*International Journal of Education*
*Vol.33, No.2, April.-June., 2010*
*pp. 98-105*

# Teacher Development Based on Mathematics Teaching Professional Standards through Lesson Study

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## ABSTRACT

The objectives of this research were: 1) to study the changes according to Mathematics Teachers Standard of teachers obtaining development by using Lesson Study, and 2) to study the Mathematics Learning Achievement of students taught by Mathematics Teachers obtaining development by using lesson study. The target group included the teachers teaching level 1, and Pratomsuksa 3 Students of None-sa-ad-rad-amnuay School and Ban-kae-wittayakom School, under jurisdiction of the Office of Kalasin Educational service Area 2, Kalasin Province, during 2008-2009 school year. The design was a Case Study. The instrument using in this study included: 1) the Assessment Form of Mathematics Teacher, 2) the Mathematics Learning Achievement Test, 3) the observation Record Form, 4) the Teacher Standard Evaluation Form, 5) the Interview Form. Data were analyzed by content analysis, Percentage, Mean, and Standard Deviation. The research findings found that:

1) For Mathematics Teacher Standard Evaluation of teachers obtaining development by using lesson study, every one was in "Very Good" level. Their evaluation scores were between 85.25-90.50. Their percentage average scores 88.25 which was in "Very Good." The evaluative findings were in "Very Good" level.

2) For Mathematics Teacher Professional Standard the learning achievement of students taught by teachers developing by using Lesson Study, they had development and change in confidence, assertion, good attitude towards Mathematics Learning, Mathematics Process Skill, and Social Skill in higher level.

**Keywords:** Lesson Study, Mathematics Teachers Standards

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## Introduction

### Background and Significance of the Problem

For Basic Education Curriculum 2001, Mathematics Learning Substance was determined as a required major learning substance for instructional management in order to be foundation of thinking and strategy in solving problem and national crisis since it was important and played a major role in developing the human beings' thinking. As a result, human beings had creative thinking, reasonable and systematic thinking as well as were able to carefully analyze the problems and situations. So, Mathematics was useful for living and supported for better quality of life (Department of Academic, 2002). Since the nature of Mathematics was a course relating to an abstract thinking which was difficult to learn and understand quickly. Consequently, the instructional management of Mathematics wasn't successful as it should be. It could be seen from the assessment of students in the former time, found that the students' quality in Mathematics Learning Substance including the assessment findings in "Very Low" level (Office of Kalasin Educational Service Area 2, 2008). It was supported by Wittayakom Chiengkoon's (2008) report in Thai Educational Condition in 2006-2007 concluded the basic educational problem that most of students had their learning achievement based on curriculum, in low level. They were lacked of creative thinking as well as learning and knowing oriented, and teacher both of quantity and quality. Most of climates were as traditional style by depending on textbook as teaching material, lecturing the content existing in the text by teacher. Then, the students were allowed to do exercise in a short time for preparing themselves in the exam rather than focusing on thinking process. For instructional process, the students' knowledge and memorization were emphasized. The outcome was focused on by teacher. There was a alack of thinking process management which would cause the students to think systematically and sensibly. As a result, there was an educational failure in various aspects ( Amonwich Nakontap, 2003; Maitree Inprasitha, 2003, 2008: The Institute of Educational Reform, 2002; Wittayakon Chiengkoon, 2008 ). It could be viewed that the students' quality of learning could be separated from teacher's quality of learning.

The students' learning couldn't be accomplished without their teacher's suggestions. The improvement in quality of education could be performed by increasing the teacher's quality. The students' learning couldn't be prominently developed when the teacher obtained opportunity and support for enhancing one's own skill to be efficient since the quality teacher was the best indicator of students' learning achievement (Maitree Inprasitha, 2008; Wittayakon Chiengkoon, 2008; Stigler & Herbert, 1999; The Finance Project and Public Education Network, 2004).

"Lesson Study," was a system for developing the teacher's profession which was broadly used in many countries throughout the world for being used in teaching professional development. It was accepted as the most efficient technique in improving and developing the Mathematics Teaching. It was also a technique in causing a better sustainable teaching (Lewis & Berry, 2003). In Thailand, this approach was applied for the first time in 2002 by Maitree Inprasitha and the Faculty Members of Faculty of Education, Khon Kaen University in order to study the worldview changes of internship students majoring in Mathematics. According to the findings, found that it was satisfactory successful

(Maitree Inprasitha, 2008). In the present time, this approach was called many words in Thai such as "Lesson Research," "Lesson Classroom," "Lesson Plan Research," Lesson Study," "Lesson Study and Development," "Study by Lesson," "Professional Learning Process," or "Lesson Learning," (Charinee Treewaranyu, 2007; Chanon Chantra, 2007). For this research, "Lesson Study," was used by the researcher.

Therefore, in order to study and investigate for model of continuous teacher development as professional teacher being able to accomplish in managing the study or learning based on curriculum. The researcher was interested in applying the approach of Lesson Study for developing the Mathematics Teachers in Primary Education Level with standard as the role of the Office of Educational Service Area collaborating with school by focusing on the teacher and students development at the same time, implementing in regular situation performed by the teacher. For the developmental process, it was based on the teachers' needs. For this research, Lewis's (2002) conceptual framework as cycles had been administered, in which the teachers had to collaborated in working at least 4 phases: the Goal Setting and Planning, Research Lesson, Reflection, Lesson Discussion, and Consolidation of Learning. The things would be concretely reflected that whether the teachers were developed according to professional standard, it was indispensable for being concretely assessed based on Mathematics Teachers' Standard and Students' Learning achievement as well. It was supported by the study of the Office of Secretariat Education Council and The Office of Accreditation Standard and Educational Quality Assurance (Mass Organization, 2005) suggesting guidelines for solving problems and obstacles in instructional management according to the reform guidelines that the school-based should be used for teacher's training. In addition, the standard and criterion of assessment in training should be clearly specified. So, the researcher developed Mathematics Teacher Standard by using conceptual framework of the Institute for Enhancing Science and Technology or IEST including 10 major standards, 37 indicators, for evaluating the teachers as target group. If the findings of this study was successful as expectation, it would be beneficial for related persons in using the findings as a guideline for developing both of teacher and students' quality in future.

**Research Question**

When the teachers were developed by Lesson Study, How it would be the changes according to Mathematics Teachers' Professional Standard? How the students' Mathematics Learning Achievement taught by Mathematics Teachers who were developed from Lesson Study, would be?

**Research Objectives**

1. To study the changes according to Mathematics Professional Standard of teachers obtained the development by Lesson Study.
2. To study the learning Mathematics Learning Achievement of students taught by Mathematics Teachers developed from Lesson Study.

## Research Methodology

The target group in this study consisted of 8 Mathematics Teachers teaching in Level 1, and 3 classrooms of Pratomsuksa 3 Students of None-sa-ad-amnuay School, and Ban-ka-wittayakom School, under jurisdiction of the Office of Kalasin Educational Service Area 2, Kalasin Province, 2008-2009 school years

## Research Methodology and Phases

The research design of this study, was a Case Study. The implementation could be classified into 3 phases as follows:

Phase 1: The surrounding context in research implementation as a study of current situation, problem, necessary need, rationale, approach, theory, related literature, research feasibility, and real practice in applying Lesson Study Innovation, were studied.

Phase 2: The Lesson Study into school as conference of teachers, school administrators, and related persons for introducing the innovation and providing necessary basic knowledge by 2 days workshop, was applied. Mathematics Teachers' Standard was assessed. The students' learning achievement and problem solving skill were assessed.

Phase 3: Lesson Study Process Usage, was implemented as follows:

1. For goal determination and knowledge management planning, were implemented among the Mathematics Teachers and/or school teachers in target school. The teachers from network schools collaborated in goal determining, instructional design, and knowledge management plan development.

2. For application of knowledge management plan and teaching observation, a teacher in group used the knowledge management plan in teaching. The other teachers, experts, and school administrators observed the teaching while they were recording their teaching observation by focusing on the students. Data from students' thinking and learning process, participation, behavior, and other incidences occurring in class, werecollected.

3. For reflection of teaching performance, it was a discussion for sharing and analyzing data together in what were the students' evidences showing that they achieved goal? Whether the development was occurred? How they should develop their teaching technique? The teacher was the first person performing the reflection. Then, the others participated in discussion on the lesson in order. The school administrator was the president of conference.

4. For conclusions of learning performance, it was a collaboration in concluding the findings from Lesson Study by concluding that What did the teachers obtain? The conclusions of findings including knowledge management plan, students' information, and teachers' learning record, were written as a report for reflecting what the teacher had learned.

After finishing the Lesson Study Process in each semester, the findings from implementation, for instance, the students' performance, teachers' performance, were shown in an exhibition, the open classroom, Mathematics Teacher's Standard was assessed, the students' Mathematics Learning Achievement were assessed by using the same issue of instrument using before development.

**Instrument and Equipment for collecting data**

1. The instrument studying the effect on teachers and students after professional development, included:

1) Mathematics Teachers' Standard Evaluation Form developed from Mathematics Teacher Standard of The Institute of Science Enhancement.

2) The Mathematics Learning Achievement, 3 sets including: the second semester of 2008 school year, consisted of 2 sets. Set 1: the topic was "Multiplication," 30 full score. Set 2: the topic was "Division," 30 full scores, during the first semester of 2009 school year, including 1 set, titled " Addition and Subtraction of the counting number and dividend not more than 100,000, 40 full scores, with item difficulty between 0.22 to 0.62 and the item discrimination between 0.20 to 0.88 reliability coefficient of total issue = .82, .81 and .86, respectively.

2. The Videotape Recorder/Digital Camera/Audiotape Recorder for recording different activities of education.

3. The Observation Record Form, the Teacher's Learning Performance Record Form, the Interview Record Form.

**Data Collection**

The basic information of school, information by deciphering the videotape and audiotape from different incidences, photograph from digital was camera, information from teachers' standard assessment. Data from total Record Form, and teachers' standard assessment from 3 times of assessment: The first time; the assessment before Lesson Study was brought to school. The second time; the assessment during development, the first semester/2009, and information from students' pretest and posttest in topics specified and planned by the teacher.

**Data Analysis**

Different Record Forms were analyzed. For information from videotape or a udiotape deciphering, basic statistic in analyzing the teachers' standard assessment and students' test performance, included the Percentage, Mean, and Standard Deviation.

**Conclusions and Discussions**

**The research findings based on research objectives:**

1) The Findings of changing based on Mathematics Teaching Professional Standard of teacher developed by using Lesson Study.

For findings of teachers' first assessment, found that they were in "Moderate" level. The assessment scores were between 49.00-52.00%, concluding that every teacher didn't pass criterion. For the second assessment, found that every teacher obtained the assessment findings in "Good" level. The assessment scores were between 75.75-78.25%, concluding that every teacher had assessment finding passing criterion. For the third assessment, found that every teacher had assessment finding in "Very Good" level. Their assessment scores were between 85.25-90.50%, concluding that every teacher had her third assessment findings in passing criterion level. While it was implemented according to cycle

of Lesson Study, the teachers' changes were obviously observed such as the instructional management by focusing on students' problem solving. The teachers used stimulating questions so that the students could think, managed atmosphere enhancing the students' interest, and used the interesting media and equipment. The students' communicating skill was managed. In addition, they could use correct language. They were able to control their emotion, and listen to the others' opinion as well as respond the others appropriately. The teachers' role in lecturing was decreased whereas the students' opportunity in learning was increased. They had good attitude toward Mathematics.

The cause of teachers had gradually increased development might be because they consulted with the researcher and mentor teacher in every phase. The implementation started from "Leading to practice," to "Trying to do," as the first phase including the knowledge management plan in "Multiplication," the researcher and mentor teacher participated in implementation as "Leading to practice," and took role as outsider expert allowing the teachers learn simultaneously with real practice. The findings of implementation, found that it was successful. It was supported by Narumon Inprasitha's (2009) conclusion that during the phase of advice for Lesson Study into schools, the outsider experts were important factors supporting in causing teacher's changes since the Lesson Study Process couldn't be able to be performed alone although the teachers collaborated in establishing the knowledge management plan, classroom observation, if they lacked of knowledge and understanding in content, curriculum, organization of learning units, knowledge management plan, learning management technique, or viewpoint or approach in classroom observation, the researcher's expectation that the teachers could be changed, would be in long period of time. Therefore, in the first phase of introduction in Lesson Study so that the teachers would know, the very important factor was the outsider experts participating in the process as well.

2) The study of Mathematics Achievement of students who were taught by Mathematics Teachers, and developed through the Lesson Study.

2.1) Analysis of data from testing students before and after the second semester of the academic year 2551 are as follows.

The results of data analysis by comparing the pretest and posttest average scores of mathematics learning achievement on "the Multiplication," found that the classroom 1-3 students were as follows: 43.47, 80.50; 29.53, 72.07 and 27.50, 74.33, and the values of standard deviation were 1.97, 2.31; 1.53, 2.13 and 2.10, 2.43 respectively. For the changes between the pretest and posttest scores, found that the classroom 1-3 had changes as follows: 37.03, 42.53 and 46.83 respectively. For the "Division," found that the classroom 1-3 students had their average pretest and posttest scores as follows: 44.73, 80.00; 29.83, 70.33 and 37.00, 74.83. The values of standard deviation were 2.12, 2.04; 1.59, 2.55 and 2.00, 1.93 respectively. For the changes between average pretest and posttest scores, found that the classroom 1-3 had changes as follows: 35.27, 40.50 and 37.83.

2.2) The analysis of test data from students before and after the first semester of the academic year 2552.

The results of data analysis to compare the mathematics achievement on the Addition, Subtraction are the results and the dividend not more than 100,000, found that the classrooms 1-3 students had their pretest and posttest average scores as follows: 28.67, 96.67; 23.87, 98.43 and 24.03, 91.07. The values of standard deviation were 1.61, 2.94;

2.59, 5.63 and 2.44, 4.31, respectively. For the changes in of average pretest and posttest scores, found that the classroom 1-3 had changes as follows: 68.00, 74.57 and 67.03.

According to the data collection through the observations and interviewing the teachers, school administrators, research participants, and students, based on the lesson study process,in the following aspects: the students had more confidence, assertion, and good attitude towards mathematics learning. They had better Mathematical Process Skill especiialy their Problem Solving Skill and Social Skill.

It was concluded that the mathematics learning achievement of students being taught by the teachers who have been developed through Lesson Study. . They had development and changes in their confidence, assertion, and good attitude towards mathematics learning. In addition, they had better Mathematical Process Skills as well as Social Skill.

For the occurred changes, might be due to the teachers collaborated in planning and organizing the instructional activity by providing opportunity for every student to be able to learn through Mathematical Thinking Process and Problem Solving, using the questions stimulating the students in thinking relevant to their daily life, organizing the instructional activities for serving the students' interest, aptitude, and ability. The media was administered relevant to content and interest. The climate and environment were managed for facilitating the students' studying. The factors enhancing their studying, were managed. It was supported by Narumon Inprasitha's findings of the study the effect of Lesson Study on students, found that the usage of Lesson Study had an effect on the students' changes in thinking process as well as learning process of Thai Language. Furthermore, the students had better attitude toward studying Thai Language.

**Recommendations for future research**

1. The Lesson Study should be used in other areas as the Office of Educational Service Area collaborated in moving the innovation aligned with schools for confirming the research findings or obtaining the findings helping in being able to apply this process more thoroughly and appropriately.
2. The research study should be conducted for comparing the occurred findings by using Lesson Study as Whole School Process among different characteristics, sizes, or locations in order to obtain the findings helping in being able to apply the process more thoroughly and appropriately.
3. The effect of teacher development by implementing based on Lesson Study Process in teacher development of other Learning Substances and class levels different from this study as well as the study in other dimensions, should be performed.

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