Notice of the Final Oral Examination
for the Degree of Doctor of Philosophy
of
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MEd (Yildiz Technical University, 2006)
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“How Does a Grade 8 Science Teacher Learn to Teach Quantum Mechanics: An Exploratory Case Study”

Department of Curriculum and Instruction

Thursday, September 14th, 2017
10:30 a.m.
Clearihue Building
Room B021

Supervisory Committee:
Dr. Kathy Sanford, Department of Curriculum and Instruction, University of Victoria (Supervisor)
Dr. Todd Milford, Department of Curriculum and Instruction, UVic (Co-Supervisor)
Dr. Tim Hopper, School of Exercise Science, Physical and Health Education, UVic (Outside Member)

External Examiner:
Dr. Richard Hechter, Department of Curriculum, Teaching and Learning, University of Manitoba

Chair of Oral Examination:
Dr. Karen Courtney, School of Health Information Science, UVic

Dr. David Capson, Dean, Faculty of Graduate Studies
Abstract

In 2016 the Ministry of Education in British Columbia (BC), Canada introduced the topics of quantum mechanics (QM) into the Grade 8 science curriculum. Science teachers with or without QM background are expected to learn and teach QM. Stemming from a constructivist theoretical framework, this in-depth exploratory case study explores the processes of learning and teaching the topics of QM by asking: “How does a Grade 8 science teacher learn to teach QM?” The purpose was to understand the teacher’s QM learning process, the development of pedagogical content knowledge (PCK) in QM and teacher's views of the nature of science (NOS). The data was collected through multiple sources and analyzed by using thematic analysis. The themes were identified under five main categories: 1) the development of PCK in QM is complex, 2) the student-centered approach mandated in the redesigned curriculum is contradictory to the nature of PCK in QM, 3) the nature of learning QM is not different than learning other subjects, 4) middle school science education is inconsistent with the current level of scientific knowledge, and 5) the development of informed views of NOS requires an accumulation and synthesis of prior knowledge in history and philosophy of science (HPS). The study proposes two previously unexplored integral aspects of PCK framework, since: the ‘allotted time’ in learning and teaching a subject and ‘pre-PCK’ changes the nature of PCK development. The term pre-PCK was coined referring to the specific content oriented and student-centered activities that take place before the class with the goal of establishing an effective basis for the PCK development. The insights emerging from the study would be of interest to other Grade 8 science teachers in BC, pre-service teacher program coordinators at the universities, and the Ministry of Education in BC to provide institutional support. This study would contribute to closing the knowledge and communication gaps between the fields of science, science education practice and science education research.