. The pedagogic competence includes:

1. mastering learner's characteristics in physical aspects, moral, social, cultural, emotional, and intellectual.
2. mastering the learning theories and principles of learning.
3. developing curriculum related to subject matters taught.
4. organizing learning
5. utilizing information and communication technology for learning purposes.
6. facilitating the development of learners' potential.
7. doing an effective communication by showing empathy and courteous to students.
8. conducting assessment, evaluation processes and learning outcomes.
9. utilizing the results of assessment and evaluation for learning purposes.
10. doing reflective action to improve the quality of learning.

The professional competence is the ability to master the in-depth teaching materials including:

1. mastering contents, structure, concepts, and patterns of scientific thought that supports subject matter taught.
2. mastering standard of competence and basic competence of subjects taught.
3. developing teaching materials creatively.
4. developing a sustainable professional with reflective action.
5. utilizing information and communication technology for communication and human development.

Especially for mathematics teachers at junior high school, secondary high school, and vocational school, the professional competence number 3 (developing teaching materials creatively) is elaborated as follows.

- Using numbers, relationships among numbers, number systems and measurement theory.
- Using measurement and interpretation.
- Using mathematical logic.
- Using concepts of geometry.
- Using statistical concepts and probability.

- Using patterns and functions.
- Using concepts of algebra.
- Using concepts of calculus and analytic geometry.
- Using concepts and processes of discrete mathematics.
- Using trigonometry.
- Using vector and matrices.
- Explaining the history and philosophy of mathematics.
- Having capability to use teaching aid, instruments of measurement, calculators, computer software, mathematical models, and statistical models.

Regarding the details of pedagogic and professional competence above, teacher should have the details of both competences and always improve her/his professional skills. Lesson Study which has steps of Plan, Do, and See, is an alternative activity to improve pedagogic and teachers' professional competence. In step Plan, a teacher or a group of teachers plans a learning; in step Do, a teacher implements the lesson plan, while other teachers observe; finally in step See, both the teacher and observers do reflection on the lesson observed. The steps of Lesson Study are ongoing activities with the aim to improve the quality of learning and simultaneously improve the teacher's competence. In addition, Lesson Study activities are carried out collaboratively among several teachers under the guidance of lecturers as resource persons, leading to the exchange of ideas and knowledge. There is communication and openness in designing learning, preparing media and facilities, implementing the designs, as well as reflecting and evaluating the learning.

Lesson Study, started in Japan in 1870s, is a practice-based method to develop the professionalism of teachers. Lesson Study in Indonesia developed through IMSTEP (Indonesian Mathematics and Science Teacher Education Project) in 1998 in three Institutes of Teacher Training and Education (IKIP), located in Bandung, Yogyakarta and Malang, in collaboration with Japan International Cooperation Agency (JICA). Later, the three IKIPs changed their names to Universitas Pendidikan Indonesia (UPI), Yogyakarta State University (UNY) and Malang State University (UM). The purpose of this project was to improve the quality of mathematics education and science (IPA). Initial activities were workshops between mathematics and science teachers at secondary schools and lecturers from UPI, UNY and UM, in order to develop mathematics and science learning. At the workshop, they developed innovative teaching models using hands-on activity, real-world context and local materials. Then, the learning models are tested in the piloting activity at several secondary schools. IMSTEP was considered successful in enhancing mathematics and science education. Therefore, after the project ended in 2003, there was a continuation project called IMSTEP Follow-up lasting 2005. In 2006 – 2008, a new joint project with JICA was started namely SISTTEMS (Strenghtening In-service Teacher Training in

Education of Mathematics and Science) in three regencies, Sumedang, Bantul and Pasuruan. According to the JICA official site (http://www.jica.go.jp/project/Indonesia), the project involved teachers from 92 Junior High Schools (SMPs) and 45 Religious Junior High Schools (MTs) in Sumedang regency, 83 SMPs and 17 MTs in Bantul regency, and 116 SMPs and 107 MTs in Pasuruan regency. Through this project, UPI, UNY, UM with JICA helped mathematics and science teachers in enhancing their professional capabilities through Forum of Subject Matter Teachers-based Lesson Study (MGMP-based Lesson Study) and school-based Lesson Study. However, echoes of lesson study grow not only in the three regencies; lesson study in Indonesia has flourished almost everywhere in Indonesia and is not confined to mathematics and science.

What do we expect next?

Lesson Study was spread to many countries after the release of TIMSS 1995 eight grade mathematics videos from Germany, Japan, and the United States. Although the sample is only three countries, the videos left deep impression that there were "good ways" to teach mathematics. The Video Study attempted to reveal the mathematics lesson characteristic in Japan, one of the countries with relatively high scores in eighth-grade mathematics as measured by TIMSS. Perry, Rebecca & Lewis, Chaterine C (2008) inform the initial Lesson Study in the USA in their article *What is successful adaptation of lesson study in the US?*.

> "Lesson study," a teacher professional development approach widely used in Japan, was first brought to the attention of many US educators in 1999, with the release of Stigler and Hiebert's book The Teaching Gap. This book summarized the Third International Math and Science Study [TIMSS] video study of 8th grade mathematics teachers in the US, Germany, and Japan, and it included a chapter on lesson study in Japan. The authors commended the Japanese professional development approach and urged US educators to try out lesson study as a way to build professional knowledge of teaching and improve teaching and learning.

Therefore, experts from the United States made study visit to Japan and Germany. They found that Japan and Germany have a system to improve the quality of education on ongoing basis. The system in Japan named "yugyo kenkyu" meaning Lesson Study and is then studied and developed by the United States.

After the implementation of Lesson Study, there is a curiosity whether mathematics achievement of students improved. TIMSS results are a great way to find out. Why? It is because there is a relationship between Japan's good performance in TIMSS and its Lesson Study.

Since implementation of TIMSS 1995 and the release of TIMSS 1995 Video Study, the other three TIMSS followed, i.e. TIMSS 1999, 2003 and 2007. Now the United States is able to smile happily since the position of the United States for its grade 8 mathematics in TIMSS 2007 has increased significantly. In 1995, the United States ranked 28th of the 41 countries with average score of 500, while Japan ranked 3rd with average score of 605. In TIMSS 1999, the United States ranked 19th of 38 countries with average score of 502 while TIMSS 1995's international average score was 487. In TIMSS 2003, the United States was in the 15th position of 46 countries with a score of 504 and it rose to the position 9 of the 48 countries in TIMSS 2007 with average scale score of 508, above the average TIMSS scale, 500.

What about Indonesia? It seems still a long way to strugle. The United States' experience in implementing Lesson Study leads the U.S. rankings in TIMSS has a significant rise, which could be interpreted as the quality of mathematics education in the U.S. rises as well. Meanwhile, Indonesia is still struggling. Although Lesson Study has been implemented since 1998, Indonesia's position in the TIMSS has not changed significantly. In 1999, Indonesia in the 34th position of 38 countries with the average score of 403, while the international average score of 487. In 2003, Indonesia in the 34th position of 46 countries with average score of 411, while the TIMSS 2003 average score was 467. In 2007 Indonesia in position 36th of 48 countries with the average score of 397. This score is still far below the average TIMSS score 500. Indonesia achievement in TIMSS 2007 was described by the profile of students whose score is below 400 on the right side.

> LOW International Benchmark -400:
> *Students have some basic mathematical knowledge.*
> Students demonstrate an understanding of adding and subtracting with whole numbers. They demonstrate familiarity with triangles and informal coordinate systems. They can read information from simple bar graphs and tables.

The facts show that Indonesian students only have some basic mathematical knowledge. This means that there is a homework for developer of Lesson Study in mathematics education in Indonesia to develop mathematics learning that challenges students. It needs to focus to mathematics learnt by students. As Isoda mentions in Marsigit (2007) that "in the case of Japan, lesson study usually begins by developing a lesson plan in which teachers solve and pose problems from student's perspectives. By analyzing problems, teachers develop good ways of questioning. Why did students say this? Behind their words, there must be so many kinds of ideas". In regard to designing lesson, as lesson learnt from the case of Japan, teachers should design learning that include the more challenging task and problems. Then, teachers develop

questions exploring student's reasoning. By doing this, it is expected that the profile of Indonesian students in mathematics will be better in the future.

Disseminating Lesson Study through SEAMEO Regional Centre for QITEP in Mathematics

Considering the benefit of lesson study, SEAMEO (Southeast Asia Ministers of Education Organization) Regional Centre for Quality Improvement of Teachers and Education Personnel (QITEP) in Mathematics believes that lesson study in mathematics education should be disseminated in SEAMEO member countries. Currently, SEAMEO members are eleven countries, i.e. Brunei Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, the Philippines, Singapore, Thailand, Timor Leste and Vietnam. SEAMEO QITEP in Mathematics is one of Centres under SEAMEO and located in Yogyakarta, Indonesia. Since its launch on 13 July 2009, it has a commitment to take part in improving the quality of mathematics education in Southeast Asia region.

In 2009, SEAMEO QITEP in Mathematics held two courses. One of those is Course on Developing Lesson Study in Mathematics Education. At least there are 2 reasons for choosing Lesson Study. First, Lesson Study has been proven in Japan as an activity that is able to improve the quality of mathematics education and facilitate teachers's professional development. Southeast Asia mathematics teachers will benefit greatly from lesson study. Second, SEAMEO QITEP in Mathematics works together with some experienced mathematics experts from UNY, UPI, and UM who have been involved in Lesson Study for years. The experts were involved in IMSTEP and SISTTEMS. In addition, SEAMEO QITEP in Mathematics got a chance to collaborate with CRICED, University of Tsukuba which assigned Dr. Masami Isoda as a source person.

The participants of the course were Junior High School mathematics teachers from Cambodia, Indonesia, Lao PDR, and Thailand. One of requirements states that the participant should be a key teacher in his/her country. By this requirement, it is supposed that the participants will have a chance to disseminate the benefits of implementing Lesson Study to other teachers in their countries. Most of Indonesian participants were familiar with the idea of Lesson Study, since it has already spread to all over Indonesia. However, the participants from Cambodia and Lao PDR felt that it was kind of new thing for them.

The participants collaborated in undergoing the steps of Lesson Study. Since the beginning, they have been informed that each of them would present a lesson in a real class. Two Junior High Schools in Yogyakarta, namely SMPN 5 and SMPN 4 Pakem became the schools where the groups implemented their Lesson Plans. The two schools are pilot of International Standard School. The

languages used in mathematics teaching and learning in the schools are English and Indonesia. Most of students of SMPN 5 are high achievers, while the students of SMPN 4 Pakem are considered above normal but below the level of students of SMPN 5. Participants implementing their lesson plans in each school were informed on the situation, so that they could develop lesson plans that are able to explore students' reasoning optimally.

The participants were grouped into group of four. Two groups went to SMPN 5 and the other two groups went to SMPN 4 Pakem. The members of each group took turn everyday to present the lesson in grade 8. It took them four days to implement the lesson plans. While one of the group members presented the lesson, others, facilitators and principal included, became observers. The reflection took place at the school right away after the lesson was over. Based on the reflection, the participants learnt the weakness of the teaching and learning so they could improve it. They learnt how to respond to students' reaction in order to improve the quality of learning. The next participants implemented the continued lesson plans that had been improved based on the comments, inputs, and suggestions given by the observers at the reflection. At the last reflection session, the participants felt that the lesson study activities enriched their teaching perspective especially in mathematics topic taught. In addition, the participants were assigned to make action plan on disseminating Lesson Study in their countries.

Based on the participants' evaluation on the Course, it can be concluded that Course on Developing Lesson Study in Mathematics Education gave a lot of benefits to the participants. Therefore, SEAMEO QITEP in Mathematics continues to conduct the same course on April 2010 but the target of participants will be Senior High School Mathematics Teachers in Southeast Asia region.

References

JICA, (2008), *Project Activities.* Retrieved from http://www.jica.go.jp/project/Indonesia/0800042/indonesian/activities/index.html, on 8 February 2010

Madziatul, (2009), *Lesson Study*. Retrieved from http://madziatul.blogspot.com/2009/04/lesson-study.html, on 8 February 2010

Marsigit, (2007). *Mathematics Teachers' Professional Development through Lesson Study in Indonesia.* Eurasia Journal of Mathematics, Science & Technology Education, 3 (2), 141-144

Ministry of National Education of Indonesia, (2005), *Government Regulation No 19, Year 2005 about Education National Standard*

Ministry of National Education of Indonesia, (2007), *Appendix to the Regulation of the Minister of National Education (Permendiknas), No. 16, Year 2007* about Standards of Academic

Qualification and Teacher's Competency

Mullis I.V.S., Michael O. Martin, Eugenio J. Gonzalez (2000), *TIMSS 1999 International Mathematics Report*. Chestnut Hill, MA: TIMSS & PIRLS International Study Center, Lynch School of Education, Boston College.

Mullis, I.V.S., Martin, M.O., Gonzalez, E.J., & Chrostowski, S.J. (2004), *TIMSS 2003 International Mathematics Report*. Chestnut Hill, MA: TIMSS & PIRLS International Study Center, Lynch School of Education, Boston College.

Perry, Rebecca & Lewis, Chaterine C. (2008). *What is successful adaptation of lesson study in the US?* Retrieved from http://lessonresearch.net/success_adapt.pdf on 11 February 2010

-------. . 2008. *Menuju Guru yang Profesional melalui Lesson Study* (*Towards Professional Teacher through Lesson Study*). Retrieved from http://edu-articles.com/menuju-guru-yang-profesional-melaui-lesson-study, on 8 February 2010

-------- . *Background of the TIMSS 1999 Video Study*. Retrieved from http://www.rbs.org/Special-Topics/International-Studies-in-Mathematics-and-Science/Using-TIMSS-Videos-to-Improve-Learning-of-Mathematics-A-Resource-Guide/Background-of-the-TIMSS-1999-Video-Study/79/, on 11 February 2010

-------- *TIMSS 1995 Highlights from the Middle School Years*. Retrieved from http://timss.bc.edu/timss1995i/Highlights.html, on 11 February 2010