



# Peer modeling and innovation adoption among teachers in online professional development



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## ARTICLE INFO

### Article history:

Received 25 July 2013

Received in revised form

12 December 2013

Accepted 17 December 2013

### Keywords:

Online learning

Teacher professional development

Adoption of innovation

Collaborative learning

## ABSTRACT

This paper draws on three years of data from an online course on educational technology for practicing teachers, in which a goal was for teachers to develop a web-based application they could use in their own teaching. Based on analyses of discussion forums and teachers' course projects, we found that iterations of the course evolved over the years from being a loose association of peers involved in vastly different development projects with different tools, to a community of designers involved in a common endeavor, as more and more students chose the same open-source learning management system for their course projects. We tracked what factors seemed to affect how many and which teachers chose which development technologies, and how the process of making these choices evolved with the increased role of designed and emergent forms of peer modeling. We situate these findings in the literature on teacher professional development and technology use, arguing that existing conversations need to attend to the important role that peers play in teachers' learning and innovation adoption, particularly in online learning environments.

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## 1. Introduction

Many efforts over the past two decades at both the U.S. federal, state, and private levels have focused on leveraging technology toward K-12 learning goals and ensuring that teachers have the necessary skills to implement them (e.g., [ISTE, 2000](#); [Norris & Soloway, 2013](#); [PCAST, 1997](#); [Poses, 2002](#)). General technology skills alone, however, are not sufficient to ensure integration and persistence, as studies suggest that even teachers who are savvy computer users in personal contexts and in their preparation for teaching may be reluctant to innovate with technology in the classroom ([Barron, Kemker, Harnes, & Kalaydjian, 2003](#); [Cuban, 2001](#); [McGrail, 2006](#); [Windshitl & Sahl, 2002](#)). Research reveals that teachers need educational opportunities and communities that not only teach about, but also directly model and scaffold, pedagogically sound technology use ([Clift, Mullen, Levin, & Larson, 2001](#); [Dede, 2006](#); [Moursound & Bielfeldt, 1999](#)).

Online programs in particular have demonstrated great potential for flexibility and adaptation to teachers' schedules, as well as giving teachers direct experiences as students learning with a variety of technologies ([Dede, 2006](#); [Dede, Ketelhut, Whitehouse, Breit, & McCloskey, 2009](#)). Yet studies suggest that technologies introduced in professional development, online or otherwise, are often not fully adopted by teachers or can be slow to take hold in the classroom ([Barron et al., 2003](#); [Cuban, 2001](#); [McGrail, 2006](#); [Windshitl & Sahl, 2002](#); [Zhao, Pugh, Sheldon, & Byers, 2002](#)). In our own professional development work with teachers online, we encountered a situation in which teachers' exponential uptake of a particular innovation seemed to run counter to this widespread finding, and we wanted to systematically analyze how and why this took place.

This study examined three years of data from three cohorts of an online four-week professional development course, in which the goal was for teachers to become not only savvy users of educational technology but also producers of their own web-based tools for student learning. Our objective for analysis was to discover what factors led to a five-fold increase over three years of the course in the proportion of teachers within cohorts who chose to innovate by developing web-based curriculum projects with a novel open-source learning management system, rather than developing applications via familiar technologies such as blogs or website authoring tools. Our findings speak

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to existing research on teacher innovation with technology and the important role of peers in the process of teacher change, and they imply some design suggestions for facilitating peer modeling in online environments for teacher professional development.

## 2. Theoretical framework and literature review

This section outlines the theories of learning and teacher knowledge in which our work is grounded and provides a literature review of relevant research in the areas of technology integration, teacher beliefs about teaching with technology, and teacher community.

### 2.1. Theories of learning and teacher knowledge

Our approach to research and working with teachers is motivated and informed by constructionist and social constructivist theories, which argue that people learn most optimally while creating purposeful artifacts with a real audience (Harel & Papert, 1991; Kafai & Resnick, 1996), and that knowledge is created in communities of practice and discourse (John-Steiner & Mahn, 1996; Vygotsky, 1978; Wenger, 1998). As Brown and Duguid articulate, “Social groups provide the resources for their members to learn,” (2000, p. 137). As such, our approach to professional development is grounded in the idea that teachers need to work together online in an interactive and collaborative learning environment. Peer collaboration is critical to creating a community of practice within the course that can carry over into teachers’ professional lives (Schlager, Fusco, & Schank, 2002). Creating a learning culture of collaborative inquiry among teachers has also been put forth as essential to long-term success for professional development (Nelson, Slavit, Perkins, & Hathorn, 2008).

Yet, while important, a true sense of community inquiry is difficult to cultivate. Seifert and Mandzuk (2006) argue that the tendency for teacher education cohorts to function more as support groups than intellectual communities results in a failure to realize the potential for cohorts’ social construction of knowledge content. For professional practice, this knowledge construction is critical. As such, our work is also grounded in the theory of Technological Pedagogical Content Knowledge (Mishra & Koehler, 2006), which describes the kinds of interrelated knowledge that teachers need to innovate and teach successfully with technology. TPCK includes: knowledge about technology itself, knowledge about what technologies may have affordances for particular subject-matter content, knowledge about how technology can impact teaching and student–teacher interactions, and knowledge about how technology can be used effectively for addressing particular learning problems that students face. Thus in our professional development work with teachers online, we should be aiming for a cohort of teachers to be constructing these kinds of TPCK at the same time they are also constructing meaningful and useful technologies for teaching.

### 2.2. Research on teachers and technology integration

A growing body of literature examines and explores the complex web of site-specific variables that present challenges to well-intentioned teachers attempting to integrate technology into their pedagogical practices and classrooms. Such variables include school culture, hard and soft infrastructure, peer and administrative support, student and parent expectations, training and dedicated time, curricular flexibility, Internet filters and restrictions, and a host of other factors (e.g., Ching & Hursh, 2010; Ertmer, 1999; Eteokleous, 2008; Mueller, Wood, Willoughby, Ross, & Specht, 2008; Windshittl & Sahl, 2002; Zhao & Frank, 2003). Yet since our work is conducted primarily with teachers in university-based professional development courses, wherein teachers gain skills and knowledge and then return to their respective schools, we have little influence over these site-specific factors. Within our professional development environment, however, we can control the extent to which the technologies and pedagogies we use can best prepare our teachers for meeting whatever site-specific challenges they face.

Studies of teaching and technology integration reveal that teachers’ adoption of and persistence with innovation can be related to the distance between the features of the technology in question and teachers’ existing technological familiarity (Windshittl & Sahl, 2002; Zhao, Pugh, Shedon, & Byers, 2002). It is thus important to create professional development opportunities in which the technologies teachers become familiar with as learners are similar to, or directly mirror, the technologies they will work with as teachers. When teachers’ online learning experiences are confined to large-scale installations of university supported black-box learning management systems (LMS), such as Blackboard™, or even large-scale offerings of open-source management systems in disguise such as Sakai™ or Desire2Learn™ (more about this later), these experiences may not be directly transferable to teachers designing online components for their own k-12 classrooms. Further, large scale, black-box online systems have a poor task-technology fit (Lin & Wang, 2011) to activity development for k-12 settings and afford teachers little agency in making their own curricular decisions surrounding technology, a factor which has been demonstrated to profoundly affect teachers’ technology integration (Cuban, 2001; Ertmer, Ottenbreit-Leftwich, & York, 2007; McGrail, 2006; Zhao et al., 2002).

In addition to familiarity and task-technology fit found within the professional development environment, studies suggest that when controlling for factors external to the teacher at school sites, teachers’ attitudes, intents, and confidence are still the most powerful factors that influence technology integration (Ertmer, 2005; Inan & Lowther, 2009; Prestridge, 2012; Teo, 2010). In other words, even in the most supportive environment, teachers’ decision-making is still key. In a few recent studies, teachers’ reasoning about apparent learning affordances of the technologies in question and perceived connections to their learning goals for students largely determined their attitudes toward instructional technologies. In these studies, English and writing teachers in particular displayed some resistance to technologies that they felt were directly or indirectly competing with traditional alphabetic literacies (Ching & Ching, 2012; McGrail, 2005, 2007). It is all the more important, then, for professional development to provide opportunities for teachers to learn about and reflect on aspects of technologies that can afford discipline-specific learning goals, a key component of Technological Pedagogical Content Knowledge (Mishra & Koehler, 2006). In another study testing a path-analysis model for technology acceptance among pre-service teachers, the most influential factors were perceived usefulness and ease of use of the technology in question, and whether the teachers’ subjectively felt that the technology was “normal” and accompanied by social expectations for use held by colleagues, parents, and students, versus unusual or novel in some way (Teo, Lee, & Chai, 2007). An open question for our research, then, is whether that sense of normalcy must come from broader societal trends or can originate within the professional development community itself.

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