Enhancing the role of pedagogical beliefs in TPACK-based professional development

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Professional development programs that aim to enhance the use of educational technology in higher education have become a priority in many countries. However, educators' pedagogical beliefs may present a barrier to the successful outcomes of these programs and are often overlooked. This paper presents a professional development approach designed to make explicit educators' pedagogical beliefs in regards to educational technology. The outcomes of the study will provide insights into strategies to address educators' beliefs about teaching, learning and students in general, as a launching pad for improvements in practice to occur.

Introduction

Technological advances have greatly influenced the higher education context. Digital systems and tools afford more flexible learning, and offer the potential to actively engage students in the construction of their own knowledge in ways that were previously difficult. But for educational technology to effectively impact the quality of education, it should be used along with "coherent instruction and assessment that supports high quality learning" (Kimberly & Pellegrino, 2007, p. 581). As a result, professional development (PD) programs focused on supporting effective technology integration into teaching practices have received much attention from the research community (Kimberly & Pellegrino, 2007; Parr & Timperley, 2010). In part, this is due to the fact that in higher education, educators have traditionally been employed based on their qualifications as subject matter experts, rather than on sound pedagogical training and experience (Ferman, 2002). Moreover, in Australia, over 50% of university teaching is done by sessional staff (Hamilton, Fox, & McEwan, 2013; May, Strachan, & Peetz, 2013). This highlights the need for comprehensive PD opportunities based on a sound pedagogical basis. There is evidence of a rich diversity of PD approaches and models; yet, the outcomes of such efforts have not always been reported as being effective in changing actual teaching practice (Kandlbinder & Peseta, 2009; Kimberly & Pellegrino, 2007). Some researchers have provided evidence of three main barriers affecting the impact of PD outcomes for technology integration: access to resources, educators' knowledge and skills, as well as their pedagogical attitudes and beliefs (Ertmer et al., 2012). A key question therefore, is how should PD be approached to respond to these barriers? This paper presents a PD approach for technology integration in higher education that focuses particularly on educators' pedagogical attitudes and beliefs. As the implementation of the PD approach is a work in progress, the focus on the paper will be on how previous research studies have informed the design features of the PD approach.

Background and context

The concern with pedagogical beliefs is that if the strategies suggested in a PD activity are inconsistent with educators' preconceptions about teaching, learning, and students in general, they are unlikely to adopt the proposed strategies in their delivery methods (Ertmer, 2005). It is also important to recognize that most of the time, existing pedagogical beliefs are tacit and idiosyncratic (Ertmer, 2005), meaning that educators themselves may not be aware of how their beliefs impact their teaching practice. For this reason, in higher education, it is not uncommon to find that teaching practices often reflect how lecturers were taught themselves. Moreover, when educators use, adapt, or redesign instructional materials, they make decisions based on their practical knowledge and on their beliefs about how a curriculum should be taught and learned (Boschman, McKenney, & Voogt, 2014). Another interesting finding is that educators' enacted beliefs do not always reflect their intentions (Norton et al., 2005). For instance, an educator may believe in the benefits of a student centred approach but in practice may employ a rote learning strategy. These inconsistencies may be due

to institutional constraints, attitudinal shortcomings or a lack of appropriate training. Thus, to increase the likelihood of a PD approach being effective, these beliefs should to be made explicit. Ertmer (2005) suggests that a change in beliefs is likely to follow a successful experience, which could be triggered by observing exemplary peers. She also suggests challenging beliefs through extended conversations, participation in communities of practice, access to expert performances, or through ongoing technical and pedagogical support.

In Australia, most universities are appropriately equipped, and educators have a high degree of control over the curriculum of their subjects (Bennett et al., 2011). Moreover, recent theoretical developments have informed approaches to improving educators' knowledge and skills. For instance, Mishra and Koehler (2006) established the Technological Pedagogical Content Knowledge (TPACK) framework, which promotes a holistic approach to technology integration. Due to its comprehensiveness and parsimony, the TPACK framework has been extensively researched and used as a lens to design, implement and evaluate PD programs for educators around the world (Graham, 2011). The authors based their work on Shulman's Pedagogical Content Knowledge framework, and stress that effective integration of educational technology requires a dynamic interrelation of content, pedagogy and technology. In their view, Technological Pedagogical Content Knowledge is represented in exemplary educators that use educational technology as an intrinsic part of their teaching practice.

Initially, Mishra and Koehler (2006) recommended a Learning Technology by Design approach to PD in which lesson planning and subject designs are a collaborative effort between educators and educational designers. The approach blends theory and practice, and takes into consideration the constraints and trade-offs between educators, resources, supports and audience. Since then, the TPACK framework has been utilized in a wide variety of contexts, resulting in a series of suggested approaches for implementation. Harris (2016) conducted a systematic review of the literature, which culminated in a comprehensive overview of eight models and twelve strategies for TPACK based PD for educators. Herring, Meacham, and Mourlam (2016) furthered this work by proposing a model specifically prescribed for higher education. However, what is evident from this research is that even though pedagogical beliefs are recognised as a potential barrier to successful PD outcomes, most of the studies emanating from the TPACK framework do not provide suggestions to directly address educators' pedagogical attitudes and beliefs. One study that addressed this issue was conducted by Rienties, Brouwer and Lygo-Baker (2013), who implemented an approach and reported a positive increase in participants' TPACK competences, but were unsuccessful in influencing the implementation of more student centred approaches, even after participants' pedagogical beliefs were challenged during training. The authors suggested that a limitation of their study was their over reliance on self reported results, and their oversight in measuring the impact on daily teaching practice.

This paper describes the main characteristics of a PD approach that builds on the aforementioned efforts by enhancing the role of pedagogical beliefs in TPACK based PD. The impact of the approach will be assessed using a longitudinal research design, in which a variety of data collection methods are employed. The approach also takes into consideration the link between learning design, evaluation and actual teaching practice.

Method

The main objective of this program of doctoral research is to investigate the impact of the PD approach on educators' pedagogical beliefs in relation to educational technology. In this paper, the discussion is centred on the following research question: what are the salient features that characterise an effective PD approach for technology integration that addresses educators' pedagogical attitudes and beliefs?

The research adopts an iterative design based approach. The current implementation of the approach involves a multi phased mixed methods design. Data collection methods to measure the impact of the PD approach on educators include a pre and post intervention diagnostic survey and document analysis, interviews and confidence logs. Data collection methods to measure student engagement and learning with the subject include a focus group, student satisfaction surveys and statistical data from the learning management system.

The study began with a review of the literature, focused on PD in higher education for in-service, pre-service and sessional staff. To further refine the focus, the analysis centred on studies describing PD programs that support the use of educational technology in teaching practice, with special attention to the ones that addressed pedagogical beliefs and TPACK. A total of 52 studies were identified, resulting in the identification of six broad elements outlining key design features that characterise effective PD programs for educational technology. These six elements are summarized below.

PD elements from the literature

The first element to emerge from the literature is the suggestion to focus on teaching practice. This includes the modelling of effective instructional methods and reducing the gap between theory, research and practice. This element is critical as research shows that a clear emphasis on pedagogical transformation, rather than on technology training, is more likely to have an impact on teacher

knowledge and behaviour, and potentially on student learning (Kimberly & Pellegrino, 2007). In the second element, it is recommended that in order to achieve pedagogical transformation, participants should be immersed in a reflection process, supported by continuous feedback. This element includes promoting reflective practice, making explicit pedagogical beliefs, considering participants' needs, providing continuous feedback, and undertaking formative evaluation throughout the intervention.

The third element involves a careful consideration of delivery methods. There is evidence to suggest that PD approaches for educators are most effective when active, reflective, job-embedded, coherent, in depth, longer in length, and link curriculum content to pedagogy (Ferman, 2002; Harris, 2016; Wilson, 2012). The suggestion is to design PD activities with the objective to deliver a combination of know-how and know-why that directly respond to participants' curricular needs. To compliment this, the fourth element regards a careful selection of the technical infrastructure. This includes, for example, using a website to disseminate training materials, modelling the use of social networking to create virtual learning communities, and making sure the selection of digital tools are reliable and easy to access.

Taking into consideration organizational culture is another relevant element to consider. This includes ensuring the PD effort is perceived as quality enhancement rather than quality management, aligning activities to national and institutional standards, engaging stakeholders in developing a shared vision, and creating a safe space to discuss practice. This also involves taking into consideration the constraints of accountability, the incentives for participation, and providing ongoing support.

The last element identified is collaboration. This can occur between educators and educational designers, amongst educators in the form of peer review of teaching, mentoring or coaching, or in the form of participation in communities of practice. This element is relevant for evidence points to collaboration between educators and an educational designer or a mentor as most impactful on teaching practice, and to participation in communities of practice as conducive to sustaining outcomes in the long term (Wilson, 2012).

Implementation of the elements in the PD approach

To address the element of organizational culture, participation in this PD approach is voluntary, confidential and flexibly scheduled around participants' time availability. The head of teaching and learning of each faculty at the university is notified of the initiative and an advertisement is posted on staff newsletters inviting educators to participate. In total, participation in this PD amounts to a minimum of five and a half hours over the course of a semester to provide ongoing support.

To ensure a focus on teaching practice, it is necessary to first become familiar with the teaching approach of each participant. An initial welcome email is sent out requesting participants to fill out a diagnostic of competences survey, which is based on Schmidt et al.'s (2009) *TPACK Assessment Instrument for Pre-service Teachers* and Norton et al.'s (2005) *Beliefs and Intentions Questionnaire*. The results of this diagnostic are useful means to challenge participants' pedagogical beliefs, and enable the PD activities to be aligned to participants' competence and prior knowledge. These results also serve as a starting point to evaluate the impact of the intervention on participants' teaching practice. Furthermore, participants are requested to send their instructional materials for an initial document analysis. This enables a further understanding of participants' subject matter and curriculum. The analysis also allows the researcher to come up with strategic improvements to the instructional materials and to structure delivery methods around the modelling of specific instructional strategies linked directly to each participant's curricular needs.

The first encounter with participants is based on a semi-structured interview designed to trigger a reflection process. The results of the diagnostic are discussed, and participants are challenged to explore how their own student experiences impact their instructional decisions and teaching practice. This is also an opportunity to guide participants to identify their own needs. The initial, mid-program and final interviews in this approach are implementation instruments focused on exposing participants' pedagogical beliefs.

To address the elements of collaboration and delivery methods, this approach is based on a maximum of 12 design consultations. These are one hour-long meetings scheduled throughout the semester with the objective of redesigning instructional materials in collaboration. Mishra and Koehler's (2006) TPACK framework and the Learning Technology by Design Approach are used as guiding principles. Design consultations allow for extended discussions on how pedagogical strategies can increase student learning, and on how educational technology can facilitate engagement with the curriculum. These discussions also serve to further challenge pedagogical beliefs, to evaluate instructional methods throughout the implementation of the subject and to provide continuous feedback on learning designs. Each design consultation is structured to culminate in the creation of a product (i.e. activities, assessments, supports or resources). Moreover, as part of the technical infrastructure, a website was created to support the delivery methods. This website contains information on learning theory, links to resources and videos of expert

performances. It also includes design blueprints and activities created to scaffold participants' design thinking and process.

At the end of the semester, a focus group with students is held to gather their perceptions of the quality of teaching and the impact of instructional strategies on their learning. Results from the focus groups are discussed during the final design consultation, which involves a summative evaluation of the subject. To finalise the implementation, participants are requested to fill out the diagnostic survey once again, and send their instructional materials for a pre and post document analysis. The last encounter with participants involves a final interview aimed to gather self-reported improvements in competence and pedagogical beliefs, as well as final comments on participant's satisfaction with the PD approach.

Discussion and future directions

This paper presents the main characteristics of a PD approach designed to address educators' pedagogical beliefs in TPACK based PD. In recognising that educators' beliefs need to be made explicit to ensure successful outcomes, the design of this approach attempts to integrate a reflection process for participants to better understand their teaching practice. In the first iteration there were two case studies, but preliminary findings from the first case provide evidence of an improvement in TPACK competences and confidence, an increase in student centred beliefs, which are reflected in the learning designs. However, there is also an increase in teacher centred perspectives, given that educators are more aware of how their instructional decisions, actions and learning designs impact their students learning.

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