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TPACK-in-Practice: Developing 21st Century Teacher Knowledge

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Abstract: This paper introduces the *Framework of TPACK-in-Practice*, derived from PCK Model (Shulman, 1986) and the TPACK model (Mishra & Koehler, 2006), as concrete teacher actions, or practice-derived teacher knowledge about teaching with technology, and illustrates its usefulness in framing technology professional learning or technology workshops for teachers and teacher educators. The framework of *TPACK-in-Practice* provides foundational knowledge to design workshops for technology professional learning opportunities. Four design elements were identified as useful for developing learning opportunities for teacher development of TPACK-in-Practice. These include: (a) modeling a technology-enhanced activity type (learning with the tool) to set the context and purpose for tool use, (b) integrating 'pedagogical dialog' in a modeled lesson, (c) developing activity-specific technical skills (TK in context) through short tool demonstrations, and (d) applying TPACK-in-Practice to design their own task. The paper compares the traditional workshop model approach to professional learning based on TPACK-in-Practice. The later facilitates the development the three technological components of teacher knowledge that inform teacher practice (TPK-in-Practice, TCK-in-Practice, and TPCK-in-Practice). The goal is for teachers to leave the workshop being able to teach with the technology featured in the workshop in an authentic learning context.

Introduction

Technology is an integral part of everyday life in the 21st century. Its pervasiveness has influenced the way learners learn (Prensky, 2005); and the way teachers teach (Becker, 2000; Ingram, Willcutt, & Jordan, 2008). Technology teacher educators have adopted a variety of ways to help teachers develop knowledge about teaching with technology for the past 20 years (Becker, 1994; Hadley & Sheingold, 1993). One of the most common and persistent forms of technology training for teachers is the delivery of technology workshops centered on how to use the tool – an approach Papert (1987) described as technocentric. Teachers attend workshops where the focus is on technical skill development and "skills are often learned out of context, [and] seem remote from classroom practice and leave many teachers wondering about their utility and worth" (McKenzie, 2001). With regard to the latter type of training, research shows that teacher proficiency with the tools has not appeared to impact teacher use of the tools in daily instructional practices with their students (Becker, 1994; Hadley & Sheingold, 1993; Schrum, 2005). Prominent researchers in the field have also raised concerns that "research on technology has failed to produce evidence that it makes a difference in the teaching and learning process (Lagrange, Artigue, Laborde, & Trouche, 2001; Pollard, 2004-05; Roblyer & Knezek, 2003; Strudler, 2003; U.S. Department of Education, 2004)" (as cited in Schrum et al., 2005). Further, Schrum (2005) explained that the "technological capacity available to schools [was] exceed[ing] our ability to use it effectively to enhance learning" (p. 220).

One response to the concerns raised, has been a discernible shift in perception on how teachers learn technology – towards a content-centric approach (Fisher, Dwyer, & Yokum, 1996; Harris, 2005; Harris, Mishra, & Koehler, 2007, 2009; McKenzie, 2001; Means & Olson, 1997; Roblyer, Edwards, & Havriluk, 1997). As McKenzie (2001) succinctly stated:

> [Teacher professional development] should be about using new tools to help students master the key concepts and skills embedded in the science, social studies, art and other curriculum standards. It is not so much about powerpointing, spreadsheeting or word processing (section 1, para 9).

The content-centric approach advocates teaching teachers how to teach with the tool to meet content learning goals rather than teaching teachers how to use the tool (Harris, 2005, 2008; Harris, Mishra, & Koehler, 2007, 2009; Niess, 2005).

In 2006, Mishra and Koehler introduced their model of Technological Pedagogical and Content Knowledge (TPACK) which highlighted the integral role of content in teaching with technology in educational settings. This model built upon Shulman's (1986, 1987) theory of teacher knowledge where teacher knowledge encompasses a number of categories of specific teacher knowledge (e.g., pedagogical content knowledge; knowledge of learners and their characteristics; and knowledge of educational contexts (Shulman, 1987). The knowledge required for successful technology-enhanced teaching (TPACK) is situated within pedagogical content knowledge (PCK), "that special amalgam of content and pedagogy that is uniquely the province of teachers, their own special form of professional understanding" (p. 8). The framework proposed by Mishra and Koehler (2006):

> emphasizes the connections, interactions, affordances, and constraints between and among content, pedagogy, and technology. In this model, knowledge about content (C), pedagogy (P), and technology (T) is central for developing good teaching. However, rather than treating these as separate bodies of knowledge, this model additionally emphasizes the complex interplay of these three bodies of knowledge (p. 1025)

The purpose of this paper is to introduce TPACK-in-Practice, derived from PCK Model (Shulman, 1986) and the TPACK model (Mishra & Koehler, 2006), and illustrate its usefulness in framing technology professional learning or technology workshops for teachers and teacher educators.

TPACK-in-Practice

To design opportunities for teachers to develop TPACK, there is a need to identify what teacher actions represent the technology knowledge components in elementary classroom teaching practice – we refer to these concrete, teacher actions, or practice-derived teacher knowledge about teaching with technology, as TPACK-in-Practice. The components of what we identify as TPACK-in-Practice are derived from Shulman's model (1987) by viewing TK as an integral, permeating feature/aspect of the three components of the PCK model, or the knowledge teachers use to effectively teach. This interpretation suggests that the components that represent technologically enhanced teaching actions, or TPACK-in-Practice, are conceptualized as TPK-in-Practice (derived from technology interaction with PK), TPCK-in-Practice (technology interacting with PCK), and TCK-in-Practice (technology interacting with CK). This is consistent with Mishra and Koehler's TPACK model (2006) as well, but our interpretation highlights the specific knowledge components teachers use in daily instructional practice. Note that in our interpretation TK is also not viewed as a separate or individual knowledge component, but is embedded as a part of TPACK-in-Practice.

Based on the above conceptualization, our prior framework of *TK, TCK, and TPK Characteristics* derived from cross-case analyses of teachers' (pre-service and in-service) decisions and actions made in the context of their teaching practice (Figg & Jaipal, 2009; Jaipal & Figg, 2010a; Jaipal & Figg, 2010b) was revised and updated. Research in progress (Figg, Jaipal, & Mueller, 2011), feedback from technology educators and external reviewers in the field, and anecdotal feedback from teacher candidates, also contributed to the updated *Framework of TPACK-in-Practice*. This framework provides examples of actions that characterize TCK-in-Practice, TPK-in-Practice, and TPCK-in-Practice (See Appendix) in the elementary classroom. In the next section, we illustrate how the TPACK-in-Practice framework can be used to inform the design of professional learning opportunities (or technology workshops) for teachers.

Comparing Traditional Technology Training to Professional Learning Based on TPACK-in-Practice

Traditional technology workshops are technocentric, and still persist as a form of professional development for educators. In these sessions, the focus is on learning technical knowledge/skills, and the typical procedure is to explain the use of the tool, highlighting each of the menu features and providing examples of what can be done with

each feature (e.g., training conducted by SMART Technologies, 2011). Participants are allowed time to practice the features on their own. Depending upon the trainer for the session, examples of how the tool could be used in instruction may be provided for each feature; however, the examples are presented out of context of an instructional setting.

As argued earlier in the paper, research indicates that a high degree of technical competence in teachers does not translate into teaching with the tools (Becker, 1994; Becker & Ravitz, 1999; Hadley & Sheingold, 1993), and that technological skill development is most effective when embedded in content instruction, rather than mastering specific tools in a vacuum (Harris, 2005, 2008; Hughes, 2005; Jaipal & Figg, 2010b; Keating & Evans, 2001; Kereluik, Mishra, & Koehler, 2010; Lundeberg, Bergland, Klyczek, & Hoffman, 2003; Margerum-Leys & Marx, 2002; Neiss, 2005; Zhao, 2003).

The framework of *TPACK-in-Practice* provides foundational knowledge to design workshops for technology professional learning opportunities. Four key design elements were identified from the framework and from a pilot implementation of a technology methods course using the framework (Figg & Jaipal, 2009; Jaipal & Figg, 2010a; Jaipal & Figg, 2010b). These elements are (a) modeling a tech-enhanced activity type (learning WITH the tool), (b) integrating 'pedagogical dialog' in a modeled lesson, (c) developing TK (in context) through tool demonstrations, and (d) applying TPACK-in-Practice to design an authentic learning task. The four elements can be sequenced as shown below in a technology professional learning workshop to promote content-centric development of TPACK-in-Practice knowledge:

(a) Modeling a tech-enhanced activity type (learning WITH the tool). The workshop designer selects a technology-enhanced activity type (e.g., virtual field trips, brainstorming with concept maps, using a WebQuest, or other technology-enhanced activity types suggested by Harris & Hofer, 2009) that incorporates the use of specific tools that will be highlighted in the workshop. This activity becomes an initial task in the workshop that engages participants in learning using the activity type. The experience provides participants with context for how the tool is useful in instruction. For example, the opening activity of a workshop on using Virtual Field Trips would be to have participants use a virtual field trip for learning purposes in a particular content area (TCK-in-Practice). The facilitator models how instruction occurs using this type of activity (TPCK-in-Practice).

(b) Integrating 'pedagogical dialog' in a modeled lesson. A discussion period in which participants build their knowledge about how the tool is used in practice is critical to promote understanding of knowledge of how to teach with technology. The inclusion of a dialogue with others about the pedagogy, content, and technology being modeled, is essential (Angeli, 2005). This conversation enlightens novice teachers about the connections between the modeled activity and the decisions teachers make in designing and implementing technology-enhanced activities (TPK-in-Practice). Without this conversation, teachers are merely participating in the technology-enhanced activity and not making connections between the TK and TPACK-in-Practice.

(c) Developing activity-specific technical skills (TK in context) through short tool demonstrations. In our Virtual Field Trip workshop, the facilitator would instruct participants in the technical skills required to develop their own Virtual Field Trip (e.g., setting up a wiki or blog with links). Research also indicates that short, frequent training sessions that are sustained over time is most effective for development of teachers who competently integrate technology into their instruction (Carlson, 2002; Grunwald & Associates, 2010; McKenzie, 2001; Wei, et al, 2009). Therefore, the tool demonstration activity provides directions for the completion of a few technical skills as well as how to integrate those skills into instruction.

(d) Applying TPACK-in-Practice to design their own task. For example, participants in the Virtual Field Trip workshop will use the TPACK-in-Practice knowledge learned in the workshop to design their own Virtual Field Trip. Participants should be provided with a task that allows for the practice of their new-found knowledge. The same task may be provided for each participant, or participants are asked to design their own instruction using the tools depending upon the learning needs and comfort level of the participants.

Conclusions

When the two approaches are compared, the traditional technology workshop does include one of the key design elements, the development of technical skills (refer to element "C" which is discussed above); however, often skill development is the major emphasis of the traditional workshop, and these technical skills are not embedded in a learning context. Participants may leave traditional workshops understanding how the tool works rather than knowing how to apply that technical knowledge to design technology-enhanced instructional activities. However, the workshop based on the *Framework of TPACK-in-Practice* provides opportunities for participants to develop the three technological components of teacher knowledge that inform teacher practice (TPK-in-Practice, TCK-in-Practice, and TPCK-in-Practice). The goal is for teachers to leave the workshop being able to teach with the technology featured in the workshop in an authentic learning context.

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Appendix: The *Framework of TPACK-in-Practice*.