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The role of value on teachers' internalization of external barriers and externalization of personal beliefs for classroom technology integration

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ABSTRACT

Recent research has shown that access alone does not automatically equate to greater or higher quality of technology integration. Teacher beliefs are also important factors of how teachers integrate technology in the classroom. This study examined how teachers' value beliefs about technology affect the way they internalize actual technology access and administrator support into perceptions of support on first-order barriers. This study also examined how teachers' value beliefs affect the relationship between perceived support on first-order barriers and their classroom technology integration practice. Using hierarchical linear modeling and multilevel path modeling, the study found that value beliefs moderated the extent to which teachers translate actual school support into perceptions of support on first-order barriers. Value beliefs also mediated *and* moderated the relationship between how teachers' perceived support on first-order barriers influences both the quantity and quality of classroom technology integration, suggesting a moderated-mediation interaction pattern. This study makes contribution to the literature by highlighting the importance of teachers' values beliefs in technology integration.

1. Introduction

Technology is increasingly present in US classrooms. The latest report from the National Center for Education Statistics indicated that the ratio of students to available computer has reached 1.7 across all public schools (Gray, Thomas, & Lewis, 2010). One-to-one laptop programs in which every student in a classroom has access to at least one computing device has spread across multiple states (Zheng, Warschauer, Lin, & Chang, 2016). According to the Barrier to Technology Integration model, this increase in access lessens external barriers known as first-order barriers (Ertmer, Ottenbreit-Leftwich, Sadik, Sendurur, & Sendurur, 2012; Kopcha, 2012). However, recent research has also shown that increasing access alone does not automatically equate to greater or higher quality of technology usage (Ertmer & Ottenbreit-Leftwich, 2010). Teacher beliefs and attitudes toward technology integration, also called second-order barriers, were found to be important factors in the extent to which teachers integrate technology in their classroom (Ottenbreit-Leftwich, Glazewski, Newby, & Ertmer, 2010; Yu, 2013) as well as the quality of this integration. Teachers with more positive beliefs and attitudes are more likely to use technology in delivering curricular contents (Mueller, Wood, Willoughby, Ross, & Specht, 2008; Ottenbreit-Leftwich et al., 2010; Wozney, Venkatesh, & Abrami, 2006), restructuring learning goals (Miranda & Russell, 2012; Mueller et al., 2008), and transforming instruction to be more student-centered and cognitively stimulating (Ertmer et al., 2012; Hixon & Buckenmeyer, 2009; Hsu, 2016).

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In particular, teachers' value belief, the belief about the value of technology for their teaching practice, is salient for effective technology integration. Research suggests that teachers with more facilitative value beliefs (e.g., technologies are important to classroom teaching; technologies are valuable in supporting student learning) maximize their resources to overcome other external barriers to technology integration (e.g., Ertmer et al., 2012). As such, value beliefs likely have the most direct relationship with teachers' technology integration practice.

The interactions between teachers' value beliefs, external barriers, and technology-integration practices in classrooms are complex. For example, teachers' value beliefs may play a role in how teachers translate actual resource availability into perception of access. That is, teachers with higher value beliefs for technology may perceive less resource barriers as they unquestioningly work around access constraints that may be present. The purpose of this study is to examine how teachers' value beliefs about technology affect the way they internalize actual technology access and administrator support into perceptions of external barriers. Concurrently, this study also investigates how teachers' value beliefs affect the relationship between perceptions of external barriers and their classroom practice.

2. Literature review

2.1. Barriers to technology integration and classroom practice

In the Barrier to Technology Integration model, Ertmer (1999), Ertmer and Ottenbreit-Leftwich (2010), Ertmer et al. (2012) posited that teachers' decisions to incorporate technology in their classroom are influenced by two sets of barriers, namely, first-order and second-order barriers.

First-order barriers are defined as those that are external to the teacher, reflecting school-wide administrative support and expectation for technology integration. Scholars, notably Hew and Brush (2007) and Kopcha (2012), have also refined and expanded the notion of first-order barriers to include *resource barriers* (e.g., access to technology devices in the classroom, availability of technical support, and sufficient time allowance to prepare for technology-integrated instruction) and *institutional barriers* (e.g., administrator's priority and school-wide plan for technology integration).

Although schools are working to increase technology access and making school environments more supportive to technology integration, teachers still perceive first-order barriers as obstructing their technology integration efforts (Ertmer et al., 2012; Hechter & Vermette, 2013; Hsu & Kuan, 2013; Mueller et al., 2008; Yu, 2013). Some of the persistent first-order barriers include: lack of access to software and hardware, physical arrangement of available technology (i.e. arranging computers in labs; Ryan & Bagley, 2015; Hsu & Kuan, 2013; Groff & Mouza, 2008), lack of access to technical assistance (Buabeng-Andoh, 2012; Ertmer et al., 2012), teacher-preparation programs with inadequate technology integration agendas (Brown & Warschauer, 2006), professional development programs with few applied examples (Hixon & Buckenmeyer, 2009), and the school environment lacking a unified vision for classroom technology integration (Ertmer et al., 2012; Somekh, 2008). Importantly, these first-order barriers were shown to have negative effects on how and how much teachers integrate technology in the classroom (Ertmer et al., 2012; Kopcha, 2012; Miranda & Russell, 2012). For example, Miranda and Russell (2012) found that a perception of high external barriers is associated with a lower amount of student-centered technology use in the classroom. A recent study by Ertmer et al. (2012) found that even for exemplary teachers chosen for their award-winning technology practices, first-order barriers still impacted their ability to integrate technology. Ertmer and associates concluded that there is a first-order “barrier threshold,” which, if not surmounted, limits what teachers can do to integrate technology in the classroom. Thus, first-order barriers can be regarded as the first line of obstacles to be overcome as schools and teachers work towards classroom technology integration. But, once this threshold is surpassed, second-order barriers become more salient in predicting the quantity and quality of classroom technology integration. Second-order barriers are intrinsic to teachers. They include *knowledge and skills* of how to operate specific devices and programs, to evaluate and select digital resources, to teach with technology, and to manage student activities with technology (Xie, Kim, Cheng, & Luthy, 2017; Kim, Xie, & Cheng, 2017). They also include teachers' *attitudes and beliefs* about the role of technology in teaching, the value of technology in delivering curricular content, as well as the difficulty of incorporating technology within a lesson (Ertmer et al., 2012; Hew & Brush, 2007; Kopcha, 2012).

Among second-order barriers, teachers' value beliefs regarding the importance of technology for learning have been recognized as the most proximal determinant of technology integration (Ertmer & Ottenbreit-Leftwich, 2010; Ertmer et al., 2012; Mueller et al., 2008). Teachers' value beliefs about technology refer to the extent to which teachers believe that technology can help fulfill instructional goals they identified as most important for their students (Ottenbreit-Leftwich et al., 2010; Yu, 2013). When teachers perceive technological tools as relevant to their instructional goals, they are more likely to integrate these tools into their classroom routine. Considering that teachers often have very limited time between classes, yet preparing meaningful technology integration is often time-demanding, these value judgments towards technology become even more salient. Researchers have found teachers' value beliefs towards technology to be highly predictive of the quantity and quality of technology integration. A study by Wozney et al. (2006) confirmed that teachers' values beliefs towards technology explain a significant amount of variation (33%) in technology usage in the classroom. Facilitative beliefs about technology as valuable for learning and teaching positively predicted teachers' use of technology in delivering curricular content (Mueller et al., 2008; Ottenbreit-Leftwich et al., 2010; Wozney et al., 2006) as well as students' use of technology to fulfill learning goals (Miranda & Russell, 2012; Mueller et al., 2008). Importantly, teachers with higher value beliefs are more likely to use technology for student-centered instruction and for higher-order, critical thinking tasks (Ertmer et al., 2012; Hixon & Buckenmeyer, 2009; Hsu, 2016). These value beliefs are also a driving force for teachers to consciously overcome other, more distal barriers such as lack of resource or technical ability (Ertmer et al., 2012).