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Judi Harris
College of William and Mary

Mark J. Hofer
College of William and Mary

Recommended Citation

The Construct is in the Eye of the Beholder:
School Districts' Appropriations and Reconceptualizations of TPACK

Judi Harris & Mark Hofer
School of Education, College of William & Mary
Williamsburg, Virginia USA
judi.harris@wm.edu   mark.hofer@wm.edu

Abstract: Despite debates about the specific parameters of its eight subcomponents, TPACK is generally understood within university-based teacher education communities as the knowledge needed to incorporate technologies—especially digital tools and resources—effectively in teaching and learning. How do professional development providers working within primary and secondary schools and districts conceptualize and operationalize TPACK? Our study of educational technology-related professional development in seven North American schools and districts in seven states/provinces found that educational leaders' discussion and operationalization of the TPACK construct differs from that of university-based researchers in intriguing and important ways. In these organizations, TPACK was both *appropriated* to reconnect curriculum and pedagogy with educational technology use after prior technocentric professional development was found to be lacking, and *reconceptualized* to focus more upon practice than knowledge.

Nine years have passed since the TPACK (technology, pedagogy, and content knowledge) theoretical construct (Thompson & Mishra, 2007) was introduced to the global educational technology community as technological pedagogical content knowledge (Koehler & Mishra, 2005; Mishra & Koehler, 2006). In less than a decade, university-based researchers have published approximately 800 articles, chapters, books, dissertations, and conference papers that examine, employ, and critique this way of understanding the knowledge that educators need to facilitate students' learning using educational technologies, especially digital tools and resources. The appearance of new TPACK-related scholarship over time shows no signs of slowing; during the last year alone, for example, the number of academic publications based in TPACK increased by approximately 25 percent (Harris & Hofer, 2013).

Yet as warmly as TPACK has been embraced in university-based teacher educators' work (Brantley-Dias & Ertmer, 2013), its diffusion in primary and secondary schools and districts has been considerably slower—and, as the results of this study showed, its K-12 conceptualizations and functions differ from how the construct has been understood and used in higher education. Extensive database and Web searches in early summer 2013 yielded approximately 60 elementary and secondary schools or school districts internationally (primarily within North America and Australia) that included mention of the TPACK construct in either organizational or professional development documents. Of those, online documents from 27 schools or districts showed that they had incorporated TPACK either frequently and/or in fundamental ways (e.g., using the construct in a district job title, such as "TPACK Coaches.")

Given TPACK's origins in higher education (Koehler & Mishra, 2005), its popularity with university-based researchers (Koehler, Mishra, Kereluik, Shin & Graham, 2014; Voogt, Fisser, Roblin, Tondeur, & van Braak, 2013), and an apparent intent for it to be used by researchers and postsecondary teacher educators (Brantley-Dias & Ertmer, 2013), we were curious about how it has made its way to school districts, why it was adopted there, and how it is understood and used in K-12 contexts for professional development purposes. To date, our work helping teachers to develop curriculum-specific TPACK in nine content areas (e.g., Harris & Hofer, 2009; Harris & Hofer, 2011), and assessing performance-based evidence of that knowledge (e.g., Harris, Grandgenett & Hofer, 2012; Hofer, Grandgenett, Harris & Swan, 2011), has focused upon a conscious process for TPACK-based professional development that works within teachers' everyday instructional planning processes and is taught by teacher educators. We became aware of K-12 schools and districts voluntarily appropriating these TPACK-based planning materials that we have developed, vetted, and made available via a Creative Commons license (http://activitytypes.wm.edu/). We were curious to see if and how the TPACK construct was being used in K-12 contexts in other ways as well. We began the study with no conscious beliefs or suppositions regarding how schools and districts understand and use TPACK for professional development beyond knowing that some K-12

organizations use our materials. We entered into this study, therefore, without expectations of either specific or general answers to our research questions.

Also, since relatively few schools and districts' online documents incorporated the TPACK construct in mid-2013, we thought that leaders within those organizations might find it helpful to consult with each other about the design and implementation of educational technology-related professional development that is informed, to some extent, by TPACK. To facilitate both professional networking among TPACK-using schools and districts, and the structured inquiry that we wished to initiate with a focused group of school- and district-based professional development providers, we organized and planned a two-day "TPACK Symposium."

The TPACK Symposium

It has long been acknowledged that sharing experiences in the form of stories is an engaging and effective way to share locally constructed, situated knowledge (Riessman, 1993). We reasoned that asking professional development providers in schools and districts that had voluntarily incorporated the TPACK construct to frame their TPACK-related work as stories to share and discuss with other professionals doing similar work in other educational organizations might facilitate an uncommon (and hopefully valuable) form of collaborative professional learning. Ideas shared by colleagues who are also helping K-12 teachers to develop and enact TPACK in other schools and districts could benefit home constituents indirectly, when symposium participants brought these ideas back home to try.

To form this group of professional development providers experienced with TPACK, we sent personalized email invitations to representatives from the 27 schools or districts that appeared to incorporate TPACK substantively within professional development plans and offerings, based upon documents located online with a series of exhaustive Web searches. We invited competitive application for 16 symposium seats, requesting two representatives participating from each of eight schools or districts. The Web-based application document requested contact and position information, plus answers to the following three requests for information:

- Please explain how TPACK frames professional development (PD) in your school or school district.
- Please describe one example of a PD session or other effort in your school/school district that is framed by TPACK.
- What might educators from other schools/districts/districts learn from your TPACK story?

In reviewing applicants' responses to these three questions, we sought to assemble a group of symposium participants whose schools and districts use TPACK in as diverse ways as possible. Fortunately, we had sufficient funding to invite representatives from all of the schools and districts that submitted applications.

Symposium Participants

During the symposium, representatives from seven schools or districts in five different U.S. states (plus the District of Columbia) and one Canadian province provided live, story-based presentations about how TPACK is used to shape and/or frame some of the professional development offered in their educational organizations. (Two schools were able to send only one representative each to the symposium, making the total number of attendees twelve, rather than fourteen.) Participants were provided with guidelines regarding the requested content of the presentations, and were asked to use a style and voice similar to a TEDTalk (http://www.ted.com/talks) while telling their "TPACK Stories" at the symposium. The guidelines recommended that the following four topics be addressed during the presentations, which were videotaped with participants' schools' or district's permission:

1. Focus:
   Your presentation should be primarily the *story* of how TPACK came to be used, and is used, to shape some of the professional development (PD) in your school/school district.

2. Background:

How did you first learn about TPACK? How and why did TPACK seem to be a "good fit" for some of your school/school district's professional development?

3. Description:
Please describe the PD in your school/district that reflects TPACK; both the "big picture" (e.g., goals, how it fits with other school/district efforts, etc.) and (especially) how it works.

4. Reflection:
What are your most important realizations that have resulted from participating in this PD effort?

The presentations were shared live during the two-day meeting at a southeastern U.S. university in summer 2013. The symposium was designed to facilitate information-sharing and deep discussion about the genesis and nature of the TPACK-based professional development that had emerged in each participating school or district. Symposium participants discussed each TPACK Story in depth immediately following its presentation, and later small- and large-group exchanges identified and explored additional ideas and questions prompted by the presentations and discussions. Videorecorded, lightly edited and formatted versions of the seven TPACK Stories were posted to the TPACK Stories Web site after the edited footage was approved by the corresponding symposium participants. All meeting expenses, save travel to and from the host university, were paid using host university-based funds from a faculty award.

Study Data

Five types of data: applications (online documents) to participate in the symposium, video recordings of symposium presentations, audiorecordings of group discussions in response to the presentations, school- and district-based documents that illustrated use of the TPACK construct, and audiorecordings of post-symposium interviews were generated and analyzed by the researchers in this study. The videorecorded presentations and the audiorecorded discussions among school district representatives that followed each and all of the presentations formed both the basis of the symposium's agenda. Participants' online application materials, collected via a customized Web form, that described the TPACK-based professional learning happening in their school or district were the first type of data generated. The content of the participants' applications reflected a wide variety of ways of appropriating TPACK, which were shared and discussed during the symposium. The videorecorded presentations and the audiorecorded discussions of each of those presentations, plus a discussion-based examination of common themes emerging across presentations, formed two more types of data generated for the study. Each pair of symposium participants also provided an audiorecorded follow-up interview during the five months following the symposium. Documents available on the school/school districts' Web sites, plus additional documents supplied by symposium participants that demonstrate and/or address the ways in which TPACK is used as a way to frame professional learning in represented schools and districts, comprised the final type of data generated for this study.

Participants' applications, presentations, and school and district TPACK-related documents were first analyzed holistically and independently by the two researchers, with each separately noting emerging patterns and themes related to the study's two related foci: how TPACK is understood and enacted in the schools and districts that were represented at the symposium. After completing these individual holistic analyses of the first three types of data, the researchers deliberated to compare and combine their data analysis notes.

Audiorecorded group discussion data were analyzed by the researchers collaboratively during the symposium, immediately following each day's presentations and discussions. Audiorecorded interview data were transcribed verbatim by a transcription service. All interview transcripts (and audio files as needed) were then examined by each of the researchers independently to reveal within-case and across-case themes relative to the study's two foci. The researchers met to combine and compare their interview data analysis notes, then considered, discussed, and agreed upon the themes emerging across all five data types from the seven participating schools/districts.

We report the results of this study comprehensively elsewhere (Harris & Hofer, 2014). In this paper, we focus in particular upon how the TPACK construct was reinterpreted—specifically, appropriated and reconceptualized—by the twelve participating school- and district-based professional development providers to fit the meso-level contexts (Porras-Hernandez & Salinas-Amescua, 2013) within which they work.

Appropriating the TPACK Construct

In many ways, the schools and districts that were represented in the TPACK Symposium appropriated the TPACK construct in light of their particular school and district contexts and cultures. In fact, when one participant was discussing the importance of linking the construct with her district's current professional development emphasis upon building teacher leaders, she stated, "Culture trumps everything you do." Connecting and interpreting TPACK with and according to current and past curriculum and professional development initiatives determined, to a large degree, how the construct was described by each participant, and also how it was enacted within each educational organization.

We identified three primary themes related to this appropriation of the construct: TPACK as the solution to a professional development problem; as an organizational learning process; and as a way to connect previously isolated professional development initiatives. These themes are discussed in the three subsections that follow. While all of these themes were not reflected in every school or district's TPACK Story, considerable discussion and agreement emerged around each of these three organizing ideas following the presentations during which they were illustrated.

Learning from Past Professional Development Challenges

Participants reported that discovering and exploring the TPACK construct helped them to understand what had been missing in their prior educational technology initiatives and professional development efforts: more deliberate and clearly articulated connections among educational technologies, curriculum content and pedagogy. In many of the schools and districts represented, participants described a shift in professional development away from a "tool-centric" approach to a more holistic, TPACK-based approach. As one participant commented, "Technology should not be the focus. That was a hard lesson for us to learn."

This realization led the participants to be more intentional about connecting recommended uses of educational technology tools and resources to curriculum standards. In multiple districts, for example, participants identified curriculum-based tools and resources and mapped them directly to either the district's curriculum standards or recommended instructional strategies and learning activity types. In this way, educational technologies were introduced in the context of many teachers' primary professional focus: addressing students' curriculum-based learning needs. Participants described how TPACK helped to provide a "common language" for the teachers, IT coordinators, and curriculum specialists in schools or districts to use to facilitate this particular type of change. As will be explained below, however, this transition in focus for educational technology use takes considerable time and effort. During that transition, some professional development providers' understanding of the TPACK construct shifted as they used it as a conceptual tool.

TPACK is a Journey

As stated above, all participants realized that prior "technocentric" (Papert, 1987) educational technology professional development had not been successful in catalyzing the extent of educational change desired in the schools and districts that had sent representatives to the symposium. Participants clearly recognized and articulated this disconnect from curriculum and pedagogy within their prior educational technology professional development efforts, albeit in different ways and to different extents. In many instances, this is precisely what made TPACK so appealing. The construct, which attempts to illustrate and explain the interrelated and interdependent nature of curriculum content, pedagogy, and technology knowledge, highlighted a perceived (but previously not fully addressed) need felt by these K-12 teacher educators. However, moving away from focusing upon the affordances and constraints of technological tools and resources is a process that requires time. All of the participants described themselves as being in the process of fully implementing the TPACK construct in their schools and districts, rather than having already met this goal.

One participating district, for example, is shifting from a "tool-centric" approach to educational technology professional development to a "focus tools" approach. In an effort to both standardize the use of a common set of flexible digital tools (e.g., Google Drive, Explain Everything) and to limit the technology knowledge required of

teachers, the district selected a discrete number of tools to include in their professional development initiatives. By narrowing the range of tools that would be supported, the district's instructional technologist was able to focus upon helping participating teachers to develop strong technological (TK) and technological pedagogical knowledge (TPK) (Mishra & Koehler, 2006). This knowledge then prepared them to connect pedagogically sound use of the tools to the district's curriculum. The participants from this district acknowledged that this professional development approach is structured around pedagogical use of selected tools, which might not seem like a TPACK-based effort. Yet, as one of the participants from the district commented, "If you can master the tools and master the process, you can be more creative [in addressing curriculum with technology]." To date, the educational technology-related professional development offered in this district does not address the development of teachers' TCK and TPACK nearly as much as their TK and TPK. The participants from this district acknowledged that structuring their work around "focus tools seems a bit counter-intuitive from what we started with: getting away from tool-centric thinking," and reported that their efforts in TPACK-based professional development are still evolving.

By contrast, representatives from another participating school district described how they had discovered the TPACK construct in 2008 and had been incorporating it systematically into their leadership and professional development initiatives ever since. The group was intentional in building awareness and buy-in with different layers of leadership in the district, including professional development providers, building-level administrators, and classroom teacher-leaders. Initially, they focused on TPACK-based professional development in literacy initiatives at multiple grade levels. They later embedded tools and resources into curriculum guides in a TPACK-based way as the district introduced content standards in ten different curriculum areas. Representatives from this district also presented a TPACK-based assessment system that included an observation instrument that helped administrators to assess the quality of technology integration during formal observations of classroom teachers. This systematic and phased approach to integrating TPACK into teacher professional learning in a district takes time to realize, and demonstrates the need for sustained commitment to such a process. It also suggests that successful TPACK-based work in schools and districts is probably best woven throughout multiple initiatives, as illustrated in the next section.

TPACK as a Connector

Several of the professional development providers at the symposium suggested that one of the key affordances of the TPACK construct for K-12 schools lies in the interconnected nature of the model's subdomains. The participants said that the graphical depiction of TPACK's interrelated components helped them to establish and strengthen connections among new and existing initiatives and programs in their schools and districts. In fact, multiple participants used the Venn diagram depiction of TPACK in their presentations during the symposium, superimposing text and images—representing multiple school or district initiatives—upon the construct's original diagram. These different versions of the TPACK diagram created by the symposium participants demonstrated how the construct was interpreted, implemented, and operationalized differently in different school and district contexts according to existing initiatives and emphases.

To many of the symposium's speakers, the TPACK construct became a way to connect seemingly disparate initiatives or projects in their school districts. Multiple participants characterized the construct as a "connector" or "glue." For example, prior to becoming aware of the construct, one large school division had developed a "skillful teacher" framework that guided professional development for the district. In this model, effective teaching incorporates knowledge and use of multiple skill sets, including technology integration. One of the participants from this district framed TPACK as "Find the right tool, at the right time, for the right learners." Another district had a strong, well-developed structure for instructional coaching as the primary vehicle for teacher professional development. A network of different types of coaches (e.g., literacy, math) was already in place to help the district realize its vision for personalized learning for each of its 56,000 students. Recognizing the complex teacher knowledge required to actualize this vision in the classroom, the district created a new type of coach – "TPACK Coaches" – to work with teachers and other coaches to help them connect the use of technology with curriculum and pedagogy. One participant from this district commented, "TPACK is a model that helps teachers see how it all fits," referring to new curriculum standards, technology initiatives, and more.

Reconceptualizing the TPACK Construct

While the examples presented above illustrate how the schools and districts represented at the symposium *appropriated* TPACK, we also found some evidence of their *reconceptualizations* of the construct. In some cases, these were comparatively minor adaptations of the construct; in other cases they seemed to alter key aspects of the construct itself. In the following three subsections, we share three themes and accompanying examples illustrating these reconceptualizations that emerged from analysis of the presentations and discussions at the symposium.

Well-Balanced Technology Integration

As explored by teacher educators and researchers to date, the TPACK construct represents interconnected domains of knowledge that teachers draw on to be able to effectively incorporate technologies within learning and teaching. Interestingly, *none* of the schools or districts participating in the TPACK Symposium characterized it in this way. To the symposium participants, *TPACK is not teachers' knowledge*. Rather, these educators seemed to see the construct as a way to describe *well-balanced technology integration in practice*. From this perspective, TPACK is somewhat external to the teacher. Participants characterized TPACK more as a leadership thinking tool; "a compass or guide" for ensuring that schools/districts are addressing curriculum content and pedagogy, in addition to technology, as they design, plan, and implement technology integration professional development for teachers. In this way, for the symposium participants, TPACK represents professional development that is not technocentric (Papert, 1987).

In two of the districts represented at the symposium, the TPACK construct guided the work of people other than teachers. In both of these organizations, these educators were instructional coaches, whose job it was to work with teachers, either individually or in small groups, as mentors. In essence, these coaches provided knowledge *for* the teachers about how and when to connect curriculum content, pedagogy, and technology tools and resources with whom they work. One of these two districts took this concept a step further in the formation of "instructional services teams" comprising teacher leaders with specific expertise (e.g., curriculum areas, technology, pedagogical approaches). These teams work with teachers who are organized into professional learning communities. The representatives from this district described the work as offering "professional learning, both embedded and after school, to support teacher learning to improve student understanding and…learning." Providing teachers with assistance in educational technology planning and implementation in these ways suggests that developing classroom teachers' independent TPACK has not necessarily been a focus in these two districts. A similar shift in focus for TPACK-based professional development is described next.

Focus on Practice Rather than Knowledge

While listening to the symposium participants' descriptions of how and why they incorporated the TPACK construct into their professional development efforts, we realized that they focused primarily on their teachers' technology integration *practice*, rather than on their TPACK *knowledge development.* This is quite different from the focus of much TPACK research with experienced teachers, which seeks to measure self-reported TPACK development, rather than its demonstration in the classroom. Even in the most curriculum-focused approach shared at the symposium, there seemed to be much more emphasis upon curriculum review and instructional planning processes (including plans for technology use) than upon developing the participating teachers' TPACK. Post-symposium interviews confirmed that growth in teachers' TPACK was assumed by the participants to occur naturally through multiple iterations of this collaborative professional development, but was not a specific aim of the work. Rather, the focus seemed to be on designing well-integrated, curriculum-based lessons, projects, and units for classroom implementation.

A majority of the symposium's participants looked to TPACK to assist with instructional planning. In the district that employed TPACK Coaches, coaches were charged with helping teachers plan in an integrated fashion. One of the participants from the district commented, "TPACK Coaches will … help teachers to plan with technology integration. What is the learning objective? What is the desired outcome? How can we help teachers to discern the appropriate tools to use?" Another school district integrated the use of TPACK-based learning activity types taxonomies (Harris & Hofer, 2009) to assist teachers in their planning of curriculum-based learning experiences for their students. Similar to the collaborative planning process and coaching model discussed above, the focus of this work seemed to be on the instructional planning process, rather than on targeted efforts to help teachers develop their TPACK. It seems reasonable to assume that as teachers engage in these experiences, they will

develop their TPACK organically. However, the symposium participants were far less interested in tracking this knowledge development than they were with focusing on teachers' practice.

TPACK as Distributed Knowledge?

One surprising finding from the study relates to how participants viewed the nature of the knowledge described in the TPACK construct. One of the participants, for example, used TPACK repeatedly as a verb. He conceptualized "TPACKing" as the process by which a team of teachers collaboratively develop their TPACK through a curriculum design, implementation, and review process. He characterized this process as a means for individuals with different expertise (e.g., classroom teacher, curriculum experts, instructional technologists, library media specialists) to incorporate their unique perspectives and knowledge into this curriculum review process. For example, as a teacher would discuss her approach to an upcoming unit on the solar system, the instructional technologist might share Web-based resources to provide students with multiple representations of the ways in which the planets revolve around the sun. The library media specialist might then offer a research strategy to help the students engage in collaborative research about the sun and planets. By each collaborating member sharing her knowledge, all of the members contribute their particular expertise "for the good of the group." In this case, it would seem that this participant views TPACK as a more *distributed* form of knowledge rather than an individual teacher's *integrated* knowledge. After the participant presented and explained this idea, several other school/district representatives echoed and expanded upon it, sharing their own strategies for "helping their teachers TPACK" in similar ways.

Other symposium participants seemed to hold quite different conceptions of TPACK's "location"— specifically, that it is interactively and collaboratively *built,* but *held* individually. In the schools and districts in which the primary approach to professional development is coaching—four of the seven school districts represented at the symposium—TPACK-building was a goal for interactions among collaborating teachers (e.g., same grade-level or content-area teachers), and especially between professional development coaches and their teacher-clients, but seemed to be assumed to be something held and used independently by individual teachers (and their coaches). We suspect that contextual conditions dictated these particular interpretations of the locus of TPACK, since instructional and curriculum planning in the two schools in which TPACK seemed to be distributed, rather than held individually by teachers and coaches, were "bottom-up," generative, collaborative, and professional learning community (PLC)-based.

Recommendations for Future Inquiry

Given the rather dramatic differences revealed in this study between conceptualizations and applications of the TPACK construct described by participating school- and school district-based educators, contrasted with those represented in the voluminous scholarly TPACK literature, further investigation of schools' and districts' appropriation and reconceptualization of TPACK could constitute an interesting and useful new line of educational technology research. Complementary recommendations for further investigation of the contextual aspects of and influences upon TPACK (Porras-Hernandez & Salinas-Amescua, 2013) and the possibility of differing conceptions of the construct as it is held and enacted by instructors working in elementary, secondary and higher education (Cox & Graham, 2009) suggest, along with the results of this study, that additional examination of the ways in which TPACK is built, held, and enacted in elementary and secondary schools and districts is warranted.

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