Professional Development of Mathematics teacher through Lesson Study in Savannakhet Teacher Training College

Phailath Sythong[1] / Amphone Khaopearsuphom[2]
Lecturer[1,2,] Savannakhet Teacher Training College, Laos
Email : phailath_ttc@yahoo.com[1] Amphu72@yahoo.com[2]

Abstract

Continuing Professional Development (CPD) of in-service teachers training program in Laos is one of the focuses of the government to improve a quality of classroom teaching and performance of students, so the effective teachers can be enhancing professional development in actual classroom practice. In this paper we present a case study of fourteen mathematics teachers in Savannakhet Teacher Training College (STTC) in Laos working in a Lesson Study (LS) team that prepared for improve teaching and learning mathematics. The Lesson Study process included preparing, observing, and reflecting the teaching in mathematics class. The data clearly showed that the collaborative environment throughout the Lesson Study enabled the teachers to increase their content knowledge andpedagogical knowledge in teaching mathematics, the student learning outcome also improved by the process of Lesson Study.

Keywords : Professional development, Lesson Study, Pedagogical knowledge

บทคัดย่อ

การพัฒนาวิชาชีพต่อเนื่อง (CPD) ของโปรแกรมการฝึกอบรมครูผู้สอนในประเทศลาวเป็นหนึ่งในเป้าหมายของรัฐบาลในการปรับปรุงคุณภาพการเรียนการสอนในชั้นเรียนและประสิทธิภาพของนักเรียน ดังนั้นครูผู้สอนที่มีประสิทธิภาพจะช่วยเสริมสร้างการพัฒนาวิชาชีพในทางปฏิบัติที่เกิดขึ้นจริงในชั้นเรียน วิจัยนี้นำเสนอกรณีศึกษาของครูคณิตศาสตร์ในวิทยาลัยครูสะหวันนะเขต (STTC) ในประเทศลาวที่ทำงานในทีมวิจัยบทเรียนซึ่งเตรียมความพร้อมในการปรับปรุงการสอนและการเรียนวิชาคณิตศาสตร์ กระบวนการวิจัยบทเรียนประกอบด้วยการเตรียมความพร้อม การสังเกตการณ์ และการสะท้อนให้เห็นการเรียนการสอนในชั้นเรียนวิชาคณิตศาสตร์ ข้อมูลแสดงให้เห็นอย่างชัดเจนว่าสภาพแวดล้อมการทำงานร่วมกันตลอดการวิจัยบทเรียนเอื้อให้ครูเพิ่มองค์ความรู้ด้านเนื้อหาและองค์ความรู้ด้านวิธีการสอนในการสอนคณิตศาสตร์ นอกจากนี้ผลการเรียนรู้ของนักเรียนยังมีการพัฒนาขึ้นด้วยกระบวนการวิจัยบทเรียนอีกด้วย

คำสำคัญ : การพัฒนาวิชาชีพ การวิจัยบทเรียน ความรู้ด้านวิธีการสอน

1. Introduction

Pre-Service teacher training program in Teacher Education Institute (TEI) is indispensable. However, the teacher education is not completed only on this stage because an actual development of teachers is done through their job at schools. Teacher should not stop learning to improve their teaching capabilities, they should continue studying.

Continuing Professional Development (CPD) of in-service teachers training program in Laos is one of the focuses of the government to improve a quality of classroom teaching and performance of students. Department of Teacher Education (DTE) operates The TESAP-III (Teacher Education Strategy and Action Plan (2016-2020). It is based on the evaluation results of the TESAP-II (2011-2015) and it emphasizes the need of quality improvement of the teachers to achieve the Government's socio-economic development policy and Education for All (EFA). It clearly mentions that "Teacher education development will ensure that teachers receive continuous and systematic upgrading related to their teaching subjects and to teaching and learning methodology in order for them to become highly skilled teachers".

Department of Teacher Education has been conducting School-Based training program which enables all teachers in primary schools in some pilot provinces to have opportunity to continuously learn from each other at school level. Lesson Study has been implemented in some TTCs in Laos, currently the researcher was the Lesson Study key trainer in Laos. Designing and implementing Continuing Professional Development activity is important component of researcher's position description, the effective model of CPD Base on Lessen Study become the focus for this study.

However, the reality in the field shows that there are many mathematics teachers in STTChad difficulty in planning the lesson, some junior teachers lack of teaching experience for teaching their lesson, the teachers have not given best effort to give knowledge and skills to the students by involving them actively. the learning process ant context is not relevant the students' need. Many students-teachers cannot do well in their teaching practices; student-teachers could not teach mathematics well when they conduct teaching practices in secondary school. Furthermore, they could not explain mathematics contents correctly and fluently (Sythong, 2013).If those conditions continuously happen, it will result in the low quality of education which

cover: 1) the teachers' incompetence in planning the lesson; 2) the low of learning outcome and competence of the students in understanding the teacher's explanation; 3) students' low thinking capacity.

According to the mentions above, it is very important to study on Lesson Study. This research is very important point to promote the CPD of in-service teachers training in Laos. There is much that can use Lesson Study from Japanese and applied to class room in Laos. Therefore, this study is significant on investigates the nature of the growth of teachers who participated in model of CPD which was based upon the principles of Lesson Study. Lesson study is an activity that encourages a learning community.

2. Idea about Lesson Study

Lesson Study is the direct translation for the term of jugyokenkyu. In Japanese, the word jugyo means lesson and kenkyu means study or research. It is a professional development model widely used by Japanese teachers, wherein they conduct a systematic inquiry into their pedagogical practices through a close examination of their lessons (Fernandez, 2002; Saito & Atencio, 2013). In Lesson Study, a group composed of three to five professional teachers, usually within the same grade level, meet together regularly, and collaboratively investigate a "research lesson" designed to impact student achievement (Fernandez, Cannon & Chokshi, 2003; Puchner & Taylor, 2006; Cheung & Wong, 2014). Initially, the professional group work together to identify a curricular goal within a content area, and set goals for their students' improvement (Puchner & Taylor, 2006; Saito & Atencio, 2013).

Lesson Study is one professional development approach for "learning from practice" (Ball, 1996; Ball & Cohen, 1999). During lesson study, teachers formulate long-term goals for student learning and development; collaboratively work on "research lessons" to bring these goals to life; observe, document and discuss student responses to these lessons; and revise the lessons (and the broader approach to instruction) in response to student learning (Fernandez & Yoshida, 2004; Lewis, 2002; Stigler & Hiebert, 1999).

Lesson Study as defined by Lewis (2002) is a teacher-led instructional improvement cycle in which teachers work collaboratively to: formulate goals for student learning, plan a lesson, teach and observe the lesson, reflect on the gathered evidence,

revise the lesson for improvement, and reteach the revised lesson. Through the use of Lesson Study, teachers have a means for planning, observing, and conferring with others.

Lesson Study has been credited with changing Japan's classroom practices from being teacher-centred to student-centred, resulting in decades of steady improvement in elementary education. It represented the teachers' school-based efforts to realize their vision of student learning and long-term development (Lewis, Perry, & Murata, 2006).

3. Purposes of study

Through this study we purpose:

1. To study the effectiveness and feasibility of using lesson study to build pedagogical knowledge and content knowledge of mathematics teachers

2. To study the effectiveness of using lesson study to increasing students learning ability in mathematics.

4. Methodology Participants

The participants of this study were obtained from 71third year student-teachers in mathematics department of Savannakhet Teacher Training College (STTC), 35 of them were from class A and 36 from class B, besides that, the number of participating teacher were 12 mathematics teacher in STTC, 7 teachers were junior teacher, 5 teachers were senior teacher, one of the senior teacher was Lesson Study key trainer(facilitator) who had two weeks training on lesson study in Japan.

Base on Japanese Lesson Study cycle, Plan, Do, See, in this study we separate the Lesson Study cycle in to 8 step follows :

(1) Problem Identification
(2) Class planning
(3) Class implementation
(4) Class evaluation and review of result
(5) Reconsideration of class
(6) Implementation base on reconsideration
(7) Evaluation and review
(8) Share result

In this study we start from two-day training workshop which covered orientation on "what

is lesson study", step and type of lesson study, how it is implementing in a school.

Step 1 : The lesson study group discussed and identified learning challenge in teachinglinear equations, the content was in geometry analysis subject; choose a mathematics teacher who had 5 years teaching experience to conduct teaching in this lesson study, she was active teacher.

Step 2 : The lesson study group planned the first research lesson in 90 minuses preparation for class A.

Step 3 : Conduce teaching in class A by using the lesson plan that the group planned, other mathematics teachers observed the teaching.

Step 4 : The lesson study group evaluate and reflect the lesson by having each observer to give comment and discussion.

Step 5 : Reconsideration of class, develop the lesson plan base on the comment and discussion.

Step 6 : Conduce teaching in class B by using the lesson plan that had been developed, other mathematics teachers observed the teaching.

Step 7 : Following that group evaluated and reflected the lesson again by each observer give comment and discussion.

Step 8 : Sharing result.

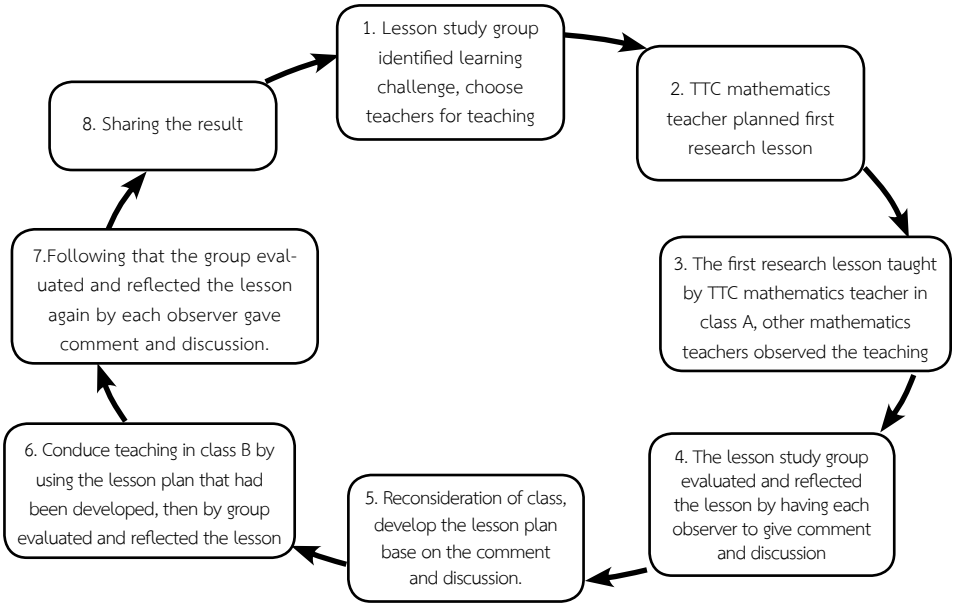

Figure 1 *: The lesson study cycle*

5. Instruments used

This study used two different tools to fulfill the aims of the study.

1. Teaching capacity evaluation sheet

2. End line survey of teacher perspective on effectiveness and feasibility of implemented Lesson Study to improve teaching and student's achievement

The Teaching capacity evaluation sheet

The Teaching capacity evaluation sheet consist 11 items focusing on teaching approaches and techniques, each item has a measuring scale from 1-5, where 1 represents the lowest mark whereas 5 represent the highest one. The final parts are the comments and the suggestions for improving the teaching. Use for evaluated teaching capacity in each class.

End line survey of teacher perspective on effectiveness and feasibility of implemented Lesson Study to improve teaching and student's achievement

The end line survey consists 12 items. It focuses on the benefit of implement Lesson study in teaching and learning mathematics by using the survey at the end of Lesson Study process.

Each item has a measuring scale from 1-5, where 1 represents strongly disagree, 2 represents disagree, 3 represents undecided, 4 represents agree, 5 represents strongly agree.

In this study, research group conduced two cycles of research study.

6. Results and Discussion

Comparison of first teaching in class A and class B of cycle 1

Researcher usedaverage score from the evaluation sheets that observers evaluated the teaching to compare the teaching conducted in class A and class B. As shown in table 1, each item had average score for the response.

The data in table 1 and figure 2 below shows average score of teaching that was conducted in class A and class B in cycle 1. The most average score in each item of class B was higher than the average score of class A, especially item 2 and item 4. The difference of average score were 1.33;the meaning increased 26.60%,

the evaluation viewpoint of item 2 was the teacher relates the lesson with students' experiences and encourages students to connect with what they have already learnt, and the evaluation viewpoint of item 4 was the teacher gives opportunity to students to design ways to try out their ideas, the highest average score in class A was item 8, the evaluation viewpoint of item 8 was the teacher directs questions to individuals, the highest average score in class B was item 2. The lowest average score in class A was item 4 and item 9, showing that teacher did not so much give opportunity to students to try out their ideas and teacher could not ask questions that help students generate further questions or ideas, the lowest average score in class B is also item 9, the evaluation viewpoint of item 9 was teacher asks questions that help students generate further questions or ideas.

Table 1 *: The evaluation sores of teaching conducted in class A and class B of cycle 1*

Evaluation items		1	2	3	4	5	6	7	8	9	10	11
The first teaching in class A cycle 1	Average	3.25	3.25	3.25	2.75	3.33	3.50	3.17	3.50	2.75	2.50	3.33
	SD	0.45	0.45	0.45	0.45	0.49	0.52	0.58	0.52	0.45	0.52	0.49
The first teaching in class B cycle 1	Average	4.33	4.58	4.17	4.08	4.25	4.25	3.58	4.42	3.25	3.67	4.25
	SD	0.49	0.51	0.39	0.29	0.45	0.45	0.67	0.51	0.45	0.49	0.45
Difference		1.08	1.33	0.92	1.33	0.92	0.75	0.42	0.92	0.50	1.17	0.92

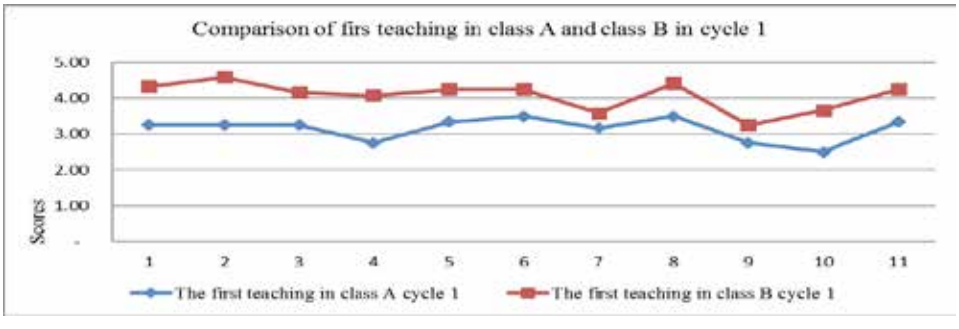

Figure 2 *: Comparison of first teaching in class A and class B of cycle 1*

Comparison of second teaching in class A and class B of cycle 2

The data in table 2 and figure 3 below shows average score of teaching that was conducted in class A and class B in cycle 2. The most average score in each item of class B was higher than the average score of class A, especially item 2,the difference of average score were 0.83; the meaning increase16.60%, the evaluation viewpoint of

item 2 was the teacher relates the lesson with students' experiences and encourages students to connect with what they have already learnt, the highest average score in class A was item 6, the evaluation viewpoint of item 6was teacher's attitude to the students was good, the highest average score in class B was item 2 and item 6. The lowest average score in class A was item 9, show that teacher could not ask questions that help students generate further questions or ideas, the lowest average score in class B is also item 9, it show that teacher could not ask questions that help students generate further questions or ideas.

Table 2 *: The evaluation sores of teaching conducted in class A and class B of cycle 2*

Evaluation items		1	2	3	4	5	6	7	8	9	10	11
The second teaching in class A cycle 2	Average	3.83	3.75	3.42	3.33	3.92	4.25	3.33	4.17	3.08	3.17	3.75
	SD	0.58	0.62	0.51	0.49	0.51	0.62	0.49	0.39	0.29	0.39	0.45
The second teaching in class B cycle 2	Average	4.50	4.58	4.08	4.08	4.17	4.58	3.67	4.42	3.50	3.67	4.33
	SD	0.52	0.51	0.29	0.29	0.39	0.51	0.49	0.51	0.52	0.49	0.49
Difference		0.67	0.83	0.67	0.75	0.25	0.33	0.33	0.25	0.42	0.50	0.58

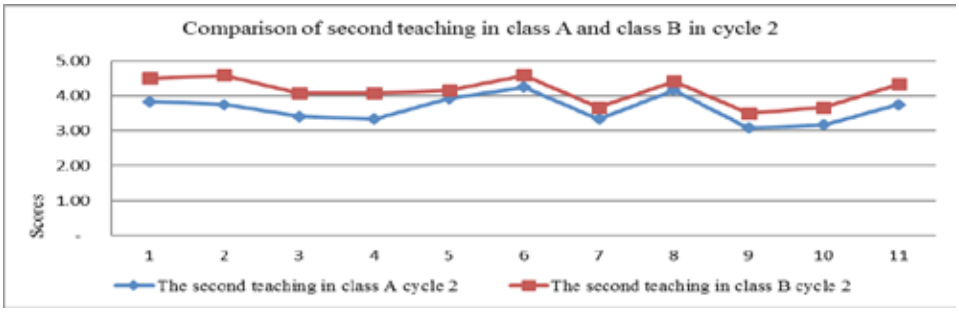

Figure 3 *: Comparison of second teaching in class A and class B of cycle 2*

The refection was done through the feedback and discussion of teaching-teachers; teachers who observed the lessons and facilitator, the comments were categorized into three as follows:

1. Mathematics Content Knowledge (MCK).
2. Mathematics Pedagogical Knowledge (MPK).
3. General Pedagogical (GP)

Table 3 shows the summary of comments given by teaching-teachers, observers and facilitator. In class A 3Mathematics Content Knowledge comments were

given, while in class B 4 comments. In Mathematics Pedagogical Knowledge comments, in class A 5 comments were given while in class B 7 comments were given. In General Pedagogical comments, in class A 8 comments were given and in class B gave 9 comments. Totally in class A could give 16 comments and in class B 20 comments were given. The highest numbers of comments of two classes were General Pedagogical comments, the lowest numbers of comments of two classes were Mathematics Content Knowledge comments, meaning in the Lesson Study Process teacher could give General Pedagogical comments more than other comments, beside that senior teachers could give comment more than junior teacher, some junior teacher could not give any comment.

***Table 3** : Summary of comments during Lesson Study Process*

Class / Period	Class A				Class B			
	Numbers of comments				Numbers of comments			
	MCK	MPK	GP	Total	MCK	MPK	GP	Total
Introduction	0	1	2	3	1	1	2	4
Body	2	3	4	9	2	4	5	11
Conclusion	1	1	2	4	1	2	2	5
Total	3	5	8	***16***	4	7	9	***20***

Summary of teacher perspective on effectiveness and feasibility of implemented Lesson Study to improve teaching and student's achievement

The data in table 4 below shows average score of teacher is perspective on effectiveness and feasibility of implemented Lesson Study to improve teaching and student's achievement. The data evaluated by 12 teachers who participated on the study at the end of Lesson Study process.

The highest average score was item 3 and item 5(4.58), the evaluation viewpoint of item 3 was LS enhance collaboratively work on research lessons and the evaluation viewpoint of item 5 was LS improve of the teachers' pedagogic competence, follow by item 6 and item 8(4.50), the evaluation viewpoint of item 6 was LS help teacher understanding learners' characteristics and the evaluation viewpoint of item 8 was LS process is a good tool for teacher professional development. The

lowest average score was item1 (3.08), the evaluation viewpoint of item 1 was LS improve students' performance in learning mathematics. It shows that LS process could develop pedagogical knowledge than content knowledge and enhancing student's achievement.

***Table 4** : Summary of teacher's perspective of effectiveness and feasibility of implemented Lesson Study to improve teaching and student's achievement*

Evaluation items / Observer	1	2	3	4	5	6	7	8	9	10	11	12
SD	0.51	0.52	0.51	0.62	0.51	0.52	0.49	0.52	0.51	0.65	0.51	0.49
Average	3.08	3.50	4.58	4.25	4.58	4.50	4.33	4.50	4.42	3.67	4.42	4.33

7. Conclusion and Discussion

In this study, we investigate teachers' experiences in two LS cycles. Our findings indicate many positive outcomes : The LS process developed pedagogical knowledge of teachers in teaching mathematics lesson, the LS process also improve teachers' content knowledge in teaching mathematics and enhancing student's achievement, it also enhances collaborative work on research lessons,in addition, LS process motivated the teachers to reconstruct students' thinking and to plan lessons that address students' misconceptions based on their models of student thinking. LS provide a structured framework that assures efficient use of teachers' time. This research shows that teachers were able to develop pedagogical knowledge in teaching mathematics; Besides that, LS process helps mathematics teachers to improve their teaching, because it helps to identify weakness that need improvements by helping them to be open-minded in order to learn from other teachers. In other words, through collaboration, they could have solidarity, and learn about themselves and about their peers in a team spirit. In this study, The LS contributes to 3 areas of knowledge development, but it is highest success in developing pedagogical knowledge, following that content knowledge and then learning achievement of students respectively.LSis good method for teacher professional development in the school.

References

Ball, D. L. (1996). Teacher learning and the mathematics reforms: What we think we know and what we need to learn. Phi Delta Kappan, 77(7), 500-508.

Ball, D. L., & Cohen, D. K. (1999). Developing practice, developing practitioners : Toward a practice-based theory of professional education. In G. Sykes & L. Darling-Hammond (Eds.), Teaching as the learning profession: Handbook of policy and practice (pp. 3-32). San Francisco: Jossey-Bass.

Cheung, W. M. & Wong, W. Y. (2014). Does lesson study work? A systematic review on the effects of lesson study and learning study on teachers and students. InternationalJournal for Lesson and Learning Studies, 3(2), 137-149.

Fernandez, C. (2002). Learning from Japanese approaches to professional development : The case of lesson study. Journal of Teacher Education, 53(5), 390-405.

Fernandez, C., Cannon, J., & Chokshi, S. (2003). A U.S.-Japan lesson study collaboration reveals critical lenses for examining practice. Teaching and Teacher Education, 19(2), 171-185

Fernandez, C., & Yoshida, M. (2004). Lesson Study: A case of a Japanese approach to improving instruction through school-based teacher development. Mahwah, NJ: Lawrence Erlbaum.

Lewis, C. (2002). Lesson Study: A handbook of teacher-led instructional change. Philadelphia, PA: Research for Better Schools.

Lewis, C., Perry, R., & Murata, A. (2006). How should research contribute to instructional improvement? The case of lesson study. Educational Researcher,35(3), 3-14.

Ministry of Education and UNESCO (2005), Education for All, National Plan of Action, Vientiane.

Ministry of Education and Sport (2010), Teacher Education Action Plan TESAP-II (2011-2015), Vientiane.

Ministry of Education and Sport (2015), Teacher Education Action Plan TESAP-III (2016-2020), Vientiane. Note on the Poverty Reduction Strategy Paper National Socio-Economic Development Plan (2006-2010) and Annual Progress Report. Washington, DC : The World Bank.

Puchner, L. D. & Taylor, A. R. (2006). Lesson study, collaboration and teacher efficacy: Stories from two school-based math lesson study groups. Teaching and Teacher Education,22(7), 922-934.

Saito, E. & Atencio, M. (2013). A conceptual discussion of lesson study from a micro political perspective: Implications for teacher development and pupil learning. Teachingand Teacher Education, 31, 87-95.

Saito, N. (2007). Lesson study in Laos. JAPANESE LESSON STUDY IN MATHEMATICS Its Impact, Diversity and Potential for Educational Improvement.

Sythong, P. (2013) Study on improving the class teaching practices power for students of Teacher Training College: Developing analytical approach. International Journal of researcher on Mathematics and Science.