

Chapter 93

An Exploratory Analysis of TPACK Perceptions of Pre- Service Science Teachers: A Regional Australian Perspective

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ABSTRACT

Four distinct constructs were identified from a survey of a sample of pre-service science teachers at a regional Australian University. The constructs emerged after employing Exploratory Factor Analysis (EFA) on respondents' perceptions of pedagogical practices incorporating the use of Information Communication and Technology (ICT). The key components of the survey were derived from a Technological Pedagogical and Content Knowledge (TPACK) survey developed for a national project. For future investigations of TPACK application in university contexts, a four-construct configuration of pre-service teacher TPACK perceptions is proposed requiring empirical confirmation. This inquiry depicts a portrait of emerging domains of TPACK. The relevance of the findings and their implications for universities that rely heavily on ICT in the delivery of are discussed, especially in relation to improving teaching practices.

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INTRODUCTION

Research findings reported in this study were based on data collected in 2011 in a regional Australian university which had 20,119 students enrolled. Of these students, there were approximately 20% enrolled to study on-campus and 80% off-campus (online or by distance). Students who chose to study on-campus resided in or nearby a regional centre in New South Wales, and attended lectures, workshops and tutorials in a face-to-face setting. All students received their study materials through a Learning Management System (LMS). When studying in off-campus mode, study materials were in the form of html pages, downloadable PDF documents, podcasts, videos, discussion boards, chat rooms, blogs, wikis and a variety of other interactive materials. Students in on-campus mode benefited from access to the LMS (just like their off-campus counterparts) as well as face-to-face teaching with their lecturers. During the period when the research was undertaken, the School of Education (SoE) of the regional university had just over 4,000 students enrolled with a larger percentage enrolled in off-campus mode than the university average. This paper focuses on a sample of off-campus students enrolled in pre-service education under the sciences discipline.

LITERATURE REVIEW: TPACK IN AN AUSTRALIAN CONTEXT

This inquiry uses the TPACK framework as a lens to examine pre-service teachers' knowledge of the technology, pedagogy and content interface. This exploratory analysis provides insights into how respondents make sense of TPACK as a result of the learning environments of courses, workshops, and other pre-service experiences. This paper provides an emerging portrait of TPACK perceptions of pre-service teachers in the subject domain of science. This becomes especially illuminating as it is situated within this regional university that is known as a leader in the provision of online courses and education.

What Is TPACK?

Technological Pedagogical and Content Knowledge, or the TPACK framework, is an emerging research area that has shown increased scholarly attention. Koehler and Mishra (2006) originally theorized TPACK illustrating seven domains of knowledge constituting the knowledge base that teachers need in order to teach effectively with technology. TPACK is based on Shulman's (1986) Pedagogical Content Knowledge (PCK) who contended that effective teachers possess a distinctive knowledge, the pedagogical content knowledge (PCK), enabling them to use pedagogy appropriately for effective learning and teaching in a particular discipline. Koehler and Mishra (2005) proposed that TPACK recognise interactions between technological pedagogical knowledge (TPK), technological content knowledge (TCK), pedagogical content knowledge (PCK), and technological pedagogical content knowledge (TPCK) (Koehler & Mishra, 2005).

Research on TPACK has steadily increased (Wu, 2013). Empirical research has traditionally been focused on pre-service educators and how they perceive TPACK. This inquiry engages with the ongoing area of research focused on pre-service educators. Koh, Chai and Tsai (2010) derived five constructs, namely Technological Knowledge, Content Knowledge, Knowledge of Pedagogy, Knowledge of Teaching with Technology and Knowledge from Critical Reflection while carefully analysing pre-service teachers' perceptions of technology and pedagogy interaction in Singapore. Angeli and Valanides (2009) extended the analyses by proposing the notion of Information Communication Technology-Technological Peda-

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