

A Study of Teachers' Perceived Beliefs Regarding Teaching Practice

Narumon Changsri¹, Maitree Inprasitha², Auijit Pattanajak³, Kanokporn Changtong³

¹Doctoral Program in Mathematics Education, Khon Kaen University, Khon Kaen, Thailand

²Center for Research in Mathematics Education, Khon Kaen University, Khon Kaen, Thailand

³Centre of Excellence in Mathematics, CHE, Bangkok, Thailand

Email: changsri_crme@kku.ac.th

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This study aimed to explore the perceived beliefs of the teachers regarding teaching practice in the context of a three year professional development project implementing lesson study incorporating Open Approach conducted by the Center for Research in Mathematics Education. The teaching practice set under the cycle of lesson study were as follows: 1) Collaboratively designing research lesson at least once a week; 2) Collaboratively observing their friends teaching the research lesson taken 3 - 4 hours per a week; 3) Collaboratively conducting post-discussion or reflection on teaching practice conducted once a week. From these three phases, Open Approach was used as an approach such as how to change teachers' roles to be more facilitator and the like. The data were collected through questionnaire distributing to teachers in three schools in the project. In addition, the qualitative data were collected by participatory observation on teaching practice of one teacher twice a week throughout one academic year, interviewing the concerned teacher and other teachers in the lesson study team. The findings, where teachers' perceived beliefs regarding teaching practice were classified into three categories and these were: 1) About mathematics teaching; 2) About students' learning mathematics; 3) About social context.

Keywords: Teachers' Perceived Beliefs; Teaching Practice; Lesson Study; Open Approach

Introduction

Teaching reforms cannot take place unless teachers deeply held beliefs about mathematics and its teaching and learning change (Ernest, 1988). It could be claimed that teachers' beliefs influence their teaching practice (Ernest, 1988; Thompson, 1992). Ernest (1988) argued that factors affect teachers' beliefs were social context and teachers' level of consciousness of their own beliefs, and the extent to which the teachers reflects on their teaching practice. Many researchers have been searching for more effective ways helping teachers to become conscious of their own beliefs and become agent to change (e.g., Ponte et al., 1999). Opportunities to reflect on teaching practices enhance not only changes in teachers' beliefs but also to promote a stronger congruence between teachers' changed beliefs and their practices (Forgasz & Leder, 2008). Change in teachers' beliefs might not lead to change in their practice. The most lasting change would be the result from professional development experiences that provide teachers with opportunities to coordinate incremental change in beliefs with corresponding change in practice (Philipp, 2007).

Caution with Forgasz and Leder's and Philipp's suggestions and in responding to Ponte et al.'s demand, this study provides a new teaching practice based on lesson study. Inprasitha (2003) suggests that professional development must be a kind of classroom-based practice and be conducted continuously and regularly. This suggestion is a consensus to the central issues of Japanese professional development "Lesson Study". Inprasitha and Loipha (2007) claimed that participating in each phase of lesson study provides the teachers an opportunity to *collabora-*

tively design a research lesson, to *collaboratively* observe their friends teaching research lesson, and to *collaboratively* conduct post-discussion or reflection on teaching practice. One of the obvious reasons is that it enhances collaboration between teachers to create a learning community (Yoshida, 2008).

Thus, in this study, teaching practice will be treated as an activity under an implementing lesson study incorporating Open Approach which provides a chance for participating teachers to become conscious of their teaching practice and their existing beliefs.

Lesson Study Incorporating Open Approach

Lesson study refers to a process in which teachers progressively strive to improve their teaching methods by working with other teachers to examine and constructively critique one another in terms of teaching techniques (Baba, 2007) and provided opportunity for the teacher to explore the students' learning which could be understood from observation and classroom discussion in specific lessons (Yoshida, 2005). Stigler & Hiebert (1999) described the process of lesson study into eight steps and these were: defining the problem, planning the lesson, teaching the lesson, evaluating the lesson and reflecting on its effect, revising the lesson, teaching the revised lesson, evaluating and reflecting, and sharing the results. Lewis (2000) summarized typically five special characteristics of lesson study, and these were following:

- 1) Research lessons are observed by other teachers;
- 2) Research lessons are planned for a long time, usually collaboratively;

- 3) Research lessons are designed to bring to life in a lesson a particular goal or vision of education;
- 4) Research lessons are recorded, and
- 5) Research lessons are discussed.

Yoshida (2008) defines lesson study cycle as research lesson planning, research lesson implementation and post-research lesson discussion.

In Thai context, the Center for Research in Mathematics Education has been implementing lesson study in the Professional Development Project (ProDev). This project modified the Japanese lesson study by incorporating Open Approach and emphasizing on a “unique collaboration” in each phase of lesson study cycle. This unique collaboration was comprised of school teachers, the 5th year undergraduate students who are doing their one year teaching practice at schools, graduate students, and mathematics educators, all from Khon Kaen University. This team then participated in collaboratively designing research lesson, collaboratively observing their friends teaching the research lesson, and collaboratively doing post-discussion or reflection on the activities of the two phases (Inprasitha & Loipha, 2007). According to these 3 phases of lesson study, Open Approach as a teaching approach is incorporated in the second phase with the following steps:

- 1) Collaboratively designing research lesson for at least once a week; lesson study team designs research lessons by trying to apply the materials and subject matters to be taught in terms of open-ended problems. Then, those open-ended problems were transformed as mathematical activities by using 4 - 5 simple instructions. The instructions focused on the students’ understanding of the problem situations by themselves either as an individual or a group based on the type of activity. In this phase, members of the lesson study team participating in designing research lesson shared in designing materials to be appropriate with the students’ activities or age levels which could be based on collaboration of teachers who know their students’ nature and condition in the classroom while the rest of members of lesson study team provided ideas about research issues. Moreover, they also collaborated in sequencing the teachers’ questions by focusing on the question “what, why, how” in order to stimulate thinking and to investigate the students’ work as well reasons of how they themselves did it.

- 2) Collaboratively observing their friends teaching the research lessons taken at least 2 - 4 hours per week; the research lessons were taught in the classroom by the subject teacher of that particular grade level using Open Approach with the following steps: posing Open-ended problems, students’ self-learning through problem solving, wholeclass discussion and summary through connecting students’ ideas. Classroom observation has focused on students’ responses to open-ended problems and students’ ways of thinking.

- 3) Collaboratively conducting post-discussion or reflection on the activities of the two phases once a week. All members of lesson study team and other teachers in the school attended the regular meeting and following up their teaching practices through process of reflection. The teacher and observers discussed the things they had observed to the research lessons. It focused especially on how the students participate in the classroom activities, students’ thinking, as well as problem situations.

In implementing the lesson study, aside from the three major phases, there were other activities which were as follows:

- 1) Open Class; the conference for reflection of practice of schools participating in the project.

- 2) Invitation the experts from foreign countries to provide workshop.

- 3) Attendance in international conference of the country groups applying lesson study for their professional development.

Teachers’ Beliefs

In this study, teachers’ beliefs would be considered as it was based on Philipp’s idea (2007: p. 259) “...beliefs might be thought of as lenses that affect one’s view to some aspect of the world or as disposition toward action. Beliefs unlike knowledge, may be held with varying degrees of conviction and are not consensual...” Perceived beliefs refer to those beliefs regarding teaching practice in which teachers gradually become conscious of after they participated in professional development project implementing lesson study incorporating Open Approach. We used three categories of beliefs which were as follows:

- Beliefs about mathematics teaching refer to teachers’ roles about designing research lesson, teaching research lesson and doing post-discussion or reflection on teaching practice.
- Beliefs about students’ learning mathematics refer to students’ behaviors in the classroom.
- Beliefs about social context refer to collaboratively designing research lesson, observing their friends teaching the research lesson and conducting the post-discussion or reflection on teaching practice with other teachers in lesson study team, researchers, school coordinators and experts.

Context of Study

The Center for Research in Mathematics Education, Khon Kaen University has been implementing lesson study by incorporating Open Approach in a three-year (2006-2008) ProDev project. Three schools have been participating in this project for 4 or 5 years. Teaching practices in those three schools were the activities under the phase of lesson study incorporating Open Approach and these were as follows:

- 1) Nineteen (19) teachers from Koo Khum Pittayasan

School have been participating in the project since 2006. In the 2006 academic year, the school implemented three phases of lesson study in the 1st grade, the 4th grade and the 7th grade. In the academic year 2007, they extended to 6 classrooms; 1st grade, 2nd grade, 4th grade, 5th grade, 7th grade and 8th grade. In 2008 academic year, they extended to 9 classrooms; 1st grade, 2nd grade, 3rd grade, 4th grade, 5th grade, 6th grade, 7th grade 8th grade and 9th grade.

- 2) Twenty six (26) teachers from Chumchon Ban Chonnabot

School have been participating in the project since 2006 academic year. In 2006 academic year, the school implemented three phases of lesson study in the 1st grade (two classrooms) and in the 4th grade (three classrooms). In 2007 academic year, they extended to 1st grade (two classrooms), 2nd grade (two classrooms), 4th grade (three classrooms), 5th grade (three classrooms). In 2008 academic year, they extended to 1st grade (two classrooms), 2nd grade (two classrooms), 3rd grade (two classrooms), 4th grade (three classrooms), 5th grade (three classrooms) and 6th grade (three classrooms).

- 3) Fourteen (14) teachers from Ban Bung Neum Bung Krai Noon

School have been participating in the project since 2007

academic year. In the academic year 2007, the school implemented three phases of lesson study in the 1st grade and in the 4th grade. In 2008 academic year, they extended to 4 classrooms; 1st grade, 2nd grade, 4th grade and 5th grade.

Their teaching practices were as followings:

- Lesson study team (teachers, the 5th year undergraduate students and graduate students) collaboratively planning the research lessons at least once a week (every Monday or Tuesday).
- Members of lesson study team (teachers, the 5th year undergraduate students and graduate students) collaboratively observing their friends teaching the research lessons at least 2 - 4 hours per a week.
- All teachers (principal, teachers in lesson study team and other teachers), graduate students attend the phase of doing post-discussion or reflection on the activities of the two phases every Wednesday or Thursday.

Moreover, mathematics educators from the University had engaged in three phases of lesson study at the three project schools once a month in the academic years 2006 and 2007 and a semester in the academic year 2008. Researchers had participated in the school twice a week in the academic year 2007 and at least four times per month in the academic year 2008.

Context of a Case-Study Teacher

It was until in the academic year 2007, the case-study school participated in the project. In the initial phase of the project, the Center for Research in Mathematics Education provided a workshop on lesson study and Open Approach for the teachers in the school. In this workshop, the participating teachers were offered opportunities to express their views on how to apply the gained concepts in the school. According to their opinions, the following concerns were revealed:

- 1) Difficulty in the rearrangement of the regular teaching schedules to allow at least one teacher to observe the class in the 1st grade and 4th grade levels which were subject to introduce lesson study and incorporating open approach,
- 2) Difficulty in the class participation and observation due to limited number of school's teachers,
- 3) They worry that they could not design research lesson, in which open-ended problems were emphasized, and
- 4) They worry that their students could not gain learning achievement nor obtain class content.

After they participated in the workshop, the school implemented the project on June 26, 2007. The implemented activities were as follows.

- 1) Collaboratively designing research lesson

Every Thursday after reflection session, a case-study teacher, observing teacher, graduate students and mathematics educators collaborated in designing lesson plan with emphasis on open-ended problems in the form of short instruction. The process of designing the materials has patterned the Japanese mathematics textbook. It was noted that the case—study teacher played a dominant role in providing comments on the developed directions for suitability on students' ways of thinking.

- 2) Collaboratively observing their friend teaching the research lesson

The research lessons would be taught in classroom by a case-study teacher in 1st grade which was carried-out for four times a week. Teaching was conducted in a sequential order. First, the case-study teacher posed the open-ended problem by either

mounting or writing the instructions on the blackboard, including introducing teaching materials. Thereafter, the students were allowed to be involved in problem solving or doing group activities; meanwhile, the case-study teacher walked around, observing actions of the students during the activity interaction. The case-study teacher approached the students to repeat the directions in the event that the students were thought that they didn't understand the instructions. Moreover, the case-study teacher kept stimulating the students to collaborate in solving the problems. Then, at the end of the class, the teacher let the students present their work by telling what they had done. Next, after the presentation by every single of group, the case-study teacher again made a summary of the current lesson taught and learnt. In fact, the lesson summary of the case-study teacher was mainly based on the content of the materials used regardless of connecting students' concept.

In this phase, all of the observers underwent observation and recording the activities performed by the students. Contents of the observation included the students' problem interpretation, problem solving, presentation and group process. The period of time spent by the observers was different i.e. the observing teacher participated in class observation at least once a week; the school coordination (graduate student) did from Monday to Thursday; the researcher (graduate student) did every Tuesday and Thursday; and the principal and a mathematics educator attended once a month.

- 3) Collaboratively doing post-discussion or reflection on the activities of the two phases

Every Thursday from 3 p.m. a reflection session was set. The reflection, which has emphasis on the students' interaction, was provided mainly by the principal and attended by all of the school's teachers as well as members of the lesson study team. The post-discussion or reflection proceeded as follows.

- The case-study teacher, who was a class teacher, reported what was observed during activity interaction of the students and what were the objectives of the lesson, including problems that were arisen.
- The observing teacher reflected what was observed from the students' activities, whose perspectives could be either similar or different from those of the case-study teacher.
- The researcher or school coordinator (graduate students) reflected viewpoints observed in the classroom and not mentioned by the case-study teacher and the observing teacher, for instance the given directions, thinking process of the students. Occasionally, educational supervisor and mathematics educator collaboratively provided reflection. The reflection by the mathematics educator additionally provided profound academic perspectives from observing the students' thinking process.

The academic year 2008 was the second year the case-study school participated in the ProDev project. It was noted that there were internship mathematics students (the 5th year undergraduate students) from Mathematics Education Program, Khon Kaen University, who practiced teaching in the case-study school. Thus, the school system was revised as follows.

- 1) Collaboratively designing research lesson

Previously, in the academic year 2007, when the collaborative research lesson was designed, it caused some problems and these were: conducting the reflection session has taken pretty long. This was resulted in the delay of designing lesson and producing teaching material, which took as late as 7 p.m. Thus, in the academic year 2008, the phase of designing research

lesson was rescheduled to Tuesday starting from 3 p.m. In the academic year 2008, the lesson study team was comprised of the case-study teacher, an internship mathematics students and graduate students. Lesson plans were collaborated and coordinated in considering the directions and problems arising from thinking information and direction interpretation of the students gathered in the academic year 2007. However, in the academic year 2008, the lesson plan had given emphasis on the prediction of students' concepts and on asking questions at the right time to stimulate the students' way thinking.

2) Collaboratively observing their peers and friends teaching the research lesson

The case-study teacher taught in the first month under the observation of the internship mathematics students. In the following month, the internship mathematics student took turns teaching under the observation of the case-study teacher, who also acted as a supervising teacher; meanwhile, the graduate students attended observing the said classes every week. Moreover, the principal and mathematics educator shared ideas discussing the observations seen and observed.

In this phase, the observation focused on students' interpretation of the directions, problem-solving process, group participation and their presentation. In addition, the observation also emphasized on teachers' role in posing the problem, motivating the students in self-thinking, driving the students to connect their adopted concepts and making summary to be used in the post-discussion or reflection.

3) Collaboratively doing post-discussion or reflection on the activities of the two phases

The post-discussion or reflection on the activities of the two phases was organized on Thursday, starting from 3 p.m. This phase was led by the principal. The reflection was initiated by the teacher (an internship mathematics student or a teaching teacher), followed by the observing teacher, and graduate students. All of the school's members were involved in this phase, while a mathematics educator as the supervisor for the internship mathematics students participated in reflection session twice in a semester.

In the academic year 2008, the internship mathematics students as class teachers analyze the teaching management regarding the objectives, interesting points and approaches for further development. They also reflected the points that had been adjusted to suit to the students' ability. Meanwhile, the case-study teacher, as an observing teacher, took this chance to provide reflection on teaching practice. It was found that the case-study teacher could precisely observe students' activity interaction. In addition, the mathematics educator could indicate such arising problems in the classroom as problem posing, teachers' role, and students' thinking process. The mathematics educator also suggested in construction open-ended problems, designing of teaching materials and methods in predicting students' concepts.

These contexts supported a case-study teacher gradually becoming conscious of their teaching ways after they participated in the PRODEV project implementing lesson study and incorporating Open Approach.

Methodology

The questionnaire was distributed to all in-service teachers of three project schools; Koo Khum Pittayasan School, Chumchon Ban Chonnabot School and Ban Bung Neum Bung Kraui Noon

School, during 2007 and 2008 academic years. 43 of 59 respondents were received from questionnaire distribution among teachers participating in the project at least one year and a half. It consisted of 5 open-ended questions and background related questions (gender, age, grade of teaching and subject of teaching). An example of open-ended question was "What is your opinion about professional development based on lesson study?"

Aside from quantitative analysis of questionnaires, the qualitative analysis was also used to analyze the teaching practices of one teacher whom the researcher had observed her teaching practice at Ban Bung Neum Bung Krai Noon School twice a week for the entire 2007 and 2008 academic years. Data collection involved participatory observation on teaching practice of one teacher which was taken twice a week throughout one academic year, interviewing that concerned teacher and other teachers in lesson study team and field note from a case-study teacher and researcher.

Data analysis was conducted based on the cycle of lesson study. Perceived beliefs in this study refers to those beliefs regarding teaching practice in which teachers are gradually becoming conscious of their ways in teaching after they participated in professional development project implementing lesson study and incorporating open approach. Three categories of beliefs were used in this study.

Results

Analysis of Data in the Questionnaire

The method of content analysis was used in analyzing the data. From the teachers' responses, their perceived beliefs regarding teaching practice could be classified with the method of content analysis into three categories: 1) on mathematics teaching; 2) on students' learning mathematics; 3) on social context.

1) Perceived beliefs about mathematics teaching

During the process of collaboratively designing research lesson, teachers were aware that they provided more chance to prepare their research lessons than they were used to do and they were planning the lessons in advance both on materials and classroom activities to be appropriate with their students. From the process of classroom observation and reflection, teachers changed their roles acting as facilitators and observed their students' ways of thinking. The following statements were quoted from the teachers' responses about teaching mathematics:

"Teachers viewed students' problem situation and their problem solving. Teachers changed their roles from telling to facilitating students to think."

"Teachers changed their roles as an observer and motivate students to think achieve the aim of the lesson. Teachers prepared their teaching and design lessons focusing on thinking process."

"Teachers changed their roles from the one who stands in front of the blackboard to the one who collaboratively learning students' activity and whole class discussion."

2) Perceive beliefs about students' learning mathematics

During collaboratively classroom observation and reflection, teachers become conscious of their students' changes in learning mathematics. For example students could express their ways of thinking and the reasons underpinning their solutions, recognized various ideas from peers, and had a variety ways of thinking and were enjoyable in learning mathematics. The fol-

lowing statements were quoted from the teachers' responses about students' learning mathematics:

"Students prompted to express their ideas and were able to think various ways."

"Students accepted that when they have learned, they were excited and enjoyed doing activities."

"Students can express the reasons underpinning their solutions."

3) Perceived beliefs about social context

Teachers worked with other teachers as a team working. They recognized their friend's constructive criticisms and various ideas from other people while collaboratively designing the lesson and reflection with other teachers in lesson study team, researchers, school coordinators and experts. The following statements were quoted from the teachers' responses about social context:

"Teachers had a team working and were able to share their ideas among them for developing the lessons."

"Teachers recognized observers' suggestions."

Case Study

A case-study teacher was a first grade teacher who had teaching experiences for more than 25 years and has been participating in the project since 2007. After the first semester in 2007 academic year, the researcher interviewed a case-study teacher and the teacher who observed a case-study teacher's teaching practice. The interviews were focused on teachers' changes and students' changes after they participated in the project for six months.

A case-study teacher recognized about her changes:

"Previously, I took a textbook and stood in front of a class, explained and demonstrated solution according to textbook. After I participated in the project, I have changed my roles as facilitator and also students did activity by themselves. It helped students to develop their positive attitude towards mathematics."

Other teachers in lesson study team also recognized the changes from the case-study teacher:

"Teaching practices have changed. In the former days, teachers explained and wrote something on the blackboard without using teaching materials. After the teachers participated in the project, they have changed their teaching practice as collaboratively planning the lesson, observed students' thinking process, instead of the answer. They are not shy to present their classroom practices to each other. Moreover, they have prepared teaching materials more than before."

A case-study teacher noticed about her students' changes:

"Especially to young children, they have changed from listening teacher and doing activities then followed by the expression of the teacher to make decision using their ideas and solutions themselves."

Other teacher in lesson study team also noticed about students' changes:

"Students enjoy asking, expressing their ways of thinking and presenting their solutions to the class. Moreover, students were interested in learning activities because of teacher allowing them to do 'hand-on' activities. Students actively participated in the activities."

Concluding Remarks

It was found that this modified Japanese lesson study pro-

vides a chance, which teachers never had before, for participating teachers to reflect upon their teaching practices and their existing beliefs. This point of view is consistent with Philipp's idea (2007), through reflection, teachers learnt new ways to make sense of what they observe, enabling them to see differently those things that they had been seeing while developing the ability to see things previously unnoticed (Philipp, 2007). Comparing those teachers who entered before the project, teachers viewed their students to listen from their lectures and the teachers' role was as a lecturer or explainer. After participating in the project, they had perceived beliefs regarding teaching practice as following; 1) about mathematics teaching: during the process of collaboratively designing research lesson, teachers provided more chance to prepare their research lessons than they were used to and they had planned the lessons in advance both on materials and classroom activities to be appropriate with their students. From the process of classroom observation and reflection, teachers have changed their roles acting as facilitators and observing their students' ways of thinking; 2) About students' learning mathematics: during collaboratively classroom observation and reflection, teachers have become more conscious of their students' changes in learning mathematics. For example, they noticed that students could express their ways of thinking and the reasons underpinning their solutions, recognized various ideas from peers, and had a variety ways of thinking and were enjoying in learning mathematics; 3) In terms of social context, teachers worked with other teachers as a team work. They recognized their peers and friend's constructive criticisms and various ideas from other people while collaboratively designing the lesson and reflection with other teachers, researchers, school coordinator and field experts. Those perceived beliefs should be considered first as critical stage before changing their beliefs and associated beliefs about their teaching practices.

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Appendix

Questionnaire consists of Open-ended questions and background related questions (gender, age, grade of teaching, subject of teaching).

Some examples of Open-ended questions were the following;

1) What is your opinion about professional development based on lesson study?

2) What is your opinion about Open Approach?

3) What is your opinion on teachers' change after implementing lesson study incorporating Open Approach in your school?

4) What is your opinion on students' change after implementing lesson study incorporating Open Approach in your school?