TPACK Newsletter, Issue #4: August/September 2009

Welcome to the fourth edition of the TPACK Newsletter, now with 494 subscribers (representing a 36% increase during the last four months!), and appearing bimonthly between August and April. If you are not sure what TPACK is, please surf over to www.tpack.org to learn more.

Gratuitous Quote about Technology
"My theme for philanthropy is the same approach I used with technology: to find a need and fill it."
- An Wang

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1. **Recent TPACK Articles**
TPACK was a "Top Story" on August 26, 2009 in both eSchoolNews and eCampusNews! A feature article ("TPACK explores Effective Ed-Tech Integration") written by senior editor Laura Delaney explained TPACK and its components in considerable detail, plus one way of helping teachers to develop TPACK: using curriculum-based learning activity types. Punya, Matt, Judi, Mark Hofer, and Karen Richardson were interviewed and provided the content for the feature stories.

Hot off the press! Judi Harris & Mark Hofer's Feature and Learning Connections articles are appearing in the September/October 2009 issue of *Learning & Leading with Technology*. "'Grounded' Technology Integration: Planning with Curriculum-Based Learning Activity Types" introduces a TPACK-based approach to technology integration during instructional planning, and "'Grounded' Technology Integration Using Social

Studies Learning Activity Types" illustrates how to do this in the social studies. Watch future 2009-2010 issues of *L&L* for more Learning Connections articles about math, world languages, science, K-6 literacy, and English language arts activity types, written with collaborators Neal Grandgenett, Marcela van Olphen, Meg Blanchard, Denise Schmidt, and Carl Young.

This summer, Judi, Punya & Matt published an overview of TPACK, emphasizing the roles of content and technological content knowledge, and how to help teachers to develop it, in the *Journal of Research on Technology in Education*, vol. 41, no. 4, pp. 393-416. The article is entitled, "Teachers' Technological Pedagogical Content Knowledge: Curriculum-based Technology Integration Reframed."

A few months earlier, Hyo-Jeong So (Nanyang Technological University) and Bosung Kim (University of Missouri) published the results of a study that "examined perceived difficulties and concerns that pre-service teachers encountered when applying their knowledge on technology, pedagogy and content to design a technology integrated lesson." They utilized a collaborative lesson design similar to Matt & Punya's Learning by Design approach to developing TPACK. The article, "Learning About Problem-based Learning: Student Teachers Integrating Technology, Pedagogy and Content Knowledge," was published in the *Australasian Journal of Educational Technology*, 25(1), pp. 101-116. A .pdf of the article is available for your perusal.

Abstract:
"What should constitute knowledge bases that we expect our future teachers to gain related to pedagogically sound technology integration? Employing the Shulman's teacher knowledge base as a theoretical lens, this study examined the complexity of pre-service teachers' technological pedagogical content knowledge (TPCK) in the context of integrating problem based learning (PBL) and information and communications technology (ICT). Ninety-seven pre-service teachers in this study engaged in a collaborative lesson design project where they applied pedagogical knowledge about PBL to design a technology integrated lesson in their subject area of teaching. Data were collected from two sources: survey and lesson design artifacts. Data analyses revealed that while participants had theoretical understandings of pedagogical knowledge about PBL, their lesson designs showed a mismatch among technology tools, content representations, and pedagogical strategies, indicating conflicts in translating pedagogical content knowledge into designing pedagogically sound, technology integrated lessons. The areas that students perceived to be particularly challenging and difficult include: a) generating authentic and ill-structured problems for a chosen content topic, b) finding and integrating ICT tools and resources relevant for the target students and learning activities, and c) designing tasks with a balance between teacher guidance and student independence. The present study suggests the potential of two explanations for such difficulties: lack of intimate connection among beliefs, knowledge, and actions, and insufficient repertoires for teaching with technology for problem based learning."

2. **TPACK-in-a-text(book)**

Candace Figg (Brock University) and Jenny Burson (LeTourneau University) are pleased to announce a new arrival: their TPACK-based preservice text, *Designs for UnPacking Technological Pedagogical Content Knowledge (TPACK): A Handy Guide for Teaching with Technology*, which will be released on September 5, 2009 by Soleil Publishing. Additional information about the book, including sample pages and a table of contents, is available online.

3. (Sort of) **Recent TPACK Articles**

Two recent issues of Contemporary Issues in Technology and Teacher Education (CITE) featured articles on TPACK. In a special issue devoted to TPACK (volume 9, issue 1), six articles appeared:

TPACK: A Framework for the CITE Journal
G. Bull & L. Bell

Mathematics Teacher TPACK Standards and Development Model
M. L. Niess, R. N. Ronau, K. G. Shafer, S. O. Driskell, S. R. Harper, C. Johnston, C. Browning, S. A. Özgün-Koca, & G. Kersaint

Abstract:
"What knowledge is needed to teach mathematics with digital technologies? The overarching construct, called technology, pedagogy, and content knowledge (TPACK), has been proposed as the interconnection and intersection of technology, pedagogy, and content knowledge. Mathematics Teacher TPACK Standards offer guidelines for thinking about this construct. A Mathematics Teacher Development Model describes the development of TPACK toward meeting these standards. The standards and model provide structured detail to further the work of various groups. The proposals may guide teachers, researchers, teacher educators, professional development consultants, and school administrators in the development and evaluation of professional development activities, mathematics education programs, and school mathematics programs."

Teaching Science with Technology: Case Studies of Science Teachers' Development of Technology, Pedagogy, and Content Knowledge
S. S. Guzey & G. H. Roehrig

Abstract:
"This study examines the development of technology, pedagogy, and content knowledge (TPACK) in four in-service secondary science teachers as they participated in a professional development program focusing on technology integration into K-12 classrooms to support science as inquiry teaching. In the program, probeware, mind-mapping tools (CMaps), and Internet applications ― computer simulations, digital images, and movies — were introduced to the science teachers. A descriptive multicase study design was employed to track teachers' development over the yearlong program. Data included interviews, surveys, classroom observations, teachers' technology integration plans, and action research study reports. The program was found to have positive impacts to varying degrees on teachers' development of TPACK. Contextual

factors and teachers' pedagogical reasoning affected teachers' ability to enact in their classrooms what they learned in the program. Suggestions for designing effective professional development programs to improve science teachers' TPACK are discussed."

Strategies for Preparing Preservice Social Studies Teachers to Integrate Technology Effectively: Models and Practices
T. Brush & J. W. Saye

Abstract:
"This paper describes strategies used by the authors to assist preservice social studies teachers with understanding and applying models and practices for effectively integrating technology into their future classrooms—thus, strengthening the link between technology and pedagogy (or technological pedagogical content knowledge). Efforts with preservice teachers described here have been informed by the authors' successes assisting in-service teachers with understanding how technology can empower inquiry-based teaching practices in social studies classrooms, as well as efforts to more fully integrate technology into the overall teacher education programs at the authors' institutions."

What Is Technological Pedagogical Content Knowledge?
M. J. Koehler & P. Mishra

Abstract:
"This paper describes a framework for teacher knowledge for technology integration called technological pedagogical content knowledge (originally TPCK, now known as TPACK, or technology, pedagogy, and content knowledge). This framework builds on Lee Shulman's construct of pedagogical content knowledge (PCK) to include technology knowledge. The development of TPACK by teachers is critical to effective teaching with technology. The paper begins with a brief introduction to the complex, ill-structured nature of teaching. The nature of technologies (both analog and digital) is considered, as well as how the inclusion of technology in pedagogy further complicates teaching. The TPACK framework for teacher knowledge is described in detail, as a complex interaction among three bodies of knowledge: Content, pedagogy, and technology. The interaction of these bodies of knowledge, both theoretically and in practice, produces the types of flexible knowledge needed to successfully integrate technology use into teaching."

Examining TPACK Among K-12 Online Distance Educators in the United States
L. Archambault & K. Crippen

Abstract:
"With the increasing popularity and accessibility of the Internet and Internet-based technologies, along with the need for a diverse group of students to have alternative means to complete their education, there is a major push for K-12 schools to offer online courses, resulting in a growing number of online teachers. Using the Tailored Design survey methodology (Dillman, 2007), this study examines a national sample of 596 K-12 online teachers and measures their knowledge with respect to three key domains as described by the TPACK framework: technology, pedagogy, content, and the

combination of each of these areas. Findings indicate that knowledge ratings are highest among the domains of pedagogy, content, and pedagogical content, indicating that responding online teachers felt very good about their knowledge related to these domains and were less confident when it comes to technology. Correlations among each of the domains within the TPACK framework revealed a small relationship between the domains of technology and pedagogy, as well as technology and content (.289 and .323, respectively). However, there was a large correlation between pedagogy and content (.690), calling into question the distinctiveness of these domains. This study presents a beginning approach to measuring and defining TPACK among an ever-increasing number of K-12 online teachers."

In volume 9 issue 2 of CITE, three TPACK-based articles appeared:

Mathematics Teachers' Development, Exploration, and Advancement of Technological Pedagogical Content Knowledge in the Teaching and Learning of Algebra
S. Richardson

Abstract:
"This article describes experiences from a professional development project designed to prepare in-service eighth-grade mathematics teachers to develop, explore, and advance technological pedagogical content knowledge (TPCK) in the teaching and learning of Algebra I. This article describes the process of the participating teachers' mathematical activities and teaching and learning tasks, each of which required a TPCK framework. Sessions were organized to transform content through strategies that integrate technology with the teachers' content and pedagogical knowledge. Content of the professional development sessions ranged from analyzing algebraic learning activities to examining appropriate uses of technology in the teaching and learning of algebra. Teachers participated in 60 hours of summer sessions and 60 hours of academic year sessions. Results revealed the need to provide teachers with opportunities to develop and explore an integration of technological, pedagogical, and content knowledge in the teaching and learning of algebra."

Giving, Prompting, Making: Aligning Technology and Pedagogy Within TPACK for Social Studies Instruction
T. C. Hammond & M. M. Manfra

Abstract:
"Technological pedagogical content knowledge (now known as technology, pedagogy, and content knowledge, or TPACK) has become a widely referenced conceptual framework within teacher education. It provides a common language to discuss the integration of technology into instruction (Koehler & Mishra, 2008) and builds upon the concepts of pedagogical content knowledge (Shulman, 1987) and teacher as curricular "gatekeeper" (Thornton, 2001a, 2001b). This paper describes a three-part pedagogical model—giving-prompting-making—to explicate the relationship between pedagogy and technology within the social studies classroom. This model is intended to enhance the TPACK framework by providing a clear and intuitive comparison between social studies

teachers' pedagogical aims and their choices with technology. The giving-prompting-making model can be used to guide social studies teacher education students to make the most appropriate use of technology."

Enhancing TPACK With Assistive Technology: Promoting Inclusive Practices in Preservice Teacher Education
M. T. Marino, P. Sameshima, & C. C. Beecher

Abstract:
"As the global community continues the transition from an industrialized factory model to an information and now participatory networked-based society, educational technology will play a pivotal role in preparing students for their futures. Many teacher preparation programs are failing to provide preservice teachers with the knowledge, skills, and dispositions necessary to adopt and utilize technology effectively. This paper presents an enhanced technology, pedagogy, and content knowledge (TPACK) model that adds assistive technology as a means to promote inclusive educational practice for preservice teachers. This model offers substantive promise for improving learning outcomes for students with disabilities and other traditionally marginalized populations who receive the majority of their classroom instruction in general education settings. This paper extends the TPACK model by providing specific examples of how assistive technology and instructional technology are distinct yet overlapping constructs. Essential technology skills for preservice teachers and strategies supporting inclusive educational practice are identified."

4. **Recent TPACK Presentations**
Maggie Niess (Oregon State University) will present a paper entitled "Mathematics Teacher TPACK Standards and Revising Teacher Preparation" at the 10th International Conference of The Mathematics Education Into the 21st Century Project, "Models in Developing Mathematics Education," which will take place on September 11-17, 2009 in Dresden, Saxony, Germany.

Bill Bauer, the Director of Music Education at Case Western Reserve University, will be presenting "Music Teachers and Technology: The TPACK Framework" at the Society for Music Teacher Education's 2009 Symposium on Music Teacher Education: Enacting Shared Visions, September 10-12, 2009 at the University of North Carolina at Greensboro.

There were several TPACK-based sessions at the National Educational Computing Conference (NECC) in Washington, DC in late June 2009:

> Teresa Foulger and Maureen Gerard (Arizona State University) presented the results of their study, "Making the Ideal Real: Reciprocal Mentoring and Technology in Preservice Education." A .pdf of their paper is available online for your perusal.

Judi Harris and Mark Hofer presented a Spotlight Session entitled, "Developing TPACK: Teachers' Technology Integration Knowledge in Action." A video of that presentation is available online, as well as the slides that they used (.mov file) during the talk.

A sold-out workshop, "School 2.0 and Understanding by Design," presented by Chris O'Neal and Donna Herold, was co-sponsored by ISTE, ASCD, the Central Susquehanna Intermediate School District and the US Department of Education. Punya noted in his blog that the talk tied together UbD ideas with TPACK (starting at about 14:50) in an interesting way. A recording of the workshop is archived for viewing.

We learned about a fascinating paper about helping teachers to develop TP**S**K – technological pedagogical *statistical* (and probability) knowledge – that was presented at the 2009 Conference on Research in Undergraduate Mathematics Education in February. A .pdf of the paper, "Preparing to Teach Mathematics with Technology: Lesson Planning Decisions for Implementing New Curriculum," written by Sarah Ives, Hollylynne Lee, and Tina Starling (North Carolina State University) is available online for your perusal.

Last but certainly not least, we discovered presentation slides by Dan Maas, Chief Information Officer for the Littleton Public Schools in Colorado, which interpret TPACK vis-à-vis 21st-century technologies. An entry in Dan's blog explains that these slides supported a reflective exercise for educators that focused on "inspired writing."

5. TPACK Podcasts

"Understanding TPCK," one of the "Teaching in the 21st Century" series of weekly podcasts for teachers, was posted recently by the Maine School Administrative District 75. The podcast explains TPACK and provides examples of TPACK in practice, in which 21st technologies were repurposed creatively for educational use. For example, in Bill's English class students used Twitter to create microblogs to discuss the books that they're studying. This podcast was created in response to Matt & Punya's feature article in the May issue of *Learning & Leading with Technology*, "Too Cool for School? No Way! Using the TPACK Framework: You Can Have Your Hot Tools and Teach with Them, Too." All podcasts in the series are produced and edited by students in MSAD 75's middle and high school.

A thoughtful and thorough podcast prepared by Ruben Puentedura for the Maine Learning Technology Initiative Fall Teacher 2008 Leader Institutes was shared recently by Lydia Leimback in her blog, "Teacher Tech." Dr. Puentedura introduces and explains two conceptual models that can be used together: TPACK and SAMR. SAMR stands for Substitution, Augmentation, Modification, and Redefinition, which focus upon the roles that digital technologies play in changing the nature of students' learning, when compared to the use of more traditional technologies for the same or similar learning activities. Illustrative examples of higher education courses are provided to show how TPCK and SAMR can work together in designs for students' learning. A transcribed version of the podcast is also available.

6. **TPACK Research in Progress**
Julie Mueller (Wilfrid Laurier University) is currently examining pre- and post-questionnaire, interview, and observation data generated with teachers, administrators, and students as part of an elementary school-initiated laptop integration project, using TPACK as her theoretical framework.   The preliminary results of this study suggest that teachers do indeed consider all of the components of TPACK when planning and providing instruction, but they are not always integrated. In addition to identifying behavioral measures of TPACK (which Julie feels are much-needed at present in TPACK research), student outcomes will be used to measure the impact of the laptop integration. Julie hopes to present the results of this project at SITE 2010.

Ghaida Alayyar, a doctoral student at the University of Twente working with her supervisors, Drs. Petra Fisser and Joke Voogt, is studying the use of TPACK as a framework to change the nature of preservice science education in Kuwait. Joke writes, "The current curriculum for prospective student- teachers in Kuwait is characterized by a teacher-centered approach and only has an optional course on basic technology applications. The content of the new course is based on the ideas of TPACK. In the first phase of the study (currently underway) a group of 50 science students is designing elementary science technology applications in small groups (3-4 persons). They are coached by subject matter, pedagogical and technology experts. …In the second phase of the study, a new group of prospective students will be involved, with part of the coaching happening via a Web-based support system. Data about student-teachers' TPACK competencies will be collected before and after the course with the TPACK survey developed by Schmidt, Baran, Thompson, Koehler, Mishra & Shin."

Are you researching TPACK? Please consider adding a description of your research methods to the TPACK wiki's "Researching TPACK" section and/or sending us a brief overview of your ongoing work to share in this newsletter.

7. **TPACK Professional Development**
As mentioned in the first TPACK Newsletter (January 2009), Craig Cunningham reports that the faculty at National-Louis University in Chicago were involved in a Faculty Senate-funded TPACK faculty development project during the 2008-2009 academic year. In the project, small groups of teacher-education and subject-matter faculty worked with technology "experts" from the faculty to develop ways to integrate technology, pedagogy, and content knowledge. The various groups worked on topics such as using video to teach interviewing techniques, using Web cameras to conduct live chats with science experts, and ways to better use interactive whiteboards. Faculty enthusiasm for the project at the end of the year led to the submission of a renewal grant for 2009-2010, which was recently awarded! The second year of the project will continue the work of the first year, with the addition of a monthly series of TPACK-based seminars designed to increase faculty expertise across the university.   For more information, please contact arlene.borthwick@nl.edu or craig.cunningham@nl.edu.

8. **Recently Completed TPACK-based Dissertations & Theses**

Chauser, J. (2009). *Instruction 2.0: Effective education for the 21st century*. Master's thesis, Michigan State University.

In this thesis, Jacqueline describes the design and implementation of a professional development course for teachers. Building on the TPACK framework, the course encourages an integrated approach to using technology for instruction and respects the interconnectedness of the three knowledge bases required for such integration.

Richardson, K. W. (2009). *Looking at/looking through: Teachers planning for curriculum-based learning with technology*. Doctoral dissertation, College of William & Mary.

Abstract:
"This interpretivist study drew upon the Technological Pedagogical Content Knowledge (TPACK) framework (Mishra & Koehler, 2006; Thompson & Mishra, 2007-2008; Koehler & Mishra, 2009) to study teachers' lesson planning processes. It focused upon 12 fifth, sixth and seventh grade content area teachers from three southeastern U.S. school districts as they planned for and used digital technologies during lessons in their classrooms. Participating teachers were interviewed about the processes they used to plan instruction, focusing upon how they determined which technologies might be used. In addition, sample technology-infused lessons were observed to see how the plans were put into action. Each of the different types of knowledge represented in the TPACK framework was evidenced in the teachers' planning. Though pedagogical (P), content (C), technological (T) knowledge, and PC, TP, TC, and TPACK were represented, interactions between technology and pedagogy (TP) took precedence. As the teachers planned and implemented lessons, they followed Shulman's (1987a) Model of Pedagogical Reasoning and Action, loosely applied. They incorporated technology use into existing practices and routines, and all of those uses can be classified according to Harris and Hofer's (2009a) learning activity types. At the time that the study was conducted, participating teachers were beginning to develop specific instructional routines related to the use of digital technologies in instruction. These routines were related to learning activity types. The study's results can assist those who work with teachers and technology, since they reveal teachers' thinking and decision-making during instructional planning that incorporates educational uses of technology."

Terpstra, M. A. (2009). *Developing Technological Pedagogical Content Knowledge: Preservice teachers' perceptions of how they learn to use educational technology in their teaching*. Doctoral dissertation, Michigan State University.

Abstract:
This study uses activity theory and current conceptions of knowledge for teaching content with technology to analyze the working knowledge and experience of a group of seven preservice teachers in order to yield insights into how preservice teachers learn to teach with technology. Seven preservice teachers, two secondary and five elementary, who had participated in a technology integration mini grant program shared their internship technology implementations and their perspectives on how they learned to teach with

technology. The preservice teachers' data on technology implementations were analyzed for evidence of Technological Pedagogical Content Knowledge (TPACK) and its components. Using activity theory, the preservice teachers' perspectives on learning to teach with technology were examined for settings and mediating tools that enabled the interns to learn to teach with technology.

Findings showed that the preservice teachers exhibited more Technology Knowledge than Technological Pedagogical Knowledge and Technological Pedagogical Content knowledge. In addition, preservice teachers exhibited more Technological Pedagogical Knowledge than Technological Pedagogical Content knowledge. Breadth of knowledge in terms of technology affordances exploitation and content area implementation was also examined. A developmental trajectory of learning to teach with technology is suggested that takes into account knowledge exhibition and breadth.

Several contributing activity settings were probed, including daily life, K-12 experiences, other workplaces, teacher education program, technology conference, mini grant program, internship placement setting, and online communities. Although the preservice teachers used digital technology in their daily lives and in some classes of their teacher education program, they did not notice or connect the Technology Knowledge and learning experiences to their own teaching. All the preservice teachers reported that they learned to teach with technology, in part, from interacting with fellow mini grant recipients and the coordinator, from designing lessons integrating technology, and from the conceptualizing technology as a tool to teach content. Through the mini grant program their identities as teachers who use technology also developed. In their internship placement settings, the preservice teachers recalled little assistance from their collaborating teachers or technology assistants in using technology to teach their students content.

The study suggests a framework of TPACKtivity that employs activity theory to track TPACK development. The findings suggest that teacher educators need to call explicit attention to educational technology modeling and aid their preservice teachers in making connections to possible K-12 implementations. Teacher educators can also aid preservice teachers in conceptualizing technology as a tool and employ lesson designing from pedagogical, content, or technology entry points. Both teacher educators and collaborating teachers need to recognize their own Pedagogical Content Knowledge and how, even if they lack technology knowledge, can assist their preservice teachers learn to teach with technology."

9. Learning and Doing More with TPACK

Interested in learning more about TPACK or getting more involved in the TPACK community? Here are a few ideas:

a.   Visit and contribute to the TPACK wiki at: http://tpack.org/
b.   Join the TPACK SIG at: http://site.aace.org/sigs/tpack-sig.htm
c.   Join and contribute to the TPACK Google group at:
        http://groups.google.com/group/tpack/
d.   Review and provide feedback on the TPACK Learning Activity Types at:
        http://activitytypes.wmwikis.net/

Feel free to forward this newsletter to anyone who might be interested in its contents.

Even better, have them subscribe to the TPACK newsletter by sending a blank email to sympa@lists.wm.edu , with the following text in the subject line:
subscribe tpack.news FirstName LastName
(of course, substituting their own first and last names for 'FirstName' and 'LastName' -- unless their name happens to be FirstName LastName, in which case they can just leave it as is).

If you have a news item that you would like to contribute to the newsletter, please send it to: tpack.news.editors@wm.edu

If you are interested in volunteering to help run the newsletter (we need help!), send email to: tpack.news.editors@wm.edu

Standard End-Matter
If you have questions, suggestions, or comments about the newsletter, please send those to tpack.news.editors@wm.edu .

If you are subscribed to the tpack.news email list, and -- even after reviewing this impressive publication -- you prefer not to continue to receive the fruits of our labors, please send a blank email message to sympa@lists.wm.edu , with the following text in the subject line: unsubscribe tpack.news

Have a great new school year, everyone! We'll be back in late October with issue #5 of the TPACK Newsletter.

- Judi, Matt, Mario, and Punya

Judi Harris,	Chair, College of William & Mary
Matt Koehler,	Vice-Chair, Michigan State University
Mario Kelly,	Futon, Hunter College
Punya Mishra,	Recliner, Michigan State University