The relations among teacher value beliefs, personal characteristics, and TPACK in intervention and non-intervention settings

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HIGHLIGHTS

- Examine the relations among value beliefs, personal characteristics, and TPACK.
- The study was situated in intervention and non-intervention settings.
- Value beliefs significantly predicted TPACK in both settings.
- The moderation effects of value beliefs were found in non-intervention settings.
- Value beliefs act as the pivotal factor for reframing teacher learning programs.

ARTICLE INFO

ABSTRACT

The purpose of this study is to examine the relations among teacher value beliefs, personal characteristics, and Technological Pedagogical Content Knowledge (TPACK) in both intervention and non-intervention settings. One-hundred and nine in-service teachers from elementary to high schools participate in this study. Our findings reveal that compared to personal characteristics, teacher value beliefs are the only variable that can significantly predict TPACK across both settings. In addition, in the non-intervention setting, the relations between personal characteristics and TPACK are also moderated by teacher value beliefs. How to foster teacher value beliefs around technology integration is discussed.

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1. Introduction

Technology integration in K-12 classrooms has brought unprecedented potential to support teaching and learning. Research has shown that technology has the capacity to improve student comprehension and complex thinking skills (Dreyer & Nel, 2003; Kozma, 2003; Lei & Zhao, 2007), enhance student motivation to learn (Mistler-Jackson & Songer, 2000; Papastergiou, 2009), and develop students' 21st century skills (Kleiman, 2004). However, integrating technology into classrooms not necessarily is a smooth process. Simply providing teachers with access to hardware and software will not lead to successful adoption of technology presumably. Teachers need sufficient knowledge to connect technological affordances with classroom practices (Xie & Luthy, 2017; Hew & Brush, 2007).

Recently, the theoretical framework of Technological Pedagogical Content Knowledge (TPACK) has risen as an influential model informing the design of teacher education and professional development (PD) programs (Mishra & Koehler, 2006). Many recent studies have focused on the important roles of teacher value beliefs, personal characteristics, and teachers' technology use in classrooms in relation to TPACK. For example, Lee and Tsai (2010) found that Taiwanese in-service teachers' content knowledge and pedagogical content knowledge for web-based instruction were positively correlated with experiences of using Web and Web-related teaching practice but negatively correlated with their age and years of teaching. Hsu, Tsai, Chang, and Liang (2017) also found that Taiwanese in-service teachers' knowledge for game-based

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instruction was positively correlated with value beliefs about using digital games in classrooms but negatively correlated with age and years of teaching.

As these two studies demonstrate, the significance of investigating the relations among teacher value beliefs, personal characteristics, and TPACK provides important understandings about how to reframe and design teacher learning programs in a way to be more responsive to the needs of teacher participants. However, previous studies tend to examine these relations separately. Correlation and mean difference analyses were used to reveal the relation of TPACK with distinct personal characteristics or value beliefs (Chuang & Ho, 2011; Jang & Tsai, 2012; Koh, Chai, & Tsai, 2010). For instance, in Koh et al.'s (2010) study, Pearson's correlation analysis was used to explore how age correlated with TPACK constructs. Then, multiple independent *t*-tests were employed to examine the mean differences in each TPACK domain by gender and teaching level, respectively. In a similar vein, Jang and Tsai (2012) employed independent *t*-tests and analysis of variance (ANOVA) to examine the mean differences in each TPACK domain by teaching subjects, gender, and teaching experience, respectively.

While these previous investigations highlight the separate relations between personal characteristics and TPACK, it is important to examine holistically the complex relations among various personal characteristics altogether and also study the possible interactions between personal characteristics and teacher value beliefs, in order to provide stakeholders with a unified understanding about these relations. In addition, most of the previous studies were non-interventional[1] in nature, but many of the implications were made for intervention programs such as professional development (e.g., Chuang & Ho, 2011; Lee & Tsai, 2010). For instance, Chuang and Ho (2011) found in a large-scale survey study (i.e., no intervention involved) across Southern Taiwan that there was a significant difference in TPACK subdomains by teacher personal characteristics such as teaching experience, age, and frequency of technology use, and hence, suggested that the design of future technology professional development (TPD) should take personal characteristics into consideration. However, in Xie, Kim, Cheng and Luthy (2017) study on the effects of a TPD on in-service teachers' TPACK, the results of repeated measures multivariate analysis of variance (MANOVA) showed that the differences in TPACK by personal characteristics observed at the starting of the program were mitigated over the course of the program even though the program was not designed in any way to cater to specific teacher personal characteristic. Therefore, tailoring TPD to personal characteristics is not supported in this case. An investigation in both non-intervention and intervention settings might provide more contextualized understanding about the relation between value beliefs, personal characteristics, and TPACK. To obtain a comprehensive picture of these relations in teacher technology integration, the need to situate our inquiry in both intervention and non-intervention settings is, hence, warranted. The aim of this study is to address the complex relations among teacher value beliefs, personal characteristics, and TPACK and situate our investigation in both intervention and non-intervention settings.

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[1] In this study, intervention settings are defined as research context involving intervention programs with an aim to improve participants' knowledge and/or attitude towards technology integration within certain time frame such as technology professional development (TPD) or pre-service courses related to technology integration. Non-intervention settings are defined as research context without involving any intervention procedure such as school- and district-wide or national survey studies. Research that is situated in intervention settings but surveys variables of interest only one time prior to the intervention is considered non-intervention studies.

2. Theoretical underpinnings

2.1. Technological pedagogical content knowledge

Mishra and Koehler (2006) introduced the concept of Technological Pedagogical Content Knowledge (TPACK) to address the relation between content, pedagogy, and technology. TPACK is a conceptual framework depicting knowledge domains that are critical for effective technology integration (Koehler & Mishra, 2009). The underlying assumption of TPACK is that effective teaching with technology requires "a nuanced understanding of the complex relationships between technology, content, and pedagogy" (Mishra & Koehler, 2006, p. 1029). A deep consideration of the interplay between these three knowledge components is essential for developing appropriate representations of concepts through technology to facilitate student learning. With an emphasis on the interaction among different knowledge domains, the TPACK framework highlights not only the importance of primary knowledge components: pedagogical, content, and technological knowledge (PK, CK, and TK) but also the integrative knowledge components: pedagogical content knowledge (PCK), technological content knowledge (TCK), technological pedagogical knowledge (TPK), and technological pedagogical content knowledge (TPCK) in technology-enhanced instruction (Fig. 1). According to Koehler and Mishra (2009), these knowledge components can be succinctly defined as follows:

- Content Knowledge (CK): knowledge of subject matter
- Pedagogical Knowledge (PK): knowledge of methods of teaching and learning
- Technological Knowledge (TK): knowledge of standard technologies
- Pedagogical Content Knowledge (PCK): knowledge of applying appropriate teaching methods to specific content
- Technological Content Knowledge (TCK): knowledge of the affordances of technologies to represent content
- Technological Pedagogical Knowledge (TPK): knowledge of using technologies to enhance teaching and learning
- Technological Pedagogical Content Knowledge (TPCK): knowledge of using technologies to enhance teaching and learning for specific subject matter
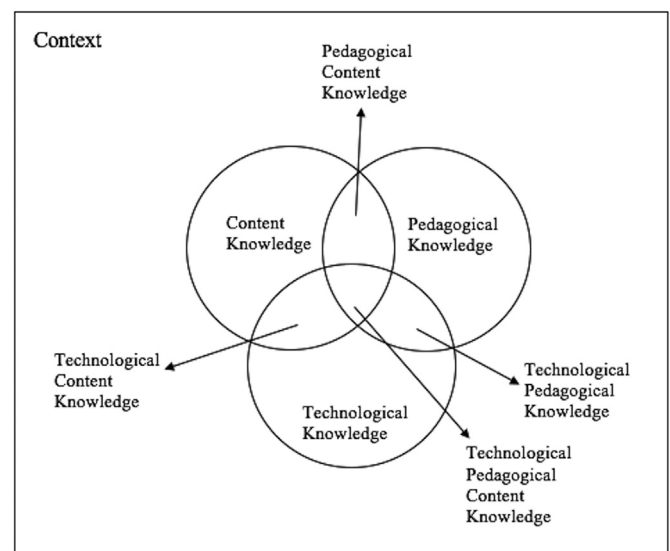

Fig. 1. The TPACK framework and its knowledge components.