

New model of teacher education program in mathematics education: Thailand experience

Maitree Inprasitha, Faculty of Education, Khon Kaen University

Introduction

Teaching mathematics in Thailand for most teachers means preparing lesson plans by themselves, teaching those lesson plans in their closed classroom, checking the assigned homework, making some quizzes, and prescribing exercises. To teach, each teacher starts by explaining new content, giving some examples, then giving students some exercises, and assigning some homework, or demonstrating, questioning, describing and lecturing (Kaewdang, 2000; Khammani, 2005; Inprasitha, 2011). These kinds of activity have become a part of their own classroom culture and this is consistent with what Sigler and Hiebert (1999) mentioned, “Teaching is a cultural activity.”

The teachers’ roles in teaching, as mentioned above, are influenced by the teachers’ understandings related to mathematical meaning. As Dossey (1992) has mentioned, various comprehension for mathematical conceptual understanding are extremely important in development and successes in mathematics teaching and learning in school, and research understanding in school mathematics. An understanding that a nature of mathematical knowledge is outside the teachers and students (Plato, 1952 cited in Dossey, 1992) has made Thai mathematics teachers play roles of transmitting their knowledge or contents to the students (Office of the Education Council, 2013). All new contents in mathematical textbooks, therefore, are things that the students have not known before. New teachers’ roles in the classroom are trying to describe, lecture, ask short questions, etc. with teaching materials as needed, while the students are just receivers of such knowledge, or are passive learners (Narot et al., 2000; Office of the Education Council, 2013). Relationships in the classroom are such that as Sekiguchi (1997) and Sierpinska (1998) have mentioned, the students’ response is short and the teachers are evaluators of the students’ response. Certainly, this kind of teaching activity cannot respond to the new demand of knowledge and skills for the 21st century, which most countries around the globe are struggling with (Levy and Murnane, 2004).

New movement in teaching approach

Before entering the 21st century, there have been many attempts to shift the paradigm for teaching, especially the way to teach mathematics from an emphasis on teacher-centered to students-centered approach (Calkins and Light, 2008). However, for many decades, the idea of student-centered approach has been taken for granted and does not seem clear when implemented in the real classroom. In mathematics education, the development of mathematics teaching approach has been centered on reconciling among these issues: new aspect of mathematics (Polya, 1954; Becker and Shimada, 1997), students’ individual differences (Graff and Byrne, 2002), and problem solving as a teaching approach (Polya, 1954; Nohda, 1991; Becker and Shimada, 1997; NCTM 1980; Singapore MOE, 1990; Korea, 1997; Finland, 2004).

For example, in Japan there has been an endeavor to teach by emphasizing on mathematical thinking (Becker and Shimada, 1997) as appearing in the course of study since 1957 (Ueda, 2013). In Japan, there is an emphasis on classroom teaching practice

with a focus on students' mathematical thinking. This approach is not without its challenges, not only because of the difficult mathematical content, but also due to individual differences. Therefore, this teaching approach has shown to be problematic to implement in classrooms around the globe (Isoda and Nakamura, 2010). During the 1970s, Japan developed a new teaching approach with the emphasis on students' mathematical thinking (Isoda, 2010), changing the focus on the correct answer, or closed problem, to that of teaching to assess the students' mathematical higher order thinking (Shimizu, 1999). An interesting point in this change in the Japanese history of mathematics education is that the teachers consider the assessment first. The problem, that remains is how to overcome the individual differences especially thinking differences between students (Takahashi, 2006; Mizoguchi, 2008; Miyauchi, 2010).

The new teaching approach has revealed an important step in the teaching process. It was found that by using an open-ended problem at the start of the lesson, teachers were able to focus on the students' thinking process about the task at hand. An important point of this teaching approach is all students have their own problems, or the problems are not a given, and this can make the students solve the problems by themselves and drive, or encourage the students to think by themselves (Brown and Walter, 2005).

From these ideas, Inprasitha (2003) has been proposing a paradigm change in the Thai teaching approach from that which was mentioned in the early part of this paper to be an Open Approach incorporating Lesson Study (Inprasitha, 2011).

Teacher education program initiative in mathematics education

Since the new national agenda, "*Reforming Learning Process*" of the 1999 Educational Act was declared a decade ago, the mathematics teacher education programs of most universities in Thailand have not been able to respond to this demand. Moreover, schoolteachers in our country lack both the professional tools to use in their daily teaching practices and the professional learning community to participate in that would enable them to continue their professional development. Certainly, this is a consequence of our traditional teacher education program. Regarding this point, there are many crucial aspects of the educational reform movement as in many countries. Among other things, professional development of teachers is a central issue. Teachers need to learn how to capture students' learning processes and to examine their own practice, etc. However, we lack clarity about how to best design initiatives that involve the examination of practice (*cf.* Ball, 1996; Lampert, 1999; Shulman, 1992; Fernandez et al., 2003).

Most teacher education programs in Thailand simply consist of three components: General Education courses, Specific courses and Selective courses, without describing the theoretical foundation of these elements or components. During the last decade (2004-2013), the Faculty of Education, Khon Kaen University was challenged to design a new type of teacher education program. Based on the idea of Pedagogical Content Knowledge (Shulman, 1986; Park, 2005; Inprasitha, 2012), we made a distinctive program by defining the major course of the Specific course into three categories, that is, collegiate or advanced mathematics, school mathematics, and mathematical learning processes related courses (see Table 1). The idea for school mathematics is based on what Klein (2004a, 2004b; NCTM 1989, 2000) mentioned about elementary mathematics, that is, "Elementary mathematics has to be seen from an advanced standpoint" and the idea for mathematics learning processes related course comes from

what was stated in the NCTM standards (1989, 2000). Moreover, the program is intentionally planned based on the idea of educational values and educational theoretical frameworks: reflective thinking (Dewey, 1933) and community of practice as a learning community (Lave and Wenger, 1991).

Table 1. Mathematics Education Program in Khon Kaen University (2013)

Curriculum Structure	Credit
Collegiate Mathematics	36
School Mathematics	24
Mathematical Learning Process	24
Professional related Courses	50
GE	30
SC	6
Total	170

Based on the perspective of values education, four core values have been selected: valuing product/process-oriented work, rather than only product-oriented work, attitudes to collaborative work, open-minded attitudes, public concerned attitudes. The idea was practically implemented in the simplest fashion by allowing students the time to reflect upon whatever activity they had done. The central issues are on “reflection” rather than what they had done. They were trained since their first year through a variety of activities such as Children’s day (Y1), Math Camp (Y2-Y3), Sports day (Y2), and School Visit (Y4) during which time the four core values have been nurtured. The idea of community of practice brought into the program is the focus on individual participation in every activity (see Figure 1).

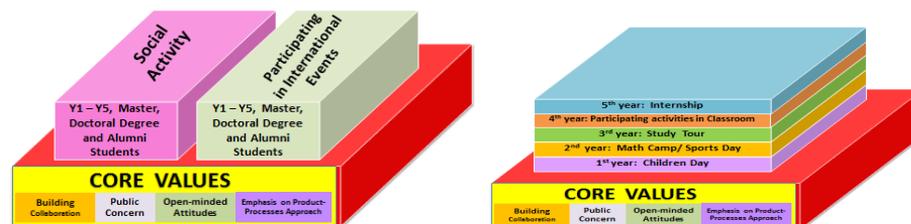


Figure 1. An Example of How to develop Core Value through 5 Year Teacher Preparation Program in Mathematics Education (Inprasitha, 2006)

There were some ideas that seemed impossible to implement in this new teacher education program at the beginning, such as we could not design courses related to mathematical learning processes separately from courses related to content. However, it was made workable by the implementation of two innovations, Lesson Study and Open Approach (Inprasitha, 2011) (see Figure 2.). Another seemingly impossible idea was to link the prospective teacher education program with the in-service teacher program. Building up this idea through the implementation of using lesson study as a professional learning community, experienced schoolteachers can work collaboratively with student interns and both groups have formed habits of ‘teacher learning’ and formed their long-term professional learning community.

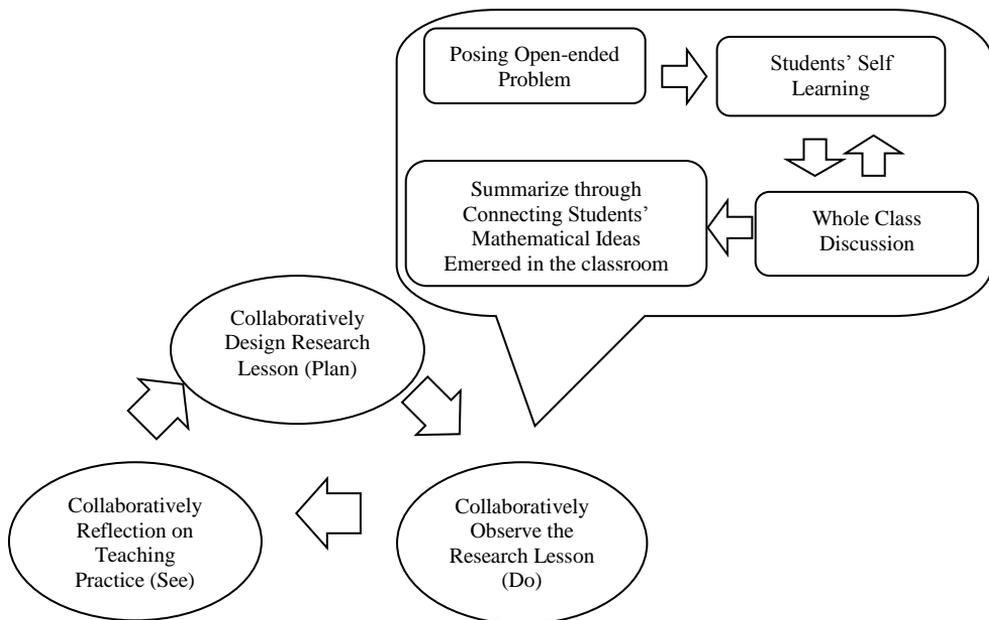


Figure 2. Lesson Study incorporating Open Approach (Inprasitha, 2011)

Exemplar of activities in *Process of Problem Solving in School Mathematics Course*

This exemplar illustrated students' activity during the Process of Problem Solving Course. Students were divided into groups and worked to solve a problem themselves. Each group included students who act as problem solvers and observers.

A learning unit was designed within the "cylinder problem." This problem was a typical Open-ended problem. A teacher and teacher assistants collaboratively planned this problem together. During the class all of them observed the students' ideas. After the class, they had a reflection about the problems, students' ideas and the way to improve this problem. Four steps of Open Approach are used as a teaching approach as in Figure 3.

Concluding remarks

This value-driven teacher education program has been built upon major core concepts: problem solving as a driving force for mathematical thinking, teachers learning together, and reflection using two innovations; Open Approach as a teaching method and Lesson Study as a way to improve teaching. When implementing this curriculum in actual classroom, "critical reflection" has been highlighted throughout the program. For student teachers, first-hand experience learning through this curriculum will form attitudes toward learning when they teach in their own classroom. Moreover, student teachers will also learn the way to implement innovations in the classroom. With these innovations brought into schools, they will become partners of schoolteachers and take part in academic leadership in schools. After a decade of implementation, the author realized that beginning teaching is an important period and very crucial to smoothly land into professional teaching career.