

Nantarat Puengpang 2007: Teaching and Learning in a Laboratory in Biology Course of First-Year Pre-Service Science Teachers in Accordance with the National Education Act, 1999. Doctor of Philosophy (Science Education), Major Field: Science Education, Department of Education. Thesis Advisor: Professor Vantipa Roadrangka, Ph.D., Ed. D. 336 pages.

This study aimed to investigate how instructors taught and how first-year pre-service science teachers learned in a Laboratory in Biology course during the implementation of an instructional set consistent with the educational guideline in the National Education Act (NEA), 1999. This study had two phases: an Exploratory Phase and a Development and Implementation of the Instructional Set Phase. In the exploratory phase, first-year pre-service science teachers learning outcomes from the regular course were assessed by a Biology Concept and Science Process Skill Questionnaire, a Views on the Nature of Science Questionnaire, and an Attitudes towards Biology Inventory in the first semester of 2004 academic year. The results from this phase, the guidelines for a learner-centred approach from the NEA, and a literature review of laboratory teaching, learning and assessment were utilized to generate guiding principles for the development of the instructional set based on social constructivism. The teaching and learning activities in the set emphasized learners' expression of prior ideas, sharing and reflection of ideas and development of understandings, skills and attitudes through laboratory activities, and collaborative group work. Some formative assessment strategies were included to help the pre-service science teachers achieve the learning outcomes and provide information for instructors about the impact of the teaching. The instructional set was implemented in a public university in Bangkok with 29 first-year pre-service science teachers in the second semester of 2005 academic year. Two experienced biology instructors participated in the implementation. The first instructor implemented the instructional set in the first two weeks and the second instructor continued the implementation from the third week to the end of the semester. During the implementation multiple data gathering methods were used including classroom observation, instructor and student interviews, and document analysis. A meeting of the instructor and researcher was held each week to provide feedback to the instructors so they could adjust the activities over the course of the implementation. After learning through the instructional set, the pre-service science teachers were asked to complete the questionnaires and inventory employed in the first phase.

The results revealed that at the beginning of the implementation both instructors hesitated to follow the teaching and learning activities in the instructional set. They modified the teaching and learning activities according to their beliefs about teaching. They gave a brief lecture about the fundamental concepts in the laboratory activities then observed how the pre-service science teachers conducted the laboratory activities and provided assistance and guidance. Formative assessment and the researcher providing information about student learning helped them shift their teaching practice towards a more learner-centred approach. The second instructor gained more confidence in the instructional set after she found that the pre-service science teachers had done well in the midterm examination. After this she followed most of the activities in the instructional set and conducted whole class discussions and student presentations. The findings show that the instructional set helped the pre-service science teachers develop their biological understandings and science process skills through the use of hands-on and minds-on activities, reflection on their learning and social interaction. Nearly all of the pre-service science teachers had appropriate understandings in the nature of science and had positive attitudes towards biology at the end of the implementation.

The findings of this study indicate on an instructional set based on social constructivism that incorporates formative assessment can be effective in assisting instructors to adopt a more learner-centred teaching approach. However, instructors need to be assured that a new teaching approach will not lower achievement relative to their regular approach. In addition, the study indicates that pre-service science teachers benefit from opportunities to share, reflect on and construct ideas.

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