US-China Education Review A 1 (2012) 112-120
Earlier title: US-China Education Review, ISSN 1548-6613

Pre-service Science Teachers' Understandings of Classroom Research and the Problems in Conducting Classroom Research Projects*

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This research paper explores pre-service science teachers' understandings of classroom research, problems in conducting classroom research and the supports that pre-service science teachers need from their cooperating teachers to help them conduct a classroom research project during the internship period. The participants in this study are 19 pre-service science teachers in a teacher education institution situated in Western Thailand. The research instruments included a questionnaire about the understanding of classroom research and interviews with the pre-service science teachers regarding the problems in conducting a classroom research project and the supports that they need from their cooperating teachers in conducting the classroom research project. The data was analysed using descriptive statistics and content analysis. The results indicate that most of the pre-service science teachers understood the principles of classroom research. The problems the pre-service science teachers encountered in conducting classroom research were the limitation of time, generating suitable research question and selecting the innovation to solve the problem. Pre-service science teachers would like recommendations from their cooperating teachers more frequently for promoting the pre-service science teachers confidence and efficiency in their chosen classroom research projects. This study has direct implications for the ways in which we introduce and engage pre-service science teachers into inquiry-oriented practice in their chosen profession.

Keywords: classroom research, pre-service science teacher, understandings, problems, cooperating teacher

Introduction

In recent years in Thailand, there have been several claims to change the way of educating teachers, with a belief that teachers are the most influential persons affecting universal student success. As stated in the National Education Act 1999 and Amendments Second National Education Act 2002, "Teachers are essentially agents for organizing the learning activities for learners to learn and be all-round persons" (ONEC (Office of the National Education Commission), 2002, p. 11). The National Education Act also outlined the requirement for teachers to conduct a classroom research project in that "Besides a major responsibility of teaching, the teachers are required to carry out research to develop suitable learning for learners at different levels of

***Acknowledgements:** The researchers would like to thank the Kasetsart University Graduate School for funding to pursue this research.

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education" (ONEC, 2002, p. 13).

With this vision for classroom-based inquiry, a new pre-service teacher education program was established in 2004 in all teacher education institutions in Thailand to train new basic teachers at the bachelor level. Teacher education institutions were thus required to redefine their education programs. Teacher education institutions are now required to prepare teachers not only to meet classroom demands, but also to contribute to the advancement of the society as a whole. As a result, highly theoretical subject matter courses have been replaced with blended theory and practice courses that develop knowledge and experiences necessary for pre-service teachers to become effective teachers and lifelong learners upon their graduation (ONEC, 2000; ORIC (Office of Rajabhat Institute Council), 2002). To this effect, the new pre-service science teacher education program is established and it is extended from a four-year to a five-year bachelor's degree, with the first four years dedicated to coursework and a final year devoted to teaching practice at an approved school (OEC (Office of the Education Council), 2006).

The new pre-service science teacher education program provides more opportunity for pre-service science teachers to engage in the school atmosphere. Adding a full-year of internship experience is the highlight of the new five-year pre-service science teacher education program in Thailand. Pre-service science teachers are assigned to participate in five field experience courses to prepare them for the year-long internship. The field experience courses begin in the second year and continue through the final year of their pre-service teacher education program. The program aims to develop the pedagogical content knowledge of pre-service science teachers and apply this kind of knowledge in real situation (IPST (Institute of Promotion of Science and Technology Teaching), 2002). Throughout their studies, pre-service science teachers continue to observe and practice teaching at various approved schools with the expectation for them to integrate their internship experiences with the campus coursework (ORIC, 2002). While the pre-service science teachers conduct their teaching practice in the final year, they are also required to conduct a classroom research project and prepare a classroom research report. The assumption behind this policy document is that pre-service teachers will be more effective, if they are given sufficient time and opportunity to explore teaching methods and practices for themselves through the direct experience of teaching, researching and the supervision from the cooperating teachers in schools before they become qualified teachers (Degago, 2007). Classroom research is believed to be an important tool for pre-service teachers to inquire into strategies for solving problems in the classroom and developing their teaching practice (Smith & Sela, 2005). Classroom research can foster skill of inquiry in teachers (Mertler, 2006). Through the involvement in the research process, teachers can establish the habit and skills of reflection regarding their own practices and thereby continue to learn from their own experiences and become better at teaching throughout their careers. Engaging in classroom research helps teachers become more critical and analytical (D. Zambo & R. Zambo, 2006).

Because involving pre-service science teachers in classroom research is a new requirement in Thai teacher education, there has been limited research to study about the pre-service science teachers' understandings and practice of classroom research. One way to learn how to promote the pre-service science teachers' practice of classroom research is to study how the pre-service science teachers understand classroom research and what problems they encounter in conducting a classroom research project. This study aims to provide insights into how the teacher education institutions should prepare pre-service science teachers to be ready to conduct a classroom research project. It could also have implications regarding how the cooperating teachers can successfully support the pre-service science teachers' practice of classroom research during the internship settings.

Research Questions

There are three research questions for this study which include:

(1) What do pre-service science teachers understand about classroom research?

(2) What problems do pre-service science teachers encounter in conducting classroom research projects?

(3) What supports do pre-service science teachers need from the cooperating teachers to help them conduct a classroom research project?

Methodology

Participants and Setting

This investigation occurred at a teacher education institution located in Western Thailand. The participants were 19 pre-service science teachers who enrolled in the internship courses in the final year of their five-year pre-service science teacher education program. All pre-service science teachers conducted their student teaching in a professional development school. During the second week of their internship courses, the researchers contacted all 19 pre-service science teachers to seek their voluntary participation in this study. Research participants were sought through phone contact.

This was a year long study comprised of two main parts. In the first part, the researchers sought to find out the pre-service science teachers' understandings of classroom research before they started to conduct their classroom research projects. The second part took place after the pre-service science teachers had already finished their classroom research projects. The pre-service science teachers were then asked to express their opinions about the problems in conducting the classroom research projects and the supports that they felt they needed from their cooperating teachers that would help them conduct the classroom research projects more effectively.

Data Collection and Analysis

The first part. Questionnaire was used to answer the RQ_1 (research question), "What do pre-service science teachers understand about classroom research?". The first part of the questionnaire sought demographics information of pre-service teachers which included items about sex, age, GPA (grade point average) score and major field of the study. The items in the second part of the questionnaire include eight open-ended questions to clarify the pre-service teachers' understandings of classroom research (see Appendix A). The questionnaire was developed by the researchers and then validated by three educators who were the lecturers in the classroom research course. The validity and reliability were enhanced by pilot testing with 15 pre-service teachers who were not the subjects in this study. The Chronbach alpha coefficient of reliability of the questionnaires was 0.91. In collecting the data, the questionnaires were administered to pre-service science teachers four weeks after they started their student teaching. A completed questionnaire was returned by all 19 pre-service science teachers.

The second part. The interviews were used to explore RQ_2 and RQ_3, "What problems do pre-service science teachers encounter in conducting classroom research projects?" and "What supports do pre-service science teachers need from the cooperating teachers to help them conduct a classroom research project?", respectively. All 19 pre-service science teachers participated in the interviews, after they finished their classroom research projects at the end of the academic year. Interviews averaged 25 minutes per participant and were audio taped and transcribed. The interview protocols (see Appendix B) were also reviewed by the three educators who validated the questionnaire.

Data analysis procedures for this study were qualitative in nature and guided by the work of Merriam (1998) and Yin (1994). Data analysis began immediately upon receiving information from the questionnaire and interviews. All audio tapes of interviews were transcribed verbatim and typed out. Then, the transcripts were given to the participants, so that they could review the data and make any necessary corrections. No participants made significant changes to the content of the transcripts. The data from the questionnaire and interview transcripts were read and re-read by the researchers and was color highlighted in the body of the texts, sentences and passages for each participant response to determine the themes, according to each research question. Initial themes were discussed and then common themes were identified. Finally, the quotes from the pre-service teachers' response were presented to support the themes.

Results

The research results are presented in three parts according to each research question: the pre-service science teachers' understanding of classroom research, the problems in conducting classroom research and the need of supports in conducting classroom research project.

Understanding of Classroom Research

The pre-service teachers' understanding of classroom research were clarified into six area: meaning of classroom research, generating research question, reviewing literature, developing research instruments, analyzing data and writing classroom research report. The details of pre-service teachers' understandings in each area are described below.

Meaning of classroom research. Fifteen pre-service teachers understood classroom research as an inquiry process for solving the problems in the classroom that intends to improve teaching and learning processes. For example,

> Classroom research was an inquiry process which the teachers tried to find the solution of the problems in the classroom (Piti, questionnaire).

> Classroom research emphasized in developing a teacher's teaching practice in order to promote the students' learning (Naree, questionnaire).

Four pre-service teachers understood that classroom research was the strictly problem-solving process that intended to formulate new theory. For example,

> There were four steps in conducting classroom research which the researchers should follow step-by-step including, identifying the problem, developing the research instrument, collecting data and analyzing and interpreting data. The purpose of the Classroom Research was to find new knowledge for formulating new theory in education (Malee, questionnaire).

Generating research question. Seventeen pre-service teachers understood that the research question for the classroom research project should emerge from the classroom situation. There were a variety of techniques that could be used to generate the research question. "The research question come from the classroom by analyzing students' achievement scores, observing the students' behavior and checking the students' exercise books" (Naree, questionnaire). Two pre-service teachers did not have ideas for generating research question. They expected their cooperating teachers to generate the research question for them. For example,

> I did not have any ideas for generating research question, because it was just one month of my teaching experience in

> the school. I did not know what problem occurs in my classroom. I wanted my cooperating teacher to tell me about "what problem in the classroom that I should select for generating my research question" (Suda, questionnaire).

Reviewing literature. Fifteen pre-service teachers understood that reviewing literature meant linking the research topic with educational theories found in books, theses and research articles that can provide a theoretical grounding for the classroom research project and help the researchers gain more insight about the investigation.

> Reviewing literature helped the researchers identify what had been done before and it enhanced the understanding of the issues associated with the research topic. Reviewing literature provided the chance to see some examples of teaching techniques used by other teachers, the results of using each teaching technique and methods for collecting and analyzing data. This knowledge was very useful for writing the research framework (Napa, questionnaire).

Four pre-service teachers understood that reviewing literature was the process that they immersed themselves with dissertations and research articles to see the trends of research topics and research questions conducted by others.

> Reviewing literature from dissertations and research articles provided ideas for me to generate my research questions (Malee, questionnaire).

Developing research instruments. Fourteen pre-service teachers understood that various research instruments can be used for collecting data. The research instruments should be proved for validity before using.

> Questionnaire, interview, test and observation were commonly used to collect data. The research instruments should be verified and approved by experienced person and then tried out before use to collect data in order to make sure the research instruments can provide valid data for answering the research questions (Piti, questionnaire).

Five pre-service teachers had misunderstandings about developing the research instruments. They understood that a development of research instruments could be carried out by selecting learning activities from previous research.

> I could develop the research instruments by studying various formats of learning activities employed in previous research. From these, I could choose one learning activity that I were interested in for trying out in my classroom to compare the students' achievement scores before and after implementing the chosen learning activity in the classroom (Dara, questionnaire).

Analyzing data. Although the pre-service teachers expressed that they could use the research instruments that provided either quantitative or qualitative data, in analyzing data, they only mention about the technique for analyzing quantitative data. All 19 pre-service teachers expressed that data could be analyzed by calculating statistics values. No pre-service teachers expressed about how they could analyze qualitative data which was collected from interviews or observations. For example, "Calculating frequency, percentage, mean, standard deviation and *t*-test were techniques for analyzing the data" (Napa, questionnaire).

Writing classroom research report. All 19 pre-service teachers understood that the classroom research report comprised of five chapters similar to a thesis-type format.

> The classroom research report included five chapters: Chapter 1—Introduction and Background of the Study; Chapter 2—Related Literature; Chapter 3—Research Methodology; Chapter 4—Results of the Study; and Chapter 5—Conclusion, Discussion and Recommendations for Further Studies (Suda, questionnaire).

Problems in Conducting Classroom Research

The pre-service teachers expressed five main problems in conducting their classroom research. First, they thought the limitation of time affected them in pursuing their classroom research project.

> There were many additional activities that were not scheduled in the school plan. These activities interrupted me could not teach follow the lesson plans that I developed for use in my classroom research project (Piti, interview).

Second, the pre-service teachers encountered problem in generating the research question.

> There were a lot of problems that occurred in the classroom. I did not know how to select among these to generate a suitable research question (Suda, interview).

Third, the pre-service teachers did not know about selecting the innovation to solve the problem in their classroom.

> I did not know which innovation was suitable to solve problem in my classroom (Montree, interview).

Fourth, the pre-service teachers mentioned the inadequate university support. The pre-service teachers mentioned about the lack of chance to share their ideas and experiences in conducting classroom research project with peers.

> I expected to get the ideas for developing the research instruments from the perspectives of my peers and university faculties during the seminars, but I could not. The university did not arrange any seminars throughout the internship period, even though it was specified in the internship manual (Dara, interview).

Fifth, the pre-service teachers expressed that they lacked of confidence in conducting classroom research project.

> The classroom research course which the university provided was not enough preparation me to conduct the classroom research project. This was stressful for me as I struggled with the problems of developing the research instruments and writing the classroom research reports (Montree, interview).

> The lecturer of the classroom research course did not teach me in-depth in developing the research instrument and analyzing data. I was assigned to read the course material and gain an understanding of these topics by myself, which result me to conduct my classroom research project with anxiety (Malee, interview).

> I learned only theory in each step of conducting a classroom research project from the classroom research course, but I did not have a chance to practice how to generate the research question, review literature, write the research plan and develop research instruments (Napa, interview).

The Need of Supports in Conducting Classroom Research Projects

From the problems that the pre-service teachers encountered in conducting their classroom research projects, they preferred their cooperating teachers to give more recommendation to them, while they were conducting their classroom research projects.

> When I had problems, I was afraid to meet and talk with my cooperating teachers, because she did not pay much attention to my classroom research projects (Montree, interview).

> I preferred my cooperating teachers to build more rapport and give recommendations to me more frequently to help me pursue my classroom research with confidence (Dara, interview).

> I did not know which problem was suitable for generating the research question and what was the cause of the problem that occurred in the classroom. I would like my cooperating teachers guide me about how to generate the research

question (Napa, interview).

> There were many formats in writing the reference. I was unclear as to which format to write in my classroom research report. I preferred my cooperating teachers to recommend me about writing the reference in my classroom research report (Naree, interview).

Conclusions, Discussion and Implication

In the overall picture, most of the pre-service teachers understood about classroom research, because the teacher education institution required all pre-service teachers to register in the classroom research course in the third year of their pre-service science teacher education program. Although the pre-service teachers show their understanding of classroom research, they struggled some obstacles while they were conducting their classroom research projects in the fifth year of their pre-service science teacher education program. The obstacles regarding time limitation in conducting the classroom research project, generating suitable research question, selecting an innovation for solving the problem, inadequate university support and the classroom research course were inadequate to prepare them to conduct the classroom research project**.** The reason was the lecturer in the classroom research course emphasized teaching of theory in conducting classroom research projects rather than offering opportunity for pre-service teachers to practice each step in conducting a classroom research project. The pre-service teachers could not transfer the knowledge that they learned into their practice. This finding agreed with the studies of Thathong (2002) who found that the acquisition of research knowledge for the pre-service teachers was an important constraint in their preparation. The classroom research course made pre-service teachers feel more confused, discouraged and worried rather than better prepared them for conducting a classroom research project. Ross (1987) and Smith and Sela (2005) also found a similar constraint as pre-service teachers had trouble in generating a research question, due to their shorter experience in teaching. Often, pre-service teachers found many problems in the classroom, so they did not know which problem they should select in conducting their classroom research project. Furthermore, Price (2001) mentioned that one of the greatest challenges the pre-service teachers encountered was finding time for work on classroom research project. The demands on pre-service teachers' time during the internship were great, but the time available was not optimal.

To overcome these obstacles in conducting their classroom research projects, the pre-service teachers preferred their cooperating teachers to supervise them about classroom research more frequently. The reason that the cooperating teachers did not supervise classroom research to pre-service teachers as much as the pre-service teachers expected may be that the teacher education institution did not clarify the exactly roles of cooperating teachers in supervising pre-service teachers during the internship period. This finding is supported the findings of Noomprasert (2005) and Roadrangka and Srisukwattanan (2002) in that the cooperating teachers did not understand their roles in supervising pre-service teachers and the intention of the pre-service teachers' field experience which lead to the unsuccessful of pre-service teachers' internship experience. Graham (2006) and Rodgers and Keil (2007) suggested that the cooperating teachers were a source of implicit, contextualized, expert and professional knowledge for the pre-service teachers. The process of selecting the cooperating teachers was important for training the pre-service teachers to be a qualified teacher in future.

From the research results, the researchers suggest future research to investigate how to promote the collaboratively work between cooperating teachers and pre-service teachers to reduce the pre-service teachers' anxiety when they struggle with the problems and would like to consult with the cooperating teachers. In

addition, cooperating teachers and pre-service teachers may conduct the classroom research project together through a collaborative classroom research process. The collaboratively work between cooperating teachers and pre-service teachers could be an effective way to share knowledge, materials and experiences which will lead the pre-service teachers to become the agents of change and enhance their professional growth.

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Appendix A

The Understanding of Classroom Research Questionnaire

Part 1: The demographics

1. Gender Male Female
2. Age 20-21 years 22-23 years More than 24 years
3. Your cumulative GPA before starting the internship course.....
4. Major field of the study

   Physics Chemistry Biology General science

Part 2: Understanding about classroom research

1. What is classroom research?

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2. How can you generate the research question?

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3. What are the purposes of reviewing literature?

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4. How can you review the literature?

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5. How can you collect the data for your classroom research project?

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6. How can you develop the research instruments?

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7. How can you analyze data for your classroom research project?

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8. How can you write the classroom research report?

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Appendix B

Interview Protocol

1. What are the problems that you encountered while you were conducting your classroom research project?
2. What are the supports that you need from your cooperating teachers to help you pursued your classroom research project?