TPACK explores effective ed-tech integration

New teacher-education concept focuses on the intersection of technology, pedagogy, and content knowledge

By Laura Devaney, Senior Editor

As technology becomes an increasingly important tool for teaching and learning, a relatively new concept–focusing on how educators can effectively and effortlessly tailor technology to their instructional practices–is making its way into pre-service and in-service teacher education programs.

Technological Pedagogical Content Knowledge, or TPACK, is the work of Punya Mishra and Matthew Koehler, both associate professors of educational technology in the College of Education at Michigan State University.

At the center of the concept is how those three knowledge areas–technological knowledge, pedagogical knowledge, and content knowledge–interact with one another.

TPACK is achieved when those three forms of knowledge intersect, and Mishra and Koehler believe that true technology integration occurs when educators can understand and use those relationships fully.

The concept is built on Lee Shulman's idea of Pedagogical Content Knowledge, which examines the relationship between what an educator knows, and how he or she then transfers that knowledge to students–using different teaching approaches when necessary–in ways the students will understand, even if the subject matter is quite complicated.

Instead of emphasizing either teacher subject knowledge or pedagogy in isolation, Pedagogical Content Knowledge recognizes that the intersection between the two is important. When examined, that relationship can reveal which teaching methods are most appropriate for the content–and how the content can be restructured for better transfer of information.

TPACK takes this concept of Pedagogical Content Knowledge one step further, blending technological knowledge into the mix.

During a November 2008 webinar with the International Society for Technology in Education's Special Interest Group for Teacher Educators (SIGTE), Mishra and Koehler described the potential for technology's impact in the classroom.

"Technology is often seen as a solution to all kinds of problems, and it's sometimes not quite clear what the problems actually are," Mishra said.

Simply including technology in a classroom doesn't mean student learning will improve, he said. That depends on the teaching approaches used, in most cases. The technology employed and the way it's used to teach must be linked.

Given the rapid rate of technological change, teachers can find it hard to keep up. Mishra and Koehler suggest that, rather than focusing on particular technologies, it's more important for educators to focus on ways of thinking about how best to integrate technology.

Technology comes in many forms–some simple, like a compass, and some more advanced, like a GPS system. But both are examples of technology, Mishra said, because technology is something that makes it easier to complete a given task.

"Users often redefine technology," Mishra said. "Technology isn't something that will be used in just one way."

For instance, he continued, eMail was not originally meant for people to send eMail messages to themselves, but many people now send eMail files, reminders, and quick notes to their own eMail addresses.

"Every technology has a zone of possibility around it, and it's often the users who come in and determine what that zone of possibility is," said Mishra. "And it's this zone that allows for creativity in the classrooms."

When it comes to technology and teaching, Koehler and Mishra believe that technology influences knowledge, and vice versa.

Teaching is a complicated process, because not only must educators possess many traits–including wisdom, flexibility, creativity, and thoughtfulness–but they also must transfer knowledge to a class of people with different backgrounds, needs, and requirements.

And simply knowing a discipline, Mishra said, is not the same as teaching a discipline. A mathematician is not necessarily a great math teacher, he said; rather, high-quality teaching is really the transformation of content.

Transformation of content occurs when the educator understands where a learner is coming from– his or her background and conceptual knowledge.

"Teaching is about transforming disciplinary knowledge to meet the needs of students," said Mishra.

Technology has to be integrated into the content and pedagogy, but it has to be used in an innovative manner as well. If educators integrate technology effectively, it becomes more meaningful because it connects learners to the content–and something creative and new emerges from that effort.

"[Technologies] don't become educational technology just by virtue of being there," Mishra said. "Giving a student an iTouch or a laptop doesn't mean it becomes educational technology, it means that we have to repurpose the technology for education, [such as using] a GPS and Google Earth to teach aspects of math."

So, Mishra asked, how do educators get to the intersection of all three?

An important part of TPACK involves teachers becoming owners of the curriculum, because it is the teachers who have the capability to combine technology, pedagogy, and content.

"They become creative because they're repurposing, rethinking relationships," and they understand the constraints they must work within, Mishra said.

Once all three elements are combined, educators and school leaders will want to make sure that students are learning and achieving. Koehler and Mishra argue that assessment should be both local and global, limited not only to individual teachers and classrooms and their willingness to try new things, but also applied to systems on an institutional level.

"Think about how we can use technologies to connect our students and learning," Mishra said.

Teachers-in-training should not be presented with TPACK as an idea, because it is more theoretical and best left for researchers and teacher educators to think about the kinds of experiences that teachers-in-training need to become good educators, Koehler said.

"We do try and think consciously about each of [the TPACK elements], and we want to make sure we give them good experiences and concepts, such as thinking about how technology and content overlap one another," he said.

A lot can be taught with the tools that educators already have at their disposal, said Mishra. "What you want are teachers who are flexible, quick-thinking, have a deep knowledge of what subject matter they want to convey, and [know] what tools best allow for that," he said.

TPACK is a conceptual framework that helps teacher-college faculty members understand technology integration. The framework can be used to plan professional development that helps educators learn to integrate technologies into their teaching, said Judi Harris and Mark Hofer, who work extensively with TPACK as professors in the College of William and Mary's School of Education.

But it's not something that, for instance, a teacher educator would ask a classroom teacher to read about and apply in instruction.

"TPACK describes a form of knowledge–it's not an approach in and of itself, but it describes knowledge that teachers need to have to connect technology with their curriculum," Hofer said.

Harris added, "You can't 'do' TPACK or teach TPACK. You can help [teachers] develop that knowledge, but it wouldn't be that helpful to teach a practicing teacher about it."

Instead, Harris and Hofer said, teachers can learn to integrate technologies into their curricula so they enhance teaching and learning, and in such a way that it becomes almost second nature to do so. The focus should be on students' learning, and not on the technology itself.

For instance, Harris and Hofer use taxonomies of curriculum-based learning activity types to help teachers integrate technologies into their instructional planning. Their approach helps teachers to first choose among particular types of instructional activities based upon students' learning needs in a given content area, such as group discussion or class presentations in social studies, then choose among subsets of technologies that are recommended to support each type of learning activity selected.

While districts have spent considerable time and money installing technology into classrooms, many have not seen corresponding improvements in student learning outcomes. Although the technology is present, many teachers don't know how to integrate it in ways that emphasize student learning, rather than finding ways to use a laptop or an interactive whiteboard, Harris said.

Added pressure from the federal No Child Left Behind Act for students' content-based learning to be measurably demonstrated has reduced the leeway that technology instructors and teachers once had to experiment with new techniques, tools, and resources.

"It's the right time for people to start thinking in terms of curriculum-based learning activities that are assisted by technologies, rather than ways to use technologies in different curricula," Harris said.

"In retrospect, it's almost a no-brainer: For most teachers, their content and their pedagogy are their comfort zones and where they have the most passion, so we start with that and then show them some potential technologies that might help," Hofer said.

Hofer and Harris said they believe many teachers' hesitation about incorporating more technology in the classroom comes from the tool-focused ways it is introduced.

When teachers start with students' learning needs, and then add technologies according to how they have designed curriculum-based activities, much of that hesitation will diminish.

And when teachers focus on *why* they are using technology, as opposed to how, student learning reaps the benefits.

Karen Richardson, who works at the College of William and Mary with Hofer and Harris, focused on TPACK for her doctoral dissertation and works with Instructional Technology Resource Teachers (ITRTs) in Virginia. Each school has an ITRT, who works with teachers on how best to integrate technology into their classrooms.

TPACK comes into play during professional development activities that Richardson gleaned from Harris and Hofer's activity types, in which ITRTs will put the names of technologies in one bag, content areas in a second bag, and different types of instructional strategies in a third bag. Once a card is picked from each bag, the ITRTs can see what kinds of technologies can be used in different classes with different instructional approaches.

"In many cases, they came up with interesting ideas," Richardson said. "Teachers can get into a rut. … [The goal is] getting teachers to look at their practice and see where technology might support it."

She added: "TPACK doesn't put a premium on any particular kind of teaching, it just says that everyone uses some kind of instructional practice every day, and technology can impact that. If you see TPACK as more than just a conceptual framework, you see that it's teacher knowledge, and we should be able to develop teacher knowledge."

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