

*The Development of Pre-Service Science Teachers' Teaching Practices through
Reflective Process*

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Abstract

The purposes of this descriptive research were to develop a criterion for evaluating pre-service science teachers' teaching practices and to study the effect of using criterion in supervision process through reflective process. The views of cooperating teachers and university supervisors on pre-service science teachers' teaching practices were collected by questionnaire. The data was analyzed and served as a basis for developing the standard criteria. In supervision process, five student teachers used the standard criterion as a self-assessment form to reflect and improve their practices in a post-observation session, and then provided feedbacks by cooperating teachers and university supervisors. The classroom observations and an interview protocol were used as research tools to gather the effect of reflective process.

The findings showed that three aspects of planning instruction, teaching, and learning environment included in the standard criterion. In aspect of planning instruction, there were six items including understanding about curriculum, content knowledge, teaching strategies/techniques, students learning, learning media and resources and assessment techniques. In aspect of teaching, there were six items including effective instruction, meaningful learning, appropriate assessment, effective communication, effective use of media, resources and technology and time management. The learning environment included care and respect to students, physical environment, motivated student learning, and classroom management. It also found that using reflective process could improve pre-service science teachers' teaching practices. They performed increasingly on effective instruction, effective use of media, resources and technology and appropriate assessments, whereas, effective communication and classroom management were still significant problems.

Keywords: preservice, science teachers, teaching practices, reflective process

INTRODUCTION

Teaching practice is a crucial aspect of teacher preparatory program in teacher preparation institution. It is the period when student teachers are aided to put the theories and principles of education which they have learnt in classroom into practice. Hence, Ministry of Education, who functioned the contribution a systematic developing and producing process for the teacher with proper qualification as well as standardization of advanced teaching profession through supervising and coordinating the teaching institutions to produce and develop the teacher, changed the policy of teacher preparation by revising the curriculum of teacher production from the 4 year-program to 5 year-program. (Office of the Higher Education Commission, 2004) In teacher's curriculum of 5 year-program, student teacher has to spend the time for course work study intensively for 4 years and teaching experience practice in the school for another year.

It has a significant role in assisting the pre-service teachers gain the expertise and confidence in their teaching. It is not enough simply to place a student teacher in a classroom setting; the supervision is a critical to the development of preservice teachers. Supervising or cooperating teachers are an essential component for developing preservice teachers' practice in schools. The supervising and cooperating teacher plays a significant role in the development of the student teachers' skills, knowledge, and attitudes (Karmos & Jacko, 1977; Lowther, 1968). Their role includes the dimensions of model, mentor, provider of feedback, and coach. However, the result of preservice science teacher seminar during field experiences address problems in teaching science effectively, such as planning lessons, organizing instruction, and selecting and using learning media and faced problems in supervising of cooperating teachers and university supervisors. (Office of Education Field Experiences, 2001; Roadrangka and Srisukvatananan, 2002)

One of the reasons attributed to the low quality in preservice science teachers' teaching practices was the supervising process that did not lead to fulfillment. For a number of years now, the practical element of pre-service teacher education has been taken in primary and secondary schools under the guidance of cooperating teachers in school, and supervisors in the university department of education. The role of cooperating teacher and supervisors is essentially one of supervising, helping and encouraging the work of the student teacher, and also giving an assessment of their abilities to teach during the practice. However, most of the assessment forms are grading on a four-five scale, simply 'satisfactory' or 'unsatisfactory' sometimes accompanied by a written report. Some of the difficulties inherent in assessment by grading were found. The teaching mark lacks validity, i.e. it does not assess what it purposes to assess, it reflects only a strictly limited number of teaching skills rather than the whole range of the student's teaching ability. Assessment by grading is not objectivity; grading depends on cooperating teacher and supervisors' experiences and views. The problem on disagreement between the cooperating teacher and the supervisor was found (Roadrangka and Srisukvatananan, 2002). The cooperating teacher and supervisor should together evaluate the student teacher on the basis of the appropriate standards. Therefore, it is necessary to design the assessment standard criteria to guide cooperating teacher and supervisors.

Additionally, the active supervision process should be required to make supervision process success. The reflective teaching process was the process that teacher learn and create knowledge by critically reflecting upon their own action and experiences. Student teachers are encouraged to provide opportunity and support for themselves and others for reflection on both the content and the learning process as well as to model reflective thinking on the strategies for learning as well as what they learned (Schon, 1987). However, there are no assessment standard criteria for preservice teacher that aligned with professional standards in Thailand. Hence, this research aimed to develop a criterion for evaluating pre-service science teachers' teaching practices based on cooperating teachers and university supervisors' views and to assess the efforts in using reflective process infused into the teaching practice of student teachers in a faculty of education in Thailand.

PURPOSES OF THE STUDY

The purposes of this study are to develop a criterion for evaluating pre-service science teachers' teaching practices and to study the effect of using criterion in supervision process through reflective process.

RESEARCH DESIGN

We employed descriptive research method to develop a criterion for evaluating pre-service science teachers' teaching practices based on cooperating teachers and university supervisors' views. The research procedure was divided into two phases.

Phase I: Development of a criterion to evaluate pre-service science teachers' teaching practices based on survey views of cooperating teachers and university supervisors in schools and science teacher preparing institutes in Thailand. The questionnaires about pre-service science teachers' teaching practices were distributed to ninety science cooperating teachers in forty five schools and thirty university supervisors in fifteen teacher preparing institutes in Thailand. The data then was analyzed and served as a basis for developing the standard criteria. The meeting was conducted with five experienced cooperating teachers and five university supervisors to modify the standard criterion.

Phase II: The implementation of a criterion to evaluate pre-service science teachers' teaching practices through reflective process. In supervision process, five student teachers used the standard criterion as a self-assessment form to reflect and improve their practices in a post-observation session, and then provided feedbacks by cooperating teachers and university supervisors.

PARTICIPANTS

During October, 2011, ninety science cooperating teachers in forty five schools and thirty university supervisors in fifteen teacher preparing institutes in Thailand were invited to response in a questionnaire items about their practices and views on evaluating pre-service science teachers' teaching practices. Forty-nine science cooperating teachers and supervisors agree to response. Then, five experienced cooperating teachers and five university supervisors were invited to participate in

focus group to modify the standard criterion based on cooperating teachers and university supervisors' views. During January-February, 2012, five student teachers and their cooperating teachers and university supervisor were invited to use the standard criterion as an assessment tool to reflect and improve student teachers' practices in a post-observation session.

DATA COLLECTION AND ANALYSIS

The development of the criterion for evaluating pre-service science teachers' teaching practices was based on the literature and then pilot survey. A review of the literature on preservice performance assessment /teacher candidate evaluation rubric (California Commission on Teacher Credentialing, 2009; The Commonwealth of Massachusetts Department of Education, 2011; Westfield State College, 2011; Wittenberg University, 2011) was conducted to be a guideline for developing questionnaire items. The survey were composed of 46 items used a rating scale for response. It measured on these things 1) how often cooperating teachers/ university supervisors' evaluating preservice science teachers' practices on three aspects of planning, teaching and environment, 2) which performance indicator items cooperating teachers/ university supervisors viewed as the key that should be included in the assessment criteria. In aspect of planning, 16 indicators of performance items under 5 criteria of understands curriculum (2 items), content knowledge (5 items), teaching strategies (3 items), student learning (3 items), and diverse learners (3 items) were included. In aspect of teaching, 22 indicators of performance items under 6 criteria of effective instruction (4 items), organizes meaningful learning (5 items), engages student learning (2 items), uses appropriate assessment (4 items), effective communication (5 items), uses appropriate and uses of media, resources, and technology (2 items) were stated. In aspect of environment, 8 indicators of performance items under 5 criteria of cares, respects and supports learning environment (2 items), manages physical environments effectively (4 items), and facilitates student engagement (2 items). Developed criteria and performance indicators, based on the literature, was pilot test on ninety science cooperating teachers in forty five schools and thirty university supervisors in fifteen teacher preparing institutes in Thailand in October, 2011. After eliminating surveys with incomplete responses, the data analyzed from this survey involved the perception of 49 experienced cooperating teachers and university supervisors were used as a guideline for revising the criteria. The meeting was conducted with five experienced cooperating teachers and five university supervisors to modify the standard criterion.

During the implementation phase, the modified criteria were used as a reflective tool for student teachers to improve their practices in supervision process. Supervision process included conducting classroom observations to observe the teaching and learning process. Five student teachers were asked to design and teach a lesson plan. Classroom observation by cooperating teachers and university supervisors were conducted to record what student teachers actually said and did during the instructional process. Cooperating teachers and university supervisors were asked to respond to statements on a four-point rubric scale. These statements were later used during a follow-up discussion with student teachers. In post-observation session, student teachers were encouraged to reflect on and self-analyze their own teaching and performance. Student teachers were asked to identify strength patterns in an

independent self-analysis of the observation data and briefly describe how they might develop appropriate strategies that lead to an improvement in the instructional process. Next, cooperating teachers and university supervisors provided feedback and guidance to improve instruction. The supervision process was conducted three times for each student teacher. To analyze the development of pre-service science teachers' teaching practices, the progression of rubric scales of the three times of classroom observation were categorized into four groups, including increase, decrease, stable and unstable.

RESULTS

Phase I: development of a criterion to evaluate pre-service science teachers' teaching practices

The following criteria and indicators of performances were developed based on the consideration, but not follow completely, on the result of survey views of cooperating teachers in schools and university supervisors and focus group interview with five experienced cooperating teachers and five university supervisors. The three aspects of planning instruction, teaching, and learning environment were included in the standard criterion. In aspect of planning instruction, there were six criteria including understanding about curriculum, content knowledge, teaching strategies/techniques, students learning, learning media and resources and assessment techniques. Moreover, the indicators of performances that describe what pre-services science teacher should demonstrate in each criteria are informed as following:

Table I: Criteria and Indicators of Performance in aspect of planning

criteria	Indicators of performances
1.Understands the curriculum	<ul style="list-style-type: none"> - Plans lesson goals that are clear, relate to academic content standards and content to be taught - Plans lesson goals that cover three domains that can be observed and measured - Plans lesson that aligns goals, content, activities, and evaluation
1.Understands content knowledge	<ul style="list-style-type: none"> - Plans lesson demonstrate central concepts, skills, and basic vocabulary that related to lesson goals and content standard - Plans lesson that are accurate in content and clearly represent subject matter content - Understands about nature of science and plan lesson that provide opportunities for students to use process of investigation in science - Understands and connects content to be taught to everyday lives
1.Understands teaching strategies/techniques	<ul style="list-style-type: none"> - Selects teaching methods, activities and materials appropriate for students and content - Plans lesson method emphasizing student-centered and knowledge construction
1.Understands student learning	<ul style="list-style-type: none"> - Plans lesson that recognize the interests, abilities, needs, prior knowledge and experiences of group and individual students - Plans lesson that varied use of differentiated instruction techniques to

criteria	Indicators of performances
	meet student differences - Plans lesson that provide learning opportunity to select learning activity based on individual and group interests
1. Prepare media, materials and resources	- Selects appropriate media, materials that are aligned with subject matter, learning activities and student abilities - Plans lesson using appropriate and multiple resources - Selects media, materials and resources relevant to local
1. Understands assessment methods	- Plans lesson using assessment methods that are relate to three domains, including knowledge, process, and attitude - Uses several and practical assessment methods - Uses authentic assessment method that appropriate to what they want to assess - Uses assessment method based on individual difference

Aspect II: Teaching

In aspect of teaching, there were six criteria including effective instruction, meaningful learning, appropriate assessment, effective communication, and effective use of media, resources and technology and time management. Moreover, the indicators of performances that describe what pre-services science teacher should demonstrate in each criteria are informed as following:

Table II: Criteria and Indicators of Performance in aspect of teaching

criteria	indicators of performances
1. Delivers Effective instruction	<p>Introduction</p> <ul style="list-style-type: none"> - Encourages student interest that relate to content and not explain key words to be taught - Elicits student prior knowledge/basic concept that align with subject matter being taught and then stimulates classroom discussion - Asks question that connect student prior knowledge/interest to learning activities <p>Teaching</p> <ul style="list-style-type: none"> - Makes connection between student prior knowledge/ interest and learning activity - Asks questions to discuss clearly on purpose, procedure, materials, data to be recorded - Engages students to do hands-on activities usin process of

criteria	indicators of performances
	investigation in science - Asks question to stimulate thinking and participating in classroom discussion to conclude key concept Conclusion - Provides opportunities for students to construct knowledge by themselves - Uses questioning or other assessment techniques to assess student learning
2. organizes meaningful learning	- Uses varied activities and materials that meet the learning of all students - Provides opportunities for students to practice and apply learning to promote understanding in deeper and real-life contexts - Teacher effectively combine independent, cooperative, and whole class organization strategies to maximize student understanding and learning
3. Use appropriate assessment	- Monitors student understanding during instruction and makes adjustments to the lesson to promote learning - Uses several kinds of assessment methods to assess knowledge, skills and attitude during instruction - Provides feedback immediately for informing and/or redirecting student learning
4. effective communication	- Displays effective use of voice - Displays clear and meaningful language and appropriate to student age - Displays correct use of oral and written language including correct use of vocabulary related to content being taught - Listens to student answers both correct and incorrect and then stimulates discussion - Displays appropriate waiting time
5. appropriate and effective use of media, resources, and technology	- Selects and uses several and creative media, materials, and technology to support student learning - Uses accurate media, materials and technology
6. time management	- Uses appropriate time with content and learning activities - Uses instructional time productively and effectively

Aspect III: learning environment

The learning environment included care and respect to students, physical environment, motivates student learning, and classroom management. Moreover, the indicators of performances that describe what pre-services science teacher should demonstrate in each criteria are informed as following:

Table III: Criteria and Indicators of Performance in aspect of learning environment

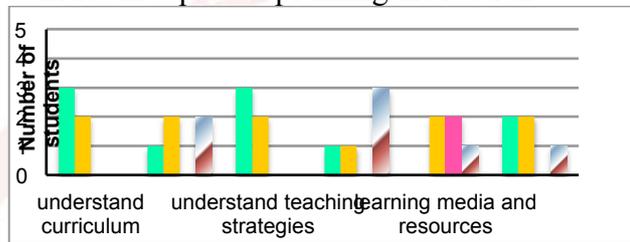
criteria	Performance indicators
1. caring, respectful and supportive learning environment	<ul style="list-style-type: none"> - Uses speech and body language with respect and care and honors their differences - Creates a climate that promotes fairness and positive social interaction - Creates safety climate in sharing ideas and not ignore or reject student incorrect answers
2. Manages physical environments effectively	<ul style="list-style-type: none"> - organizes physical environments to support instructional activities - manage clean, lighten, and quiet classroom environment - Takes care classroom environment, provide appropriate media and materials accessible to all student
3. motivates student engagement	<ul style="list-style-type: none"> - engages student learning in group and individual - engages student social interaction to construct knowledge - uses appropriate positive and negative supports to promote student learning
4. Uses classroom management techniques	<ul style="list-style-type: none"> - uses a variety of classroom management techniques - shows instant problem solving

Phase II: The implementation of a criterion to evaluate pre-service science teachers' teaching practices through reflective process

The cooperating teachers and supervisors responded to various statements on a four-point rubric scale. These statements were combined into three aspects, including planning instruction, teaching, and learning environment. For each aspect, we separately reported the development of pre-service science teachers' teaching practices of their cooperating teachers and university supervisors' views (See picture 1-3). However, the correlations between cooperating teachers' perceptions of student teachers' teaching practices were comparable to supervisors' perceptions.

As a result of the study, reflective process stimulated majority of the student teachers to be greatly developed in teaching practices in two aspects of planning instruction and instruction. However, the abilities in organizing learning environment were stable.

Picture 1: University supervisors and cooperating teachers' views on student teachers' abilities in aspect of planning instruction

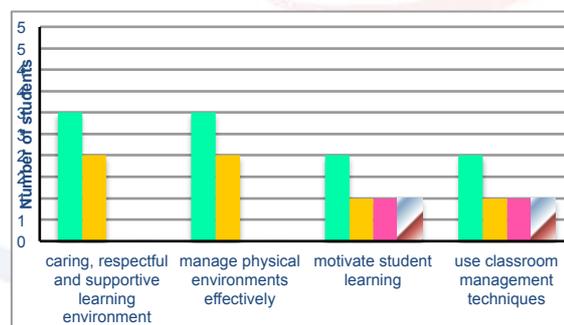


University supervisors' views

Cooperating teachers' views

In the first aspect on planning instruction, six criteria including understanding about curriculum, content knowledge, teaching strategies/techniques, students learning, learning media and resources and assessment techniques were evaluated (See picture 1). The perceived teaching practice level of the student teachers rated by university supervisors and cooperating teachers in were equivalent. They viewed that student teachers' abilities in planning instruction were increased. The university supervisors viewed that equal number of student teachers developed abilities in planning instruction in five criteria including understanding about curriculum, content knowledge, teaching strategies/techniques, learning media and resources and assessment techniques. It was also noticed that most of student teachers showed their abilities in understanding about curriculum and teaching strategies/techniques in stable level and showed unstable level in criteria about understanding about learning. Moreover, the cooperating teachers viewed that the majority of student teachers developed abilities in planning instruction in two criteria including understanding about student learning and learning media instruction.

Picture 2: University supervisors and cooperating teachers' views on student teachers' abilities in aspect of instruction



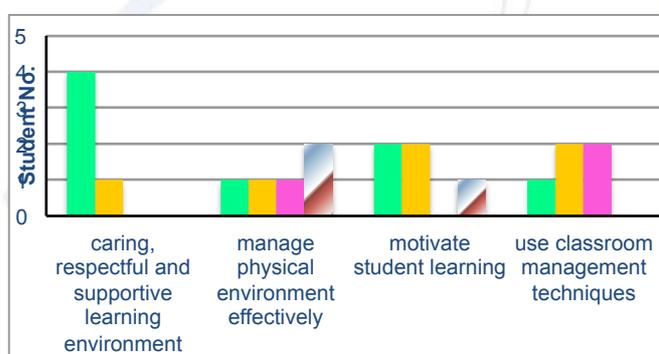
University supervisors' views

Cooperating teachers' views

In the aspect of teaching, six criteria including effective instruction, meaningful learning, appropriate assessment, effective communication, and effective use of media, resources and technology, and time management were evaluated (See picture

2). The perceived teaching practice level of the student teachers rated by university supervisors and cooperating teachers in were equivalent. They viewed that student teachers' abilities in teaching were placed in increase level. The university supervisors viewed that the majority of student teachers developed abilities in teaching in two criteria including use appropriate assessment techniques and effective use of media, resources and technology. It was also noticed that most of student teachers showed their abilities in organizing meaningful learning in unstable level. Similarly, the cooperating teachers viewed that the majority of student teachers developed abilities in teaching in criteria of use appropriate assessment techniques.

Picture 3: University supervisors and cooperating teachers' views on student teachers' abilities in aspect of learning environment



University supervisors' views

Cooperating teachers' views

In the aspect of learning environment, four criteria, including care and respect to students, physical environment, motivates student learning and classroom management were evaluated (See picture 3). The perceived teaching practice level of the student teachers rated by university supervisors and cooperating teachers in were equivalent. They viewed that student teachers' abilities in organizing learning environment were placed in stable level. The university supervisors viewed that equal number of student teachers developed abilities in this aspect in two criteria including care and respect to students and manage physical environment. The remained number of student teachers showed their abilities in increase level. However, the cooperating teachers viewed differently that the majority of student teachers developed abilities in managing learning environment in two criteria including motivates student learning, and use classroom management techniques.

DISCUSSION OF FINDING

The present study aimed to develop a criterion for evaluating pre-service science teachers' teaching practices and to assess the efforts in using reflective process infused into the teaching practice of student teachers in a faculty of education in Thailand. The finding of the study revealed that reflective process stimulated majority of the student teachers to be greatly developed in teaching practices in two aspects of planning instruction and instruction. In aspects of planning instruction,

understanding about curriculum and understanding about teaching strategies were mostly developed because in 5 year teacher preparation program, student teacher has to spend the time for course work study intensively for 4 years and teaching experience practice in the school for another year. During 4 years for course work, student teachers had experiences in writing lesson plans and microteaching with their peer in many method courses. However, it was found that student teachers were struggled in understanding about content knowledge when they planed lessons which content did not related to their major field. In aspect of teaching, the abilities of student teachers on the use effective instruction, effective use of media, resources, and technology and use appropriate assessment techniques was highly developed because the reflective process provided opportunities for them to assess taught lessons, determine their strengths and flaws, thereby taking positive action in subsequent lessons. However, the ability in using effective communication was still the problems. Some student teachers should ask more probing questions. Moreover, the ability in using classroom management techniques also should be developed.

RECOMMENDATION

A number of recommendations are derived from the findings of this study. The first concern of the study was the supervision process that normally included only conducting classroom observations to observe the teaching and learning process by cooperating teachers and university supervisors. It would be recommended that the reviewing artifacts of teaching and monitoring evidence of student learning should be included in reflective supervision process. Moreover, the reflective supervision process should involve continuous self observation and evaluation of student teachers to understand individual actions and reactions of learners. Another concern of the study was the comparisons between cooperating teachers and supervisors' perceptions of student teachers' teaching practices. The findings were that, the perceived teaching practice level of the student teachers rated by cooperating teachers was higher than university supervisors. It might be the reason that the university supervisors normally viewed as very knowledgeable regarding content and methods. However, cooperating teachers appears to provide high scores for student teachers because they ensured whether student teacher practices into their classroom related to what they have learned at the university.

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REFERENCES

California Commission on Teacher Credentialing. 2009. *California Teaching Performance Assessment Candidate Handbook*. California. Retrieved September 9, 2011, from www.ctc.ca.gov/educator-prep/TPA-files/CandidateHandbook.pdf

Office of Education Field Experiences. (2001). *The Report of Problems during Field experiences of Preservice Teachers, Faculty of Education, Kasetsart University from academic year 1996-2001*. Faculty of Education, Kasetsart University.

Office of the Higher Education Commission. (2004). *Handbook for Teacher Education Program in Basic Education (5 year program)*, Bangkok.

Karmos, A., and Jacko, C. (1977). The role of significant others during the student teaching experience. *Research in Teacher Education*, 28, 51-55.

Lowther, M. (1968). Most and least helpful activities of supervising teachers. *The Clearing House*, 40, 4043.

Roadrangka, V. and Srisukvatananan, P. (2002). Problems in field experiences of preservice teacher, Faculty of Education, Kasetsart University. *Kasetsart Journal (Social Science)*, 23, 104-117.

Schon, D.A. (1987). *Educating the Reflective Practitioner*. San Francisco, C.A. Jossey Bass.

The Commonwealth of Massachusetts Department of Education. 2011. *Preservice Performance Assessment for Practicum or Practicum Equivalent*. Retrieved September 9, 2011, from www.doe.mass.edu/edprep/ppa_form.doc

Westfield State College . 2011. *Candidate Evidence Sheet for Preservice Performance Assessment Form*. Retrieved September 7, 2011, from www.wsc.ma.edu/TEC/CandEvidenceSheet1.pdf

Wittenberg University. 2011. *Student Teaching Evaluation Rubric*. Retrieved September 9, 2011, from [www4.wittenberg.edu/academics/.../student_teaching/ST%20Rubric\[3\].pdf](http://www4.wittenberg.edu/academics/.../student_teaching/ST%20Rubric[3].pdf)

