

Pojchana Magrood-In 2008: A Professional Development Program for Lower Secondary Science Teachers' Development of Pedagogical Content Knowledge in Genetics. Doctor of Philosophy (Science Education), Major Field: Science Education, Department of Education. Thesis Advisor: Assistant Professor Naruemon Yutakom, Ph.D. 298 pages.

The objectives of this research were: 1) to explore lower secondary science teachers' current practices, problems, and needs for teaching and learning in genetics, 2) to design a professional development program that served to guide the development of a professional learning experience for developing a teacher's genetics content knowledge (CK) and pedagogical content knowledge (PCK), and 3) to study the development of three Thai lower secondary teachers' genetics CK and PCK over the course of a professional development experiences.

The participants of this study were three lower secondary science teachers who participated in the PCK-based professional development program in the second semester of the 2006 academic year. The contents and activities in the program, emphasizing on 5E inquiry and reflective approaches, were included a five-day workshop, two seminars, and following-up in teachers' classrooms. To understand their development of teachers' CK and PCK, the grounded theory was guided for collection and analysis. An interpretive case study design guided the collection of qualitative data with a questionnaire, semi-structured interviews, concept interviews, teacher and researcher-generated narrative cases, researchers' field notes, teachers' journals, and lesson planning documents. Constant comparative analysis was used for analyzing those data and generated a theory of how lower secondary science teachers develop their CK and PCK in genetics.

The findings indicate that three teachers gained an understanding of many genetic concepts and their relationships and possessed few misconceptions about genetics following the professional development experience. They understood the strengths and weaknesses of representations and activities and also applied their understandings in practice. In addition, they planned and improved their lesson plans and teaching based on the 5E inquiry that relied on a student-centered orientation. Furthermore, they increased their knowledge of curriculum for organizing the genetic content in their lessons. However, two of the three teachers gradually developed their CK and PCK better than the other teacher. Many factors was influencing on their CK and PCK development. First, the activities regarding the development of genetic content knowledge and knowledge of representations and activities in the PCK-based PD program had a potential to help in-service science teachers develop their CK and PCK for teaching genetics. Especially, with hands-on 5E inquiry activities, discussing genetic concepts, examining the strengths and weaknesses of representations and activities, case discussions, reflection on knowledge on teaching, and collaboration with the research team gave them a better understanding of genetic concepts and their teaching. Second, teachers' knowledge of students' backgrounds, conceptions, and learning styles, impacted on planning and practicing in teachers' classrooms. Third, their personal characteristics, beliefs, and teaching experiences effected teachers' development of CK and PCK in genetics. As a result, the PCK-based PD program will be an effective professional development program for developing science teachers' PCK for developers, schools, IPST, pre-service science teacher education and researchers in the future.

Pojchana Magrood-In
Student's signature

Naruemon Yutakom
Thesis Advisor's signature

20 / 05 / 08