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Understanding Biology Teachers'Pedagogical Content Knowledge for Teaching "The Nature of Organism"

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Abstract

Effective and experienced teachers have the capacity to transform and enact subject matter into forms that can be understood by students. The capacity to transform depends on the blending of content and pedagogy and it is conceptualised as pedagogical content knowledge (PCK). The purpose of this study is to investigate the understandings and practices that comprise a biology teacher's PCK. In this research, the research participant demonstrated her PCK through writing a content representation (CoRe), teaching in the classroom, and discussion during the interview. The researcher determined the extent and nature of her PCK in relation to the Magnusson et al (1999). The findings expose the teacher's understanding and practice of PCK supported teaching and learning science based on constructivism. The teacher had strong, clearly articulated views on the NOS which she implemented all components of PCK confidently into her teaching.

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Keywords: Pedagogical Content Knowledge (PCK), Content Representations (Cores), Biology Teachers, Experience Teachers;

1. Introduction

The Thai National Education Act B.E. 2542 seeks to improve the quality and relevance of education throughout the Thai education system (ONEC, 1999). The Act focuses on a teaching and learning reform through an implementation of a student-centered approach as a new method of teaching and learning. The success of educational reform depends on the quality of

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teachers and their cooperation (Jurawatanaton, 2003). The role of the teacher as facilitator and the learner-centered approach, based on constructivist-based teaching and learning perspectives, will contribute to the success of learning reform in Thailand (OEC, 2004). The National Science Education Reform advocates that science teachers should engage students in doing and thinking about inquiry, and renew emphasis on teaching about the nature of science (Institute for Promotion of Teaching Science and Technology [IPST], 2002b). Some science teachers attempt to acquire knowledge for teaching, that is pedagogical content knowledge [PCK], because this knowledge helps them to create constructivist classrooms and provides the opportunity for their students to learn science through an inquiry approach. PCK has been described as the hallmark of teaching and PCK has become a central focus in learning how to teach particular subjects. It shows that teacher is the expert teacher and the professional teacher.

Exploring PCK to learn about teaching

Pedagogical content knowledge (PCK) was originally introduced by Shulman (1987) to enclose a category of teachers' professional knowledge determined to each individual teacher. Shulman (1987) originally defined PCK as " the blending of content and pedagogy into an understanding of how particular topics, problems, or issues are organized, represented, and adapted to the diverse interests and abilities of learning, and presented for instruction" (p.8) and "the particular form of content knowledge that embodies the aspects most germane to its teachability" (p.9).

PCK also is "...knowledge of the transformation of several types of knowledge for teaching (including subject matter knowledge), and that as such it represents a unique domain of teacher knowledge" (Magnusson, Krajcik and Borko, 1999: 95). In addition, PCK is a unique knowledge processed only by individuals within the profession of teaching, and consequently the concept of PCK is useful to help teachers' understandings what teachers know, what teachers ought to know, and how they might develop it (Baxter and Lederman, 1999; Park, 2005).

Geddis (1993) argued that science teachers with well developed PCK are effective teachers because they realize the importance of students of understanding science concepts and were able to utilise a range of effective and appropriate teaching methods and instruction strategies to develop students' science concepts.

Magnuuson et al. (1999) conceutualized pedagogical content knowledge for science teaching as consisting of five components :

- orientations towards science teaching (since teacher's knowledge and beliefs related to their teaching goals and approaches will influence their classroom practice)
- knowledge of curriculum
- knowledge of assessment (since what is to be assessed, how and why, also influences a teacher's practice)
- knowledge of students' understanding of science
- knowledge of instructional strategies

Loughran et al. (2006) try to construct explicit correlation that is available between the knowledge of content, teaching and learning for science teacher. Content Representation (CoRe) as originally devised, represent conceptualizations of the collective PCK of expert teachers

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