The SAGE Encyclopedia of Educational Technology

TPACK (Technological Pedagogical Content Knowledge)

Contributors: Matthew J. Koehler & Punya Mishra
Editors: J. Michael Spector
Book Title: The SAGE Encyclopedia of Educational Technology
Chapter Title: "TPACK (Technological Pedagogical Content Knowledge)"
Pub. Date: 2015
Access Date: June 04, 2015
Publishing Company: SAGE Publications, Inc.
City: Thousand Oaks,
Print ISBN: 9781452258225
Online ISBN: 9781483346397

DOI: http://dx.doi.org/10.4135/9781483346397.n318
Print pages: 783-786

http://dx.doi.org/10.4135/9781483346397.n318
Technological, pedagogical, and content knowledge— TPACK—refers to the framework developed by Punya Mishra and Matthew Koehler to describe the knowledge that teachers need in order to effectively teach with technology. The TPACK framework was developed to respond to two challenges confronting teacher educators. First, there was a systemic push for teachers to integrate technology in ways more consistent with the growth of technology outside of education. Second, there was limited treatment of technology for teachers, beyond generic uses. As Judith B. Harris and her colleagues reported, technology use in classrooms has historically been conceptualized and supported using a predominance of approaches that overemphasize technology and technology skills. These approaches typically include additional technology-focused teacher education courses; professional development workshops; and demonstration resources, lessons, and projects. Taken together, these approaches were labeled by Seymour Papert as *technocentric* because they begin with technology skills and only later aspire to help discern how these technologies can be used to teach content-based learning at different levels.

The TPACK framework, in contrast, characterizes what teachers need to know about technology by reconnecting technology to both subject-matter knowledge and teachers' pedagogical understanding. In this way, the TPACK framework builds upon the work of Lee Shulman and the construct of pedagogical content knowledge (PCK) that describes how and why teacher knowledge of pedagogy and content cannot be considered solely in isolation. PCK captured a unique type of knowledge that characterizes an interaction between pedagogy and content in order to implement strategies that help students to fully understand content. Similarly, the TPACK framework extends Shulman's notion of PCK by considering how technology, pedagogy, and content interrelate in order to create a form of knowledge greater than the sum of the three separate knowledge bases. This entry first describes the components of the TPACK framework and discusses the implications of the framework for teacher educators. It then discusses the different conceptual lenses the TPACK framework provides for researchers in the area of teaching with technology.

Components of the TPACK Framework

In order to characterize the knowledge needed to effectively teach with technology, three major knowledge components form the foundation of the TPACK framework. Four additional knowledge components characterize how these three bodies of knowledge interact, constrain, and afford each other. Together, these seven knowledge components—and attention to the context in which these knowledge components function—comprise the TPACK framework and are characterized as follows:

Content knowledge (CK): depth and breadth of understanding about the ideas, topics, or subject-matter knowledge that a teacher is planning to teach to students;

Pedagogical knowledge (PK): depth and breadth of understanding about a variety of instructional practices, strategies, and methods to promote students' learning;

Technology knowledge (TK): depth and breadth of understanding about technologies (new and old) for use in educational contexts;

Technological content knowledge (TCK): Understanding of the reciprocal relationship between technology and content; for example, what is being taught often defined and constrained by technologies and their representational and functional capabilities—accordingly, what is being taught affords or suggests some technologies over others;

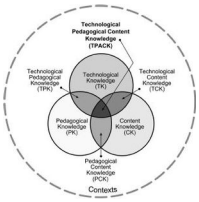
Pedagogical content knowledge (PCK): Shulman's idea of the understanding needed to teach particular subject matter, including an understanding of assessment, common misconceptions, and adapting instruction to diverse learners in specific subject matter;

Technological pedagogical knowledge (TPK): an understanding of technology and pedagogical practices, which can, and should, constrain and afford one another;

> *Technological pedagogical content knowledge (TPACK):* an understanding of the complex relations among technology, pedagogy, and content that enables teachers to develop appropriate and context-specific teaching strategies.

TPACK is grounded and situated in specific contexts, represented by the outer dotted circle in Figure 1. Teachers need an understanding of all of the knowledge components listed in this section in order to orchestrate and coordinate technology, pedagogy, and content into teaching. However, this understanding is tied to a specific context. What works in one classroom **[p. 783 ↓]** context is not guaranteed to work in a different classroom with a different teacher, student, goals, or learning environment.

Figure 1 Components of the TPACK framework



Implications for Teacher Educators

The TPACK framework characterizes the knowledge that teachers need in order to skillfully teach with technology. An important implication of the framework is that teacher educators must identify and utilize methods that best develop the complex and integrated forms of knowledge elucidated in the TPACK framework.

Researchers and teacher educators seeking to develop within the preservice teacher population must confront unique challenges, two of which are described here. First, preservice teacher candidates, for example, typically begin with minimal levels of all the TPACK constructs. Hence, there is not an existing knowledge base upon which to build knowledge of how to effectively integrate technology—TPACK. Second, as a new topic of research, there is not yet a corpus of evidence pointing to an agreed-upon approach, or route, to developing TPACK.

Despite these challenges, dozens of methods have been proposed for the development of the connected, contextualized knowledge described in the TPACK framework. Two approaches are described here: (1) learning technology by design and (2) activity types. Learning technology by design is a method to develop TPACK by utilizing design teams that collaborate on the design of a piece of educational technology. In a group that may include content experts and technology experts, teachers work to solve authentic problems of practice over an extended period of time. Design teams have created online courses, educational websites, and technology-integrated lesson plans. In this approach, the assigned tasks require teachers to develop and integrate all of the knowledge components of the TPACK model at once. For example, in designing an online course, what is being taught (CK), what instructional strategies to use (PK), and the specific technologies (TK) are being developed and learned in an integrated way. In this manner, technology is used to teach specific content with specific pedagogy.

The use of activity types is a method to build on teachers' existing knowledge in subject-matter disciplines. Teachers build knowledge about technology upon already existing knowledge of pedagogy (PK), content (CK), and pedagogical content knowledge (PCK). In this approach, learning experiences are focused upon curricular goals. Each learning experience can be broken down into smaller components that specify what students do during each portion of the learning experience. For example, a learning experience in social studies might require students to do the following activity types in sequence: *read text, research, debate, create a timeline, design an exhibit*, and *deliver a presentation*. For each activity type, specific technologies that support learning are identified; PowerPoint, Photo Story, Movie Maker, iMovie, and Audacity are well suited to support the *deliver a presentation* activity type. Researchers have identified 44 activity types that commonly occur in social studies teaching, along with technologies in support of those activity types. Activity type taxonomies have also been developed for literacy, mathematics, music, physical education, science, secondary English language arts, visual arts, and world languages.

Learning technology by design and activity types are two examples that demonstrate the diversity of methods proposed for the development of TPACK. This diversity of method and approach to developing TPACK knowledge is also found in other approaches to developing TPACK.

Implications for Researchers

The TPACK framework provides different conceptual lenses for researchers to understand the phenomena of teaching with technology. Four of these lenses—descriptive, inferential, analytic, and applied—are briefly described here.

Descriptive Lens

Theories and frameworks help researchers to make sense of the world by providing concepts and terminologies with which to describe phenomena. Accordingly, the TPACK framework can provide the terminology and structure needed to describe the complex web of relationships that exist when teachers integrate technology into the teaching of subject matter. Separating technology, pedagogy, and content, and the complex relationships between and among these bodies of knowledge, may be difficult in practice. The TPACK framework can help researchers identify the important components of teacher knowledge that are relevant to the thoughtful integration of technology in education. The TPACK framework may help to provide the starting point for a conceptualization and discussion of complex relationships in a methodological and grounded manner. Accordingly, frameworks like TPACK are helpful not only for identifying phenomena of interest in the world worthy of study but also for providing the language to talk, conceptualize, and explore relationships.

Inferential Lens

Theories and frameworks allow researchers to make inferences about the world, the way it works, and the consequences of changes to elements in the system. The TPACK framework allows researchers not just to understand what effective teaching with technology is about but also to make predictions and inferences about contexts under which such good teaching will occur. As suggested in the TPACK framework, teacher education programs that focus on generic technology skills development independent of content are not sufficient; these programs only address knowledge of technology

(TK) and ignore the connections with content (CK) and pedagogy (PK). In addition, the TPACK framework allows researchers to look more closely at successful programs of technology integration and suggest inferences about the causal mechanisms underlying their success.

Analytic Lens

Theories and frameworks can also guide the design and analysis of research. The TPACK framework provides a map of the constructs to be measured—the components of the TPACK framework. These measures provide data in support of research questions about the knowledge of individual teachers or groups of teachers, changes in knowledge over time, and the mastery of the knowledge components.

Quality measures of the constituent TPACK components are a prerequisite guiding much of the research in this area. How these components are measured as well as what these measurements represent raise important epistemological issues. However, what is evident is the close connection between the analytic frameworks guiding research in the area of technology integration and the conceptual framework provided by the TPACK framework.

Applied Lens

Theories and frameworks, particularly those in the arena of education, can help researchers to apply ideas to the real world. The TPACK framework offers two pragmatic insights into applied settings that help researchers build better learning contexts. First, by suggesting the types of knowledge individual approaches are likely to develop (or not develop) in teachers, the TPACK framework can scaffold an analysis of approaches to teachers' professional development. For example, the TPACK framework provides an applied approach for understanding why technocentric professional development approaches are unlikely to produce knowledge of technology that is connected to pedagogical and content knowledge—that is, knowledge that is truly needed by teachers. Second, the TPACK framework can guide the evaluation of teacher professional-development programs and learning contexts through the closely

connected analytic lens that TPACK provides. By suggesting measures of teacher knowledge, the TPACK framework may prove helpful as a means of evaluation and communication about the components of teacher knowledge and the effectiveness of approaches aimed at developing teachers' knowledge.

See alsoMeasuring and Assessing TPACK (Technological Pedagogical Content Knowledge); Pedagogical Knowledge; Technology Integration; Technology Knowledge

Matthew J.KoehlerPunyaMishra

http://dx.doi.org/10.4135/9781483346397.n318
Further Readings

Angeli, C., & Valanides, N. (2009). Epistemological and methodological issues for the conceptualization, development, and assessment of ICT–TPCK: Advances in technological pedagogical content knowledge (TPCK) . Computers & Education , 52(1), 154–168. doi:http://dx.doi.org/10.1016/j.compedu.2008.07.006

Brush, T., & Saye, J. W. (2009). Strategies for preparing preservice social studies teachers to integrate technology effectively: Models and practices . Contemporary Issues in Technology and Teacher Education , 9(1), 46–59.

Graham, C. R. (2011). Theoretical considerations for understanding technological pedagogical content knowledge (TPACK) . Computers & Education , 57(3), 1953–1960.

Harris, J. B., & Hofer, M. J. (2011). Technological pedagogical content knowledge (TPACK) in action: A descriptive study of secondary teachers' curriculum-based, technology-related instructional planning . Journal of Research on Technology in Education , 43(3), 211–229.

Harris, J. B., Mishra, P., & Koehler, M. J. (2009). Teachers' technological pedagogical content knowledge and learning activity types: Curriculum-based technology integration reframed . Journal of Research on Technology in Education , 41(4), 393–416. doi:http://dx.doi.org/10.1207/s15326985ep2803_7

Koehler, M. J., & Mishra, P. (2005). Teachers learning technology by design . Journal of Computing in Teacher Education , 21(3), 94–102.

Koehler, M. J., Shin, T. S., & Mishra, P. (2011). How do we measure TPACK? Let me count the ways . In R. N.Ronau, C. R.Rakes, & M. L.Niess (Eds.), Educational technology, teacher knowledge, and classroom impact: A research handbook on frameworks and approaches (pp. 16–31). Hershey, PA: IGI Global.

Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge . Teachers College Record , 108(6), 1017–1054. doi:http://dx.doi.org/10.1111/j.1467-9620.2006.00684.x

Niess, M. L., van Zee, E. H., & Gillow-Wiles, H. (2011). Knowledge growth in teaching mathematics/science with spreadsheets: Moving PCK to TPACK through online professional development . Journal of Digital Learning in Teacher Education , 27(2), 42–52.

Papert, S. (1987). Computer criticism vs. technocentric thinking . Educational Researcher , 16(1), 22–30.

Shulman, L. S. (1986). Those who understand: Knowledge growth in teaching . Educational Researcher , 15(2), 4–14.