

The Encouragement Thai Primary Science Teachers' Competency in Developing the Inquiry-based Science Lesson Plans using Lesson Study Process, Thailand

Pornpaka Chamnanwong¹, Kongsak Thathong² Toshinobu Hatanaka³

¹ Ph.D. Student Science Education,
Faculty of Education, Khon Kaen University, Thailand

² Assoc. Prof. Dr. Faculty of Education,
Khon Kaen University, Thailand.

³ Assoc. Prof. Dr. Faculty of Science,
Toho University, Japan

Abstract

This research is based on two cycles of Lesson Study (LS) conducted during a 4-day workshop in Thailand. The purposed of the workshop were: 1) to foster the primary science teachers' knowledge and understanding about Lesson Study Process, and 2) to enhance the competency of primary science teachers to develop the inquiry-based science lesson plans using LSP. The data were collected through reflective learning of teachers, semi-structured interview, questionnaire, and observation form. The results showed that: 1) the participants understood the technique of construction science lesson plans pretty well. After participating in a training workshop on LS, teachers begin to believe that the learning management using the LS is an approach to enable them to develop their teaching profession. And the inquiry-based science lesson plan based on the structure inquiry has helps students gained scientific and learning skills, 2)The participant teachers satisfied with the workshop at the highest level (Mean = 4.52), And 3) The effect of the inquiry-based science lesson plans on Grade 6 students' achievement. All student participants in both schools improved their understanding of the content knowledge after taught by teacher participants using the inquiry-based science lesson plans, which were developed based on LSP

Keywords: Science, Lesson plans, Thai Primary science teachers, Lesson Study (LS), Inquiry approach

1. Introduction

Education to prepare students for life in the 21st century with the stream of social changes that affect the way of life of the society is challenging. Teachers need to be alert and well prepared to manage learning in order to prepare students with the skills needed for the life of the world in the 21st century. The necessary 21st Century Skills should result in changes to the curriculum so that children in the 21st century develop the required content knowledge and skills. As a result, reforms to change the ways of teaching and learning and to prepare for the better future are being implemented (Mishra and Kereluik, 2012).

Recent reform efforts have focused on systematically studying "effective" teaching strategies and lessons that will increase student achievement. Instructional practices can only be changed through examination of teaching practices and its impact on student learning. In order for this to occur, schools need to create a process for teachers to systematically study teaching strategies and lessons that will increase student achievement. Current research in the area of LS illustrates that collaboration of teachers, through the use of LS groups, increases student achievement and decreases teacher isolation (Chokshi, S., & Fernandez, C. 2005; Lewis, 2000).

LS provide one way in which teachers can systematically improve instruction and decrease teacher isolation, if it can be sustained over time. Lesson Study provides a process for teachers to collaborate and design lessons while examining successful teaching strategies to increase student learning. In the process of LS, teacher work together to plan, teach and observe a cooperatively developed lesson. While one teacher implements the lesson in the classroom, others observe and take notes on student questions and understanding. The development of an “ideal lesson” is not the critical component in the LSP (Fernandez, C. 2005; Lewis, 2000; Yoshida, M. 2005). The process focus on student learning and professional collaboration is what drives the group process. In addition, the focus of the observation process is on the lesson, not on the teacher. Collaboration among teachers will expand assistance and help teachers understand themselves and the others. The purpose of this research were to foster the primary science teachers’ knowledge and understanding about LS Process, and to enhance the competency of primary science teachers to develop the inquiry-based science lesson plans using LS Process.

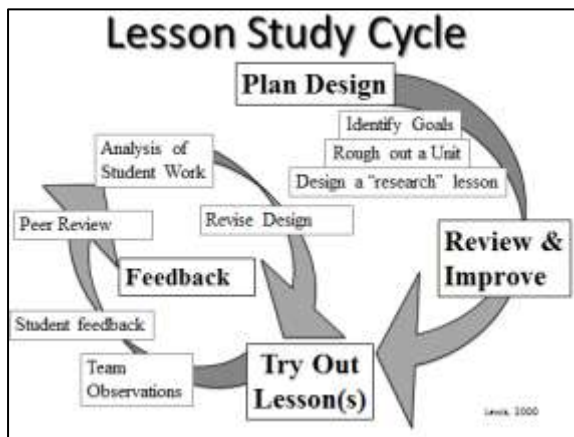


Fig.1 The Lesson Study Cycle

The Training Program of the LS Workshop is significant in that the results obtained from it will add to current understandings of the construction of science lesson plan based on inquiry approach using a LSP. The results of this study also had the power to inform the understanding of the role of collaboration that reflection plays in developing teaching profession. This study also has the potential to reveal the influence of developed science lesson plans based on an inquiry approach using LSP on students’ achievement. The knowledge gained in this study showed the benefit of the LSP to the teachers’ knowledge and practice,

which has implications for the delivery of course work and school placements in the future.

3. Materials and Methods

Participants are one educational supervisor of the Khon Kaen Primary Educational Service Area Office 3, Thailand, one observer from Science Education of Khon Kaen University, Thailand, one expert from Toho University, Japan, 25 teachers in learning area of science for Grade 6 students in 25 schools under the jurisdiction of Khon Kaen Primary Educational Service Area Office 3, Thailand. Twenty-five participants were a group of volunteer teachers selected purposively with criteria to be included in this study: first, they teach science in primary schools located in the same community and second, they were voluntary and willing to participate in this workshop training. Variables were the primary science teacher’s knowledge-understanding of Lesson Study, ability in creating inquiry-based science lesson plans using Lesson Study Process, satisfaction of the primary science teachers toward Lesson Study, and students’ learning achievement.

Research instruments were Reflective learning of teachers, Semi-structured interview, Questionnaire, Observation form, and Test

The nine topics of training plans for Lesson Study workshop activities during 3, 7-9 July of 2015 were as follows:

1. Innovation of Lesson Study for 3 hours.
2. An importance of inquiry-based science lesson plan to develop learner’s thinking skills for 1.5 hours.
3. Inquiry teaching approach for 1.5 hours.
4. Japanese views and technique of inquiry teaching approach for 1 hour.
5. Introducing the Japanese instructional media, materials, and textbooks to teachers for 1 hour.
6. Guiding and giving examples of inquiry teaching approach of Japanese teachers in primary schools for 1 hour.
7. Group activity: Practice to write lesson plans for 2 hours.
8. Discussion and reflection about lesson plans for 1 hour.
9. Implementation of lesson plan to actual classroom based on Lesson Study Process for 2 days

These topics of the training plans for the Lesson Study workshop training activities were developed by analyzing the connecting of training activities

with the importance of Lesson Study along with conceptions of science teaching, especially an inquiry teaching approach. Training activities were developed according to the aforementioned topics and presented to the advisor from Science Education of Khon Kaen University, Thailand and experts in science teaching to check for the congruency of activities and topics. The Lesson Study Workshop Framework as follow.

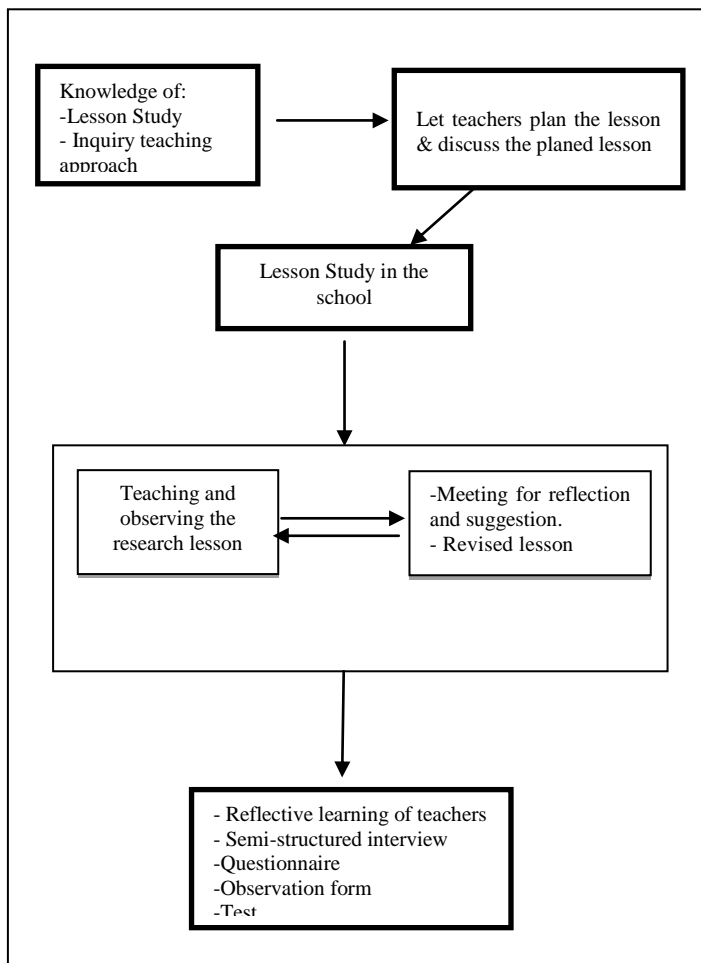


Fig.2 The Lesson Study Workshop Framework

4. Results and Discussion

1) In this research provided a training workshop on LSP. The development of the science lesson plans were based on the inquiry process for seeking knowledge. The inquiry method was considered as a part of leaning science like the scientists' styles of learning and should be used as a teaching tool, which encourages students to learn science content and practical experience through the investigation itself

(Jiang & McComas, 2015; National Research Council, 1996.).structured Inquiry (Jiang &McComas, 2015)was used in developing science lesson plans. According to the first round of jointly developed lesson that focused on scientific inquiry, it was found that teachers lacked of understanding on how to write lesson plans to encourage children to construct the knowledge on their own. In addition, the event-based model of Structure inquiry teaching was appeared not much in the science lesson plans. Teachers did not write lesson plans in details so it caused problems when they applied to teach in the classroom. As a result, children were unable to build their own knowledge. Then a group of teachers had improved their lesson plans so students were able to build on their own knowledge and encouraged students to use their skills to think more. The teachers tried to create situations and questions inserted in activities to stimulate children's learning and to add more links to the part of everyday life so that children understood even more.

Role of teachers according to LSP is classroom observation is another role in which teachers had never done before so then could not help themselves not to interfere in the students' activities. They tried to be participant observers not only instructed the students to solve the problems but talked, asked questions, and assisted students to conduct activities in the classroom. They did not have clear guidelines in observing classroom activities. During the reflection session, they reported everything they saw in the classroom, including teaching styles so they took much time. They did not have time to reflect about management of teaching activities and learning of the students. Later, they learned to give reflection mainly on the collaboratively constructed lesson plans and learning behaviors of the students. Overall, teachers attended workshops in this situation reflected that they had a better understanding of the LSP by practicing in all phases of activity and realized that the process of lesson study is a form of learning new techniques that focus on the development and problem solving in the classroom by the teachers themselves. In addition, they all believed that the process of teaching using the lesson study is learning approach that focuses on the learners. The students are trained to solve problems and take action on their own. The teachers are just facilitators to encourage students to think critically using questions.

Among other things, the children enjoyed learning and had fun, whereas teachers believe that the learning process using the LS is an approach to teacher professional development which aligned with the research results of Meyer and Wilkerson (2011)

that study lessons was considered as a form of teacher professional development which provides the opportunities for teachers to improve their knowledge in learning activities on teaching that focus on group work to create collaboratively an innovative lesson study, to reflect, and to improve teachers' ability to see children in order to provide an appropriate learning activity for the learners as well as to be well aware of the important of the question to encourage the learners to gain thinking skills. According to reflection of post teaching session, it was found that the students lacked confidence in performing their learning activities, dared not to express their opinions and answer questions when teacher began to start learning activity. They were excited of being observed by many teachers and were recorded by video recorder during they were performing learning activities. The students had never studied with many teachers came to watch the activity in classroom; therefore they were tensed making them not understand how to perform learning activities. When students began to get used to a teacher and learning activities, some students dared to ask questions when they did not understand the question and had doubts. When the teacher asked questions, the students dared to express ideas more despite of excitement with the equipment and materials used in activities provided by teachers. Sometimes, some students did not pay attention to group work presentation in front of the classroom because they gave importance to some instructional media in front of them. However, the students enjoyed and having fun as well as thrilled with new learning activities and presentation in front of the classroom. The presentation to the class made the students develop scientific skills, therefore the development of lesson plans that focus on scientific inquiry, especially, the Structured Inquiry affects student learning to be gained in learning skills, which was consistent with the view of Inprasitha, M. (2011) that lesson plans were considered as guidelines for teachers to guide what they want students to learn and how to encourage students to learn more effectively and build new skills.

2) Results of satisfaction of the primary school science teachers toward LSP. After participation in a training workshop on LS, teacher participants were asked to indicate their opinions or satisfaction toward knowledge gained from participation in a training workshop on LSP using the 6- item Likert scale questionnaire. In scoring the Likert scale questionnaire, the numerical values of one through five were assigned to each level of satisfaction:

Table1 The primary school science teachers' levels of satisfaction toward knowledge gained from participation in training workshop on LSP (n=25)

Item	Issue/statement to be considered	Level of satisfaction	
		Average	Meaning
1	Lesson study makes you able to develop your potential, apply the knowledge / skills to work, and prepare lesson plans in the context of the lesson study.	4.43	High
2	Lesson study encourages the vision of self-development and promotes a variety of learning process.	4.56	Highest
3	The lesson gives you an idea of the pursuit of knowledge and new techniques to develop teaching and learning activities with better quality.	4.56	Highest
4	To have the opportunity to exchange ideas and learn with others.	4.43	High
5	To communicate and propose ways of thinking as well as possess your own solution for solving problem.	4.37	High
6	Are you willing to participate in the next session if this project is expanded for implementation?	4.75	Highest
Total average		4.52	Highest

According to Table 1, the mean scores of the primary school science teachers' levels of satisfaction toward knowledge gained from participation in training workshop on Lesson Study Process ranged from 4.37 – 4.75 with a mean score of 4.52 and was rated at the “Highest” level. They indicated that lesson study encourages vision of self-development and promotes a variety of learning process ($\bar{x}=4.56$), the lesson gives an idea of the pursuit of knowledge and new techniques to develop teaching and learning activities with better quality ($\bar{x}=4.56$), and they are willing to participate in the next session if this project is expanded for implementation with a mean score of 4.75 which was the highest mean score and was rated at the “Highest” level. A half or 50 % of the statements to be considered was rated at “High” level of satisfaction toward knowledge gained from participation in a training workshop on Lesson Study Process. They were to communicate and propose ways of thinking as well as possess your own solution for solving problem ($\bar{x}=4.37$), lesson study makes you able to develop your potential, apply the knowledge / skills to work, and prepare lesson plans in the context of the lesson study ($\bar{x}=4.43$), and to have the opportunity to exchange ideas and learn with others ($\bar{x}=4.43$).

3) The effect of the inquiry-based science lesson plans on Grade 6 students' achievement. The results

of investigation of Grade 6 students' achievement before and after taught by teachers using the inquiry-based lesson plan using LSP. The researcher explored the 44 students of two classrooms participants' understanding of "Lever" in order to examine the effect of implementing the inquiry-based science lesson plans on Grade 6 students' achievement. The teacher made test was administered to each student participant before and after taught by teacher participants. In scoring test item, the students were awarded one point for a correct answer and zero point for a wrong answer. Before analysis of data, Kolmogorov-Smirnov (K-S) was used to test for normality of the test scores distribution. It found that the normality of pretest, posttest and gain scores was accepted. Due to the distributions of the pretest and posttest scores were normal distribution, so parametric test was used. Independent t- test was used to test the differences between means of pre and posttest and gain scores disaggregated by schools, whereas dependent t-test for related samples was used to test the differences between means scores of pretest and posttest scores.

Table 2 Means, standard deviations of students' test scores and t-test disaggregated by schools

School	Pretest score		Posttest score		Gain score		t- test	
	\bar{X}	SD	\bar{X}	SD	\bar{X}	SD	t-value	Sig
Nong Aroon (n=22)	2.77	1.38	3.45	1.47	0.68	0.78	4.101	.001
Lomkom (n=22)	2.64	1.40	3.91	1.27	1.27	1.16	5.137	.000
Total (n=44)	2.70	1.37	3.68	1.38	.98	1.02	6.338	.000
t-value	0.326 (df=43, sig=0.746)		-1.097 (df=43, sig=0.279)		-1.98 (df=43, sig=0.054)		t-test	

Table 2 indicated the means scores of pretest, posttest, and gain scores of test items to measure understanding about content knowledge categorized according to schools along with independent and dependent t-test statistics of student participants' scores. After taught by teacher participants, the means scores of student participants' understanding of content knowledge were 3.45 for Ban Non Aroon School and 3.91 for Ban Lomkom School with an average of 3.68. Analysis of the students' test scores for each school showed that the differences between the means of pretest, posttest, and gain scores for two schools were not statistically significant differences at .05 level with t- values = 0.326, -1.097, and -1.98, respectively by using independent t-test. This means that two schools of

students were similar at the start and the end of this study. Table2 also revealed the significant differences of the means scores of pre- ($\bar{X} = 2.70$, $SD = 1.37$) and post-test scores ($\bar{X} = 3.68$, $SD = 1.38$) of all students at .05 level using dependent t-test with $t = 6.338$. There were also significant differences between the means scores of the pretest and posttest scores at the .05 level disaggregated by schools using dependent t-test. This means that all student participants in both schools improved their understanding of the content knowledge after taught by teacher participants using the inquiry-based science lesson plans developed based on Lesson Study Process. The means of gain scores for Ban Nong Aroon and Ban Lomkom schools, and for all student participants were 0.68 ($t=4.101$, $sig=.001$), 1.27 ($t=5.137$, $sig=.000$), and 0.98 ($t=6.338$, $sig=.000$), respectively; as depicted in Table 2.

6. Conclusions

The researcher developed nine topics of training plans used in training session for 4-day workshop to enhance the teachers' understanding of LS and ability to create lesson plans of learning activities according to the structured inquiry teaching approach based on LSP. The results of workshop to enhance the primary school teachers' competency in developing the inquiry-based science lesson plans using LSP were:

- 1) After participating in a training workshop on Lesson Study, teachers begin to believe that the learning management using the LS is an approach to enable them to develop their teaching profession. And the inquiry-based science lesson plan based on the structure inquiry has helps students gained scientific and learning skills;
- 2) After participating in a training workshop on LS, 25 teachers' levels of satisfaction toward knowledge gained from participation in training workshop on LSP at the "Highest" level of satisfaction;
- 3) The effect of the inquiry-based science lesson plans on Grade 6 students' achievement. All student participants in both schools improved their understanding of the content knowledge after taught by teacher participants using the inquiry-based science lesson plans, which were developed based on LSP

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