

AERA 2008 Proposal

SIG: Teaching as an Agent of Change in Teaching and Learning

Title: **Technological Pedagogical Content Knowledge (TPCK): A Conceptual Framework with Examples for Integrating Technologies into Teacher Education**

Abstract: This symposium will present a framework, *Technological Pedagogical Content Knowledge (TPCK)*, for integrating multiple technologies into teacher education. TPCK represents a new direction in understanding the complex interactions among content, pedagogy and technology that can result in successful integration of multiple technologies in classroom practice. Attendees will be provided with an overview of the TPCK framework, including its impact on issues of diversity and equity of access. This will be followed by papers on the application of TPCK to pre-and in-service teacher education programs, emphasizing mathematics, science, social studies, secondary English, and world languages. Specific strategies and examples for fostering technology integration will be included and implications and directions for future research on TPCK in teacher education will be discussed.

Consent for Audiotaping: *Check with Authors*

Length of Session: 1.5 hours

Estimated Attendance: 50

Descriptors: *Check list on submission page*

Special Requests: *Check with authors*

ADA: None

Names, affiliations, email addresses for session organizer, chair, and participants

Session Organizer/Leader: Joel A. Colbert, Chapman University, colbert@chapman.edu

Participants: Charoula Angeli, University of Cyprus, cangeli@ucy.ac.cy

Joan E. Hughes, University of Texas at Austin,

joanh@mail.utexas.edu

Mario Kelly, Hunter College, mkelly@hunter.cuny.edu

Matthew J. Koehler, Michigan State University,

mkoehler@msu.edu

John Lee, North Carolina State University, john_lee@ncsu.edu

Punya Mishra, Michigan State University, punya@msu.edu

Maggie Niess, Oregon State University, niessm@onid.orst.edu

Marcela van Olphen, Univ. of South Florida,

Vanolphen@coedu.usf.edu

Discussant: Nicos Valanides, University of Cyprus, nichri@ucy.ac.cy
Sharon Guan, DePaul University, xguan@depaul.edu

AV Equipment Needed: *Check with participants*

General Description

Calls for teachers to increasingly integrate technology into classroom practice are not new, but developing the teacher knowledge, skills, and dispositions required to do so result in a “wicked problem” (Rittel and Webber, 1973). Though many researchers have suggested that comfort and competence with technological tools alone are not sufficient for meaningful curriculum-based educational technology use, technocentric approaches to educating teachers have dominated both pre-service and in-service teacher education.

This symposium will present a conceptual framework for the type of teacher knowledge, skills, and dispositions necessary for successful technology integration: *Technological Pedagogical Content Knowledge (TCPK)* (Colbert et al, in press). This framework represents a new direction in understanding the complex interactions among content, pedagogy and technology that can result in successful integration of technology in classroom practice.

The session will provide attendees with an overview of the TPCK framework, a discussion of contextual issues related to equity and access, discussions of specific applications for fostering technology integration knowledge, skills, and dispositions in pre-service and in-service teacher education, social studies education, language arts education, mathematics education, science education, and world language education. Finally, the implications of TPCK development in both pre-service and in-service teacher education and future research needs and opportunities will be discussed.

References

Colbert, J., Boyd, K., Clarke, K., Guan, S., Harris, J., Kelly, M., and Thompson, A. (in press) (Eds.). *The Handbook of Technological Pedagogical Content Knowledge for Educators*. London, UK: Routledge.

Rittel, H.W. and Webber, M.M. Dilemmas in a general theory of planning. *Policy Sciences*, 4 (1973), 155-169.

Description of Each Presentation

Paper 1: Introducing Technological Pedagogical Content Knowledge

Punya Mishra & Matthew J. Koehler
Michigan State University

Recently, considerable interest has surfaced in using the notion of Technological Pedagogical Content Knowledge (TPCK) (Mishra & Koehler, 2006; Koehler & Mishra, in press) as a framework for the teacher knowledge required for effective technology integration. TPCK arises from multiple interactions among content, pedagogical, and technological knowledge. It

encompasses understanding the representations of concepts using technologies; pedagogical techniques that apply technologies in constructive ways to teach content in differentiated ways according to students' learning needs; knowledge of what makes concepts difficult or easy to learn and how technology can help redress conceptual challenges; knowledge of students' prior content-related understanding and epistemological assumptions; and knowledge of how technologies can be used to build on existing understanding to develop new epistemologies or strengthen old ones.

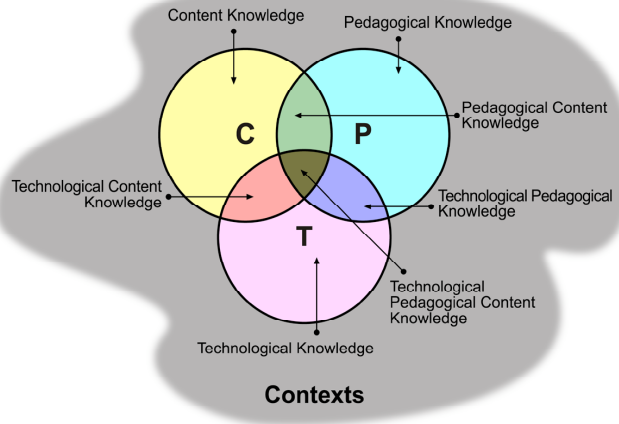


Figure 1. The TPACK framework and its knowledge components (Koehler & Mishra, in press)

Each instructional situation in which teachers find themselves is unique; it is an interweaving of these three factors, and accordingly, *there is no single technological solution that will function equally well for every teacher, every course, or every pedagogical approach*. Rather, solutions' successes lie in teachers' abilities to flexibly navigate the space delimited by content, pedagogy, and technology and the complex interactions among these elements as they are demonstrated in the multitude of specific instructional situations and contexts.

How are teachers to acquire an operational understanding of the complex relationships among content, pedagogy, and technology? Given the ever-evolving nature of educational research and practice, it is clear that we need to continue to invent, revise, expand, update, test, and otherwise explore the ways in which we understand and help teachers to develop flexible ways of thinking.

In this presentation we will establish the frame for the other presentations to follow by describing the foundational ideas of the TPACK framework, providing examples of research that indicates how teachers develop TPACK and provide pointers for future research.

Paper 2: **Bridging Digital and Cultural Divides: TPACK for Equity of Access to Technology**

Mario Antonio Kelly

Hunter College of the City University of New York

Cultural, socioeconomic, ethnic and linguistic differences play an important role in achievement, interacting with instruction, the curriculum and other factors, often to the

benefit of some students and the disadvantage of others. The use of technology in teaching does not automatically neutralize these differences, and in fact has the potential to exacerbate them. This is particularly true when students have different levels of access to technology outside of the classroom, and different levels of prior experience using technology.

This paper has two major objectives: 1) to describe, based on an extensive review of the literature, the multidimensional nature of the digital divide; and 2) to utilize Mishra and Koehler's concept of Technological Pedagogical Content Knowledge (TPCK) as a basis for instructional strategies for bridging digital and cultural divides during technology-mediated instruction.

The digital divide—race, SES, and culture-based differential access to technology and the Internet—has been well documented in countless recent journal articles. However, the digital divide is much more than differences in physical access. The paper proposed here will discuss how cultural, social and psychological factors have interacted in complex ways to create not only differential physical access to technology, but also other digital divides. These include differences in how students from different racial, income, and linguistic backgrounds are taught with technology, even within the same classroom, and differences in how students respond to technology mediated instruction.

The paper will also elaborate on Mishra and Koehler's TPCK framework to discuss the impact of cultural, social and psychological factors during technology-mediated instruction and to propose culturally sensitive instructional strategies for bridging the divides that often arise.

Paper 3: TPCK in Pre-Service Teacher Education: Preparing Primary Education Students to Teach with Technology

Charoula Angeli and Nicos Valanides
University of Cyprus

Technological Pedagogical Content Knowledge (TPCK) has been conceptualized by Mishra and Koehler (2006) as the intersection of three knowledge components, namely, content, pedagogy, and technology. In this paper, we will first argue for the need to expand Mishra and Koehler's (2006) existing framework to include learners as one of the interacting knowledge components. Thus, according to our characterization of the construct, TPCK is the form of knowledge that makes a teacher competent to teach with technology and can be described as the ways knowledge about tools and their affordances, pedagogy, content, and learners are synthesized into an understanding of how particular topics can be taught with technology, for specific learners, and in ways that signify the added value of technology. Then, based on this expanded view, we will explore two epistemological views regarding the teaching and assessment of TPCK, namely, the transformative and integrative views (Gess-Newsome, 1999). According to the transformative view, TPCK is considered to be a distinct set of knowledge constructed from other forms of teacher knowledge, whereas, according to the integrative view, TPCK is not considered a distinct form of knowledge, but a body of knowledge, which is made of from other forms of teacher knowledge that are integrated during the act of teaching. We argue that the transformative view is more appropriate for researching

TPCK, and we report on a methodology of how we went about cultivating and assessing TPCK in a preservice course with primary education students.

Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A new framework for teacher knowledge. *Teachers College Record*, 108(6), 1017-1054.

Gess-Newsome, J. (1999). Pedagogical Content Knowledge: An introduction and orientation. In J. Gess-Newsome & N. G. Nederman (Eds.), *Examining pedagogical content knowledge* (pp. 3-17). Dordrecht, The Netherlands: Kluwer Academic.

Paper 4: **TPCK in In-Service Teacher Education**

Maggie Niess

Oregon State University

Technological Pedagogical Content Knowledge (TPCK) is the knowledge teachers rely on in thinking strategically as they plan, organize, implement, revise and reflect on teaching specific content. Niess (2005), extending Grossman's (1989, 1991) four central components of pedagogical content knowledge (PCK) described TPCK as the knowledge and beliefs that teachers demonstrate that are consistent with:

1. An overarching conception about the purposes for incorporating technology in teaching the content;
2. Knowledge of students' understanding, thinking, and learning with technology;
3. Knowledge of curriculum and curricular materials that integrate technology in learning and teaching; and,
4. Knowledge of instructional strategies and representations for teaching and learning with technologies.

In-service teacher education programs focused on developing teachers' TPCK must support knowledge development in these components. What types of programs are effective in guiding teachers' development of TPCK? Multiple research efforts have been directed at preparing teachers to teach with technologies. Substantial qualitative differences in their TPCK have been identified. Analysis of the differences mathematics and science teachers' achieved TPCK from these programs has revealed five increasing levels of TPCK: recognizing, accepting, adapting, exploring and advancing. A meta-analysis of multiple and varied in-service teacher education programs resulted in extended descriptions for each of the TPCK levels and the various components of TPCK.

These extended descriptions provide a guide for educators in (1) designing programs to enhance in-service teachers' TPCK, (2) assessing teachers' progress in meeting the needs of their students in technology-enhanced classroom environments, and, (3) assessing initial and extended teacher education programs.

References

Grossman, P. L. (1989). A study in contrast: Sources of pedagogical content knowledge for secondary English. *Journal of Teachers Education*, 40(5), 24-31.

Grossman, P. L. (1991). Overcoming the apprenticeship of observation in teacher education coursework. *Teaching and Teacher Education*, 7, 245-257.

Niess, M. L. (2005). Preparing teachers to teach science and mathematics with technology: Developing a technology pedagogical content knowledge. *Teaching and Teacher Education*, 21(5), 509-523.

Paper 5: In-service Teachers' Use and Development of TPCK within Technology Inquiry Groups

Joan E. Hughes

University of Texas at Austin

This research paper describes how teachers' TPCK is evidenced within technology-focused inquiry groups and how such knowledge transformed into classroom-based technology integration. The in-service context for this study were collaborative technology inquiry groups, involving small groups of teachers who collectively investigate pedagogical and content issues (Hughes, Kerr, & Ooms, 2005; Hughes & Ooms, 2004).

The current study focused on the following research questions:

1. What categories of TPCK are revealed in in-service teachers' technology inquiry conversations?
2. How does an outside collaborator's and peer teachers' verbal contributions elicit teachers' TPCK during technology inquiry conversations?
3. Is there a pattern between the evidence of TPCK in technology inquiry "talk" and teachers' future adoptions and integration of technology for classroom learning purposes?

Participants included two different technology inquiry groups – one with 5 teacher participants at an urban middle school and one with 5 teacher participants at a rural high school. The researcher ("outside collaborator") was an active participant in both inquiry groups. Data for this study included transcripts of technology inquiry meetings across one year's time (the second year of each group's inquiry activities) and end of year teacher interviews. This study used discourse analysis methodology (Davies & Harré, 1990; Schiffrin, 1994; Tannen, 1989) to code the data and identify patterns to address the research questions.

Results show that the type of TPCK that is evidenced within conversations led to teachers' technological adoptions in ways that such knowledge affords. For example, teachers who consistently talk about pedagogical uses of technology (e.g., using personal response systems – "clickers") with little connection to content topics/subject matter goals adopted the technologies to support general pedagogical problems of practice such as increasing participation or motivation as opposed to directly supporting subject matter learning. Results show examples of the outside collaborator's and peers' turns at talk and how the content of such contributions provided potential and enacted growth opportunities for teachers to bring technology, pedagogy, and content together in the conversation. Finally, results show contrasts in "talk" and technology integration between the two groups that are interpreted through key differences in the participants, the group creation, and functional processes. Implications of this research focus on the value of collaborative teacher learning as well as the need for participants, whether external or internal to the school, to create conversational opportunities that move beyond technology tools and/or general pedagogical uses of technology.

References

- Davies, B., & Harré, R. (1990). Positioning: The discursive production of selves. *Journal for the Theory of Social Behavior*, 20(1), 43-63.
- Hughes, J. E., Kerr, S. P., & Ooms, A. (2005). Content-focused technology inquiry groups: Cases of teacher learning and technology integration. *Journal of Educational Computing Research*, 32(4), 367-380.
- Hughes, J. E., & Ooms, A. (2004). Content-focused Technology Inquiry Groups: Preparing urban teachers to integrate technology to transform student learning. *Journal of Research on Technology in Education* 36(4), 397-411.
- Schiffrin, D. (1994). *Approaches to discourse*. Cambridge, MA: Blackwell.
- Tannen, D. (1989). *Talking voices: Repetition, dialogue, and imagery in conversational discourse*. Cambridge, MA: Cambridge University Press.

Paper 6: **Social Studies, Democracy, and Technological Pedagogical Content Knowledge**

John K. Lee

North Carolina State University

Technological Pedagogical Content Knowledge (TPCK) has been conceived of as the intersection of the three domains of technology, pedagogy, and content knowledge. Mishra and Koehler (2006) argue that as an emerging theory, which draws on a number of variously well-developed existing theories, TPCK can be thought of as complex, multifaceted, and situated. A theoretical framework for TPCK and a practical “learning technology by designing” application of the framework developed by Mishra and Koehler (2006) emerged out of Shulman’s (1986) model of pedagogical content knowledge and Papert’s (1991) work on constructionism. The Mishra and Koehler (2006) TPCK framework and model requires that certain expectations for content and pedagogical thinking exist. Such considerations complicate TPCK in social studies, which as a field lacks an agreed upon or consistent content structure and has long been cleaved along a continuum representing conventional/lecture approaches and more active inquiry-based learning. Out of these complications emerges an opportunity to consider long-held alternative conceptualizations of the field.

This paper will argue for a conceptualization of TPCK in social studies that is focused on practical experiential learning, which uses content knowledge that is relevant for and focused on democratic life. The affordances of technology in social studies enable a wide variety of content-oriented democratic experiences in school social studies. These affordances relate to the use of technology for locating and adapting authentic digital resources, facilitating students’ work in non-linear environments, enabling students to make critical decisions about how to select and navigate through resources, developing critical media literacy skills, utilizing presentational capabilities of the Web to motivate and encourage students, using the Internet to extend collaboration and communication among students, and extending and promoting active and authentic forms of human interaction. Along with a discussion of how the affordances of technology enable experiential democratic life in content-rich environments, this paper will provide examples of TPCK in social studies practice.

References

Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A new framework for teacher knowledge. *Teachers College Record*, 108(6), 1017-1054.

Papert, S. (1991). Situating constructionism. In S. Papert & I. Harel (Eds.), *Constructionism* (pp. 1–11). Norwood, NJ: Ablex.

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

Paper 7: World Language Teacher Education and Educational Technology: A Look into CK, PCK, and TPACK

Marcela Van Olphen

University of South Florida

The aim of this presentation is to advance our current understanding of the types of knowledge world language teachers need to achieve in order to develop thoughtful and pedagogically sound approaches to integrate technology into their content area. Shulman's concepts of Content Knowledge (CK) and Pedagogical Content Knowledge (PCK) and Koehler & Mishra's concept of Technological Pedagogical Content Knowledge (TPCK) are used as springboards to frame this discussion as well as to move it forward.

According to Shulman (1987, p. 9), CK is the “knowledge, understanding, skill, and disposition that are to be learned by school children.” That is, world language teachers (WLT) need to develop the knowledge, understanding, skills, and disposition of their target language (e.g. French, German, Italian, Spanish, etc.). PCK “represents the blending of content and pedagogy into an understanding of how particular topics, problems, or issues are organized, represented, and adapted to the diverse interests and abilities of learners, and represented for instruction” (Shulman, 1987, p. 8). Within the context of world language teacher education, PCK constitutes what teachers know about teaching the target language to empower students to communicate across linguistic and cultural borders.

Drawing from Shulman's work, Mishra & Koehler (2006) contend that “thoughtful, pedagogical uses of technology require the development of a complex, situated form of knowledge we call *Technological Pedagogical Content Knowledge*” (p. 1017). Following Mishra & Koehler's (2006) explanation of how TPACK lies at the core of teaching with technology, it is possible to assert that the foundation of effective technology use in language teaching requires: (a) an understanding of how linguistic and cultural concepts can be represented using technology; (b) educational approaches to language teaching that draw from socio-constructivist philosophies to develop students' language and cultural competencies; (c) an awareness of what facilitates or hinders the acquisition of language and the development of language competence and how technology, specifically CALL or computer-mediated communication (CMC), can revamp common problems that students ordinarily face; (d) an awareness of students' previous knowledge, and particularly a knowledge of second language acquisition (SLA) and cognitive development theories; and (e) an understanding of how current and emerging

technologies can be used to advance present knowledge and to develop new epistemologies and sustain previous ones.

References

Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A new framework for teacher knowledge. *Teachers College Record, 108*(6), 1017-1054.

Shulman, L. S. (1987). Knowledge and teaching: Foundations of the new reform. *Harvard Educational Review, 57*(1), 1-22.