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Teacher beliefs and technology integration practices: A critical relationship

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ABSTRACT

Early studies indicated that teachers' enacted beliefs, particularly in terms of classroom technology practices, often did not align with their espoused beliefs. Researchers concluded this was due, at least in part, to a variety of external barriers that prevented teachers from using technology in ways that aligned more closely with their beliefs. However, many of these barriers (access, support, etc.) have since been eliminated in the majority of schools. This multiple case-study research was designed to revisit the question, "How do the pedagogical beliefs and classroom technology practices of teachers, recognized for their technology uses, align?"

Twelve K-12 classroom teachers were purposefully selected based on their award-winning technology practices, supported by evidence from personal and/or classroom websites. Follow-up interviews were conducted to examine the correspondence between teachers' classroom practices and their pedagogical beliefs. Results suggest close alignment; that is student-centered beliefs undergirded student-centered practices (authenticity, student choice, collaboration). Moreover, teachers with student-centered beliefs tended to enact student-centered curricula despite technological, administrative, or assessment barriers. Teachers' own beliefs and attitudes about the relevance of technology to students' learning were perceived as having the biggest impact on their success. Additionally, most teachers indicated that internal factors (e.g., passion for technology, having a problem-solving mentality) and support from others (administrators and personal learning networks) played key roles in shaping their practices. Teachers noted that the strongest barriers preventing other teachers from using technology were their existing attitudes and beliefs toward technology, as well as their current levels of knowledge and skills. Recommendations are made for refocusing our professional development efforts on strategies for facilitating changes in teachers' attitudes and beliefs.

1. Introduction

Technology integration has been a topic of discussion among educators for over thirty years (Lowther, Strahl, Inan, & Ross, 2008). Literally thousands of articles (EBSCO Publishing, 2011) have been published recommending effective strategies to facilitate meaningful integration (i.e., using technology to support a student-centered and student-directed curriculum; Becker & Riel, 1999), with a large portion of these articles proposing strategies for eliminating or circumventing the barriers that schools and teachers encounter during the process.

In 1999, Ertmer distinguished between two types of barriers that impacted teachers' uses of technology in the classroom. First-order barriers were defined as those that were *external* to the teacher and included resources (both hardware and software), training, and support. Second-order barriers comprised those that were *internal* to the teacher and included teachers' confidence, beliefs about how students learned, as well as the perceived value of technology to the teaching/learning process. Although first-order barriers had been documented as posing significant obstacles to achieving technology integration (O'Mahony, 2003; Pelgrum, 2001), underlying second-order barriers were thought to pose the greater challenge (Dexter & Anderson, 2002; Ertmer, 1999; Ertmer, Addison, Lane, Ross, & Woods, 1999; Newhouse, 2001; Zhao, Pugh, Sheldon, & Byers, 2002).

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In 2007, Hew and Brush provided a detailed analysis of the integration barriers that had been documented in the literature over the previous ten years (1995–2006). Six categories of barriers were identified including four that comprised first-order barriers (e.g., resources, institution, subject culture, and assessment) and two that comprised second-order barriers (e.g., teacher attitudes and beliefs; knowledge and skills). Based on the analysis of 48 empirical studies, Hew and Brush delineated the three most frequently cited barriers impacting technology integration: 1) resources, 2) teachers' knowledge and skills, and 3) teachers' attitudes and beliefs, reported in 40%, 23%, and 13% of the studies, respectively.

In the early to mid-2000s, access to technology resources began to increase (National Center for Education Statistics, 2006) effectively reducing, and in some cases even eliminating, this first-order barrier. Given this, researchers and educators began to turn their attention to the relationship between teachers' pedagogical beliefs and meaningful technology use, specifically that which facilitated student-centered learning (Dexter & Anderson, 2002; Ertmer, 2005; Judson, 2006). According to Means and Olson (1997), student-centered learning was defined as using technology to "promote student learning through collaborative involvement in authentic, challenging, multidisciplinary tasks by providing realistic complex environments for student inquiry, furnishing information and tools to support investigation, and linking classrooms for joint investigations" (p. 9). McCain (2005) elaborated: "the use of technology in the classroom is not the critical issue facing education in the 21st century. [Rather], the issue of foremost importance is to develop thinking skills in our students so that they will be able to utilize the power of technological tools to solve problems and do useful work" (p. 84). This, then, translates into the requirement that technology be placed in the hands of students, who are encouraged and enabled to utilize it in the same ways, and for the same purposes, that professionals do – that is, to communicate, collaborate, and solve problems.

Building on earlier work by Hadley and Sheingold (1993) and Becker (1994), researchers investigating the relationship between teachers' beliefs and student-centered learning described a common pattern of results: teachers with constructivist beliefs tended to use technology to support student-centered curricula; those with traditional beliefs used computers to support more teacher-directed curricula (Andrew, 2007; Hermans, Tondeur, van Braak, & Valcke, 2008). Thus, it became clear that simply increasing computer access was not sufficient to change teachers' technology practices especially if this increased access was not accompanied by a corresponding shift in teachers' pedagogical beliefs. However, this led to the false assumption that teachers with student-centered beliefs would readily translate those beliefs into constructivist technology classroom practices (Sandholtz, Ringstaff, & Dwyer, 1997).

Early studies (Berg, Benz, Lasley, & Raisch, 1998; Ertmer, Gopalakrishnan, & Ross, 2001) indicated that teachers' *enacted* beliefs, as represented by classroom technology practices, often did not align with *espoused* beliefs. That is, teachers with constructivist beliefs were observed, at least in some instances, to use technology in fairly traditional ways – asking students to complete drill and practice exercises or to fill in computer-generated worksheets (Ertmer et al., 2001). Reasons for the disparity between practices and beliefs, at least in the Ertmer et al. study, seemed to relate to the external constraints/barriers placed on teachers by pre-determined curricular or assessment practices. Similarly, participants in the Berg et al. study reported *wanting* to incorporate higher-level technology uses, but not being able to do so due to access and time constraints. Ravitz, Becker, and Wong (2000) reached a similar conclusion: teachers' implementations of constructivist beliefs were often limited by difficulties associated with meeting individual student needs within a large classroom, balancing multiple objectives, and responding to external forces and expectations.

In general, teachers' responses to these external forces and constraints have varied. While some have managed to either eliminate or bypass them (Ottenbreit-Leftwich, Glazewski, Newby, & Ertmer, 2010), many, if not most, have not (Ertmer, 1999, 2005; Judson, 2006). For example, Becker (1994) found that only 45 of the 516 computer-using teachers he surveyed, were able to do so. That is, these 45 teachers reported actually dropping "inconsequential" curricula from their current practices to make room for more student-centered lessons. In the Ertmer et al. study (2001), teachers with constructivist beliefs tended to utilize a "blended" pedagogical approach (using traditional *and* constructivist practices), which allowed them to reconcile differences between their *espoused* student-centered beliefs and their *enacted* teacher-centered practices.

Given that classroom contexts are constantly changing, especially where technology is concerned (Straub, 2009; U.S. DOE, 2010), it is important to revisit this phenomenon. Do external constraints exert the same influence over teachers' technology practices as was true 10 or more years ago? To what extent do external, or first-order, barriers constrain teachers' integration efforts, leading to potential misalignments between beliefs and practices? We consider the current status of key external barriers next.

1.1. Hardware and Internet access

Over the past two decades, substantial funds have been dedicated to increasing technology access in U.S. K-12 classrooms (Culp, Honey, & Mandinach, 2005), with more than $40 billion dollars invested between 1990 and 2000 (Dickard, 2003). As a result, access to Internet-connected computers has increased steadily, with the percentage of public schools connected to the Internet increasing from 35% in 1994 to nearly 100% in 2005 (Wells & Lewis, 2006). Based on the responses of 3159 teachers to a 2009 NCES survey (Gray, Thomas, & Lewis, 2010), 97% of teachers had access to one or more computers in the classroom, with approximately half of these teachers (54%) having the option of bringing in additional computers (e.g., laptops, tablets). Student-computer ratios, based on the number of computers available in the classroom everyday, hovered around 5.3 to 1, yet decreased to 1.7 to 1 if other available computers were considered, a noticeable improvement over the 3.8 to 1 ratio recorded in 2006 (Wells & Lewis, 2006). Furthermore, nearly all (96%) of these available computers are Internet-connected (Gray et al., 2010).

According to an NEA (National Education Association) 2008 survey, the majority (74.1%) of the 1934 responding educators reported that their access to computers, the Internet, and instructional software was "adequate" to do their jobs and almost all (94.6%) reported having additional access to computers and the Internet at home. Furthermore, 81% percent of teachers reported having remote access to student data, and of these teachers, 61% used this remote access sometimes or often (Gray et al., 2010).

1.2. Software and tool access

In addition to hardware and infrastructure, the wide availability of Web 2.0 tools has made access to powerful communication and collaboration tools almost a "non-issue" for any teacher who has Internet access in his/her classroom. Web 2.0 is the term commonly