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Investigating the Nature and Development of Pre-Service Chemistry  
Teachers' Content Knowledge, Pedagogical Knowledge and Pedagogical  
Content Knowledge

探究職前化學教師學科知識、教學知識、與學科教學知識的本質與發展

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Abstract

This study investigated the nature and development of content knowledge, pedagogical knowledge and pedagogical content knowledge of three pre-service chemistry teachers during one year of practicum course. Views toward pedagogical content knowledge in studies by Shulman (1986), Cochran et al. (1993), Lederman, et al. (1994), and Reynolds (1992) were applied as a research framework for this investigation. Qualitative data collection included semi-structured interviews before and after each teaching experience, classroom observation and assignment collection. Interviews addressed the subjects' views on chemistry and the topics they taught, their methods of transmitting content knowledge to students and their views on general pedagogy. After taking one year of practicum course, pre-service chemistry teachers' views on chemistry became simpler and broader than before. On the other hand, their knowledge of pedagogy became more complicated, focusing more on students' characteristics and learning styles than before. Most of their pedagogical content knowledge included terminological explanations and usage of analogies. Toward the end of the study, the pre-service chemistry teachers started to link content and pedagogical knowledge in their concept of science teaching. Factors influencing these pre-service chemistry teachers' content knowledge, pedagogical knowledge and pedagogical content knowledge development were their reflection and action ability, real teaching experience and their preferences toward content, pedagogy and pedagogical content knowledge. Suggestions for future science teacher education are addressed in this study.

Key words : Science teacher education; Pedagogical content knowledge;  
Content knowledge; Pedagogical knowledge; Professional development

## 中文摘要

本研究旨在探求三位職前化學教師在大四一年實習課期間，其學科知識、教學知識與學科教學知識之本質與發展。Shulman(1986)，Cochran, et al(1993)，Lederman, et al(1994)與 Reynolds(1992)等學者，對學科教學知識的看法將作為本研究的理論架構。本研究藉每次教學前後對個案進行的半結構晤談、課室觀察，個案所撰寫之教案與個案及學生之相關作業等途徑從事資料收集。晤談的重點包括個案對化學和其所教授單元的觀點、如何將學科知識傳達給學生以及對一般教學知識的看法。研究結果顯示在一年的研究期間，個案教師對於化學領域內涵的描述越趨精簡，但是對於思考化學與其它學科領域的聯結度增加。教學知識較一年前複雜，且著重在學生的特質和學習特色。至於個案的學科教學知識則包含了名詞釋義和類比的引用。在研究的後期，個案教師已能將學科知識與教學知識二者納入其教學考量之中。職前化學教師學科知識、教學知識與學科教學知識發展之因素，包括教師本身的反省和實踐能力，實際的課室教學經驗，和教師本身對學科、教學與學科教學知識的偏好等。有關對科教師資培育之建議在本文中亦有論述。