The Evolution of the Required Educational Technology Course

Keith Wetzel, Teresa S. Foulger, and Mia Kim Williams

Abstract

University instructors discuss a required educational technology course in a teacher education program and the impact of two forces: (a) Technological Pedagogical and Content Knowledge, commonly known as TPACK (Misha & Koelher, 2006), and (b) action research data. Over the past two semesters, two new assignments have been instituted based on these two factors. Data revealed concerns on the part of some students: (a) resistance to collaborative work, and (b) concern about implementing this model of technology integration in their future classrooms. Finally, next steps to improve course assignments are discussed, as are efforts to place the course in a context in which it contributes to the transformation of other courses in the teacher licensure program. (Keywords: TPACK, communal constructivism, collaboration, teacher education, higher education, technology integration.)

What should be the content of a course that will help students teach and learn with technology? How does an instructor decide what knowledge and experiences best prepare students to be teachers in an age of Web 2.0 technologies? Further, on what basis can the traditional standalone, required educational technology course continue to be justified? These questions are endemic to the teaching of the rapidly evolving field of educational technology. Each year at our Southwestern urban university, 350–450 initial teacher licensure students take TEL 313: Technology Integration in the PK–12 Curriculum during their first semester in the program. Approximately 5 years ago, we received the 2003 CITE Award for the Introductory Technology course (for course description see Wetzel, Wilhelm, & Williams, 2004). During the years since receiving the award, we redesigned the course to address the above questions with impetus coming from two sources: First, each semester we conducted action research on the course to determine how it might be improved. We made gradual changes to course procedures, assignments, support, and readings based in part on fine-grained feedback that students gave on extensive end-of-course surveys. (See http://tinyurl.com/TEL313survey for the survey.) We refined assignments and processes, resulting in changes to readings, open lab support hours, and the addition of examples of outstanding prior student work. The second impetus for change was derived from a rethinking of the conceptual framework for the course, which led to more far-reaching changes. TPACK caused us to think deeply about the design of the course.

This article will describe the impact of the new conceptual foundation on the design of the course, including recently implemented major themes and assignments and a comparison of time allocation to earlier versions of the course. As we implemented the redesign, we conducted action research on two new theory-based assignments to capture student views of the changes and their recommendations for improvements. This study also led us to reconsider the role of the required educational technology course in the teacher education program.

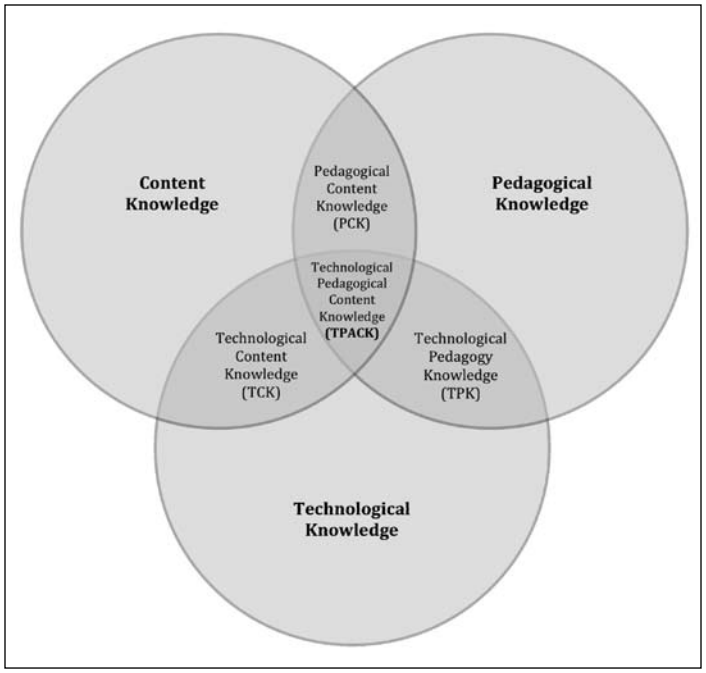

Figure 1: TPACK emphasizes the interconnectedness of content, pedagogy, and technology.

Lack of Knowledge of Content, Pedagogy, and Technology

Keating and Evans (2001) found that preservice teachers felt comfortable with technology in their schoolwork and daily happenings but expressed concern about using technology in their future classrooms. They concluded that preservice teachers lacked "technological pedagogical content knowledge" (p. 1). TPACK (see Figure 1) was originally derived from Shulman's (1986) Pedagogical Content Knowledge (PCK) model. Whereas content knowledge is what is known about the subject matter being taught, pedagogical knowledge describes the structure, organization, management, and teaching strategies for how a particular subject matter is taught. TPACK also includes a third dimension, technological knowledge, or the basic operational skills of technologies and how technologies can be used in the classroom in conjunction with particular subject matter and pedagogical approaches (Misha & Koelher, 2006).

PCK recognizes knowledge of subject matter content as basic and adds knowledge of the representation of subject matter for the purpose of developing student understanding of the subject. TPACK adds technology to this model. Keatings and Evans (2001) explain that "technological pedagogical content knowledge extends beyond proficiency with technology for personal use to an understanding of how technology can

be integrated with subject matter and the technology itself." The TPACK framework emphasizes the "connections, interactions, affordances, and constraints between and among content, pedagogy, and technology" (Mishra & Koehler, 2006, p.1025). To understand technology integration and thus teach the concepts to preservice teachers, it is necessary to make sense of technologies as they are embedded in the messiness of the teaching and learning process.

Keeping Up with Innovative Technologies

The advent of a continuing barrage of Web 2.0 technologies caused us to face a simple truth: If we, the experts in classroom technology integration, could not keep abreast of new social networking technologies, how could we expect our initial licensure students to do so? Even if the entire curriculum of the required educational technology course were devoted to mastering Web 2.0 technologies, we would just scratch the surface of this avalanche of new social networking capabilities. We wanted our course to be a hotbed of learning that would provide an experiential model for our students when they became teachers. As such, we had to provide a foundation that would enable our students to keep up with innovations once they became teachers and with how they would go about locating appropriate technologies for their professional learning needs or the learning needs of their students. We knew the answer to "How do I keep up?" lay in the adages: We need to be "lifelong learners," and we need to "prepare students to learn how to learn." As preservice teachers, our students did not understand that professional PK–12 teachers participate in ongoing professional development. This challenge is exacerbated in the area of technology.

Because social networking technologies were at the forefront, we adopted communal constructivism (Holmes & Gardner, 2006) as the pedagogy in our application of the TPACK framework. Communal constructivism combined a constructivist philosophy in which collaborative learning communities are actively engaged in creating new knowledge. Students conduct investigations by working together, pooling resources, sharing, and teaching others (Holmes & Gardner, 2006). This learning model couples principles from Vygotsky's work (1978) related to constructivism with advances in communications technology that can blur the roles of learner and teacher. The pedagogical style requires instructors to "build on the knowledge, skills, and energy of those at the heart of schooling—the students" (Holmes, Tangney, FitzGibbon, Savage, & Meehan, 2001, p. 3). In a communal constructivism environment, students and teachers work together to develop their own understandings; with great efficiency, they archive knowledge that is meant for their personal benefit, and for the benefit of other students and their instructor (Holmes & Gardner, 2006). Within this framework, Web-based social networking tools help students capitalize on augmented conversations, sophisticated communication, and collaboration beyond the physical classroom—even beyond the scope of the semester.

First New Assignment: Innovations Mini-Teach Project

We implemented this framework through the introduction of the Innovations Mini-Teach project. Small groups of students would select a largely unknown technology, work within their group to master the intricacies of the tool, teach other classmates about it, provide a picture of its use in their future classrooms, and begin to use the new tools to accomplish learning goals. In this use of the TPACK framework, the content and technology constructs largely overlapped (see Figure 2) because students were learning to use new technologies as they discussed where to use them in PK–12 academic areas. The Innovations Mini-Teach Project challenged students to use collaboration to accomplish learning goals that they could "never manage on their own" (Rogers, 2001, p. 54). As

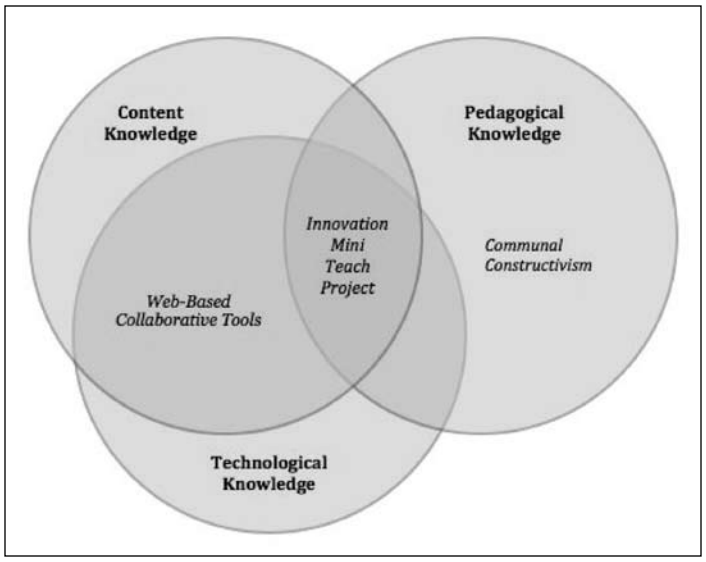

Figure 2: TPACK allows students to experience communal constructivism while learning about new technologies and to share PK–12 applications during the Innovations Mini-Teach project.

students began the Innovations Mini-Teach process, they read background articles about social constructivism and social networking technologies to make explicit our reasons for asking them to participate in this unique experience. These readings also help set up a framework for them to reflect after the entire experience.

Success depended on the many facets of collaboration by small groups (two to four students) who worked outside of class toward the following course outcomes:

- Exploring the many facets of their assigned innovation, mostly independent of the instructor, taking advantage of each others' strengths
- Becoming experts on how their assigned innovative technology functions and the many ways it might support the learning needs of PK–12 students
- Designing and delivering an interactive experience during a class meeting intended to merely expose classmates to their innovative technology during a 15–30-minute modeling or hands-on experience.

Additionally, each small group worked to support the future needs of their classmates through the following requirements:

- Collecting or creating simple, usable resources about their innovation for classmates' potential future use for university assignments and/or PK–12 use (tutorials, lesson ideas, examples, etc.)
- Organizing and archiving resources about their assigned innovation for classmates in the class wiki (for examples see http://web.mac.com/teresa.foulger/iWeb/Innovations/Home.html).

And lastly, as innovations groups shared their technology tools during a class meeting, students in the audience participate in a hands-on experience to gain a broad overview of the features of the tools and possible classroom uses.

Students selected Innovations Mini-Teach topics from a wide array of choices, such as Google Earth, Docs, Sites, Calendar, VoiceThread, webcams, Smartboards, podcasting, and social bookmarking. Instructors found that innovation topics changed each semester to accommodate the skills and teaching needs of each student group as well as any new developments in technology tools. As students from each semester inherited

the wiki created by students in prior semesters, they reorganized and added to it to make it their own. As a result the resources became more usable and the list of innovations grew. All teaching materials, including the assignment guide, grading rubrics, support scaffolds, and examples of class wikis, can be viewed at http://web.mac.com/teresa.foulger/iWeb/Innovations/Home.html.

Action Research on the Innovation Mini-Teach Project

The sources of data for action research on this project were a student survey, in-depth student focus groups, and a detailed examination of the class wikis and student presentations. The end-of-semester survey was administered to 126 students in six sections of TEL 313. In the survey we asked students if the Innovations Mini Teach project was a worthwhile learning activity and if they planned to use any of the technologies presented during the project for personal or professional purposes. We found that 94.6% of students strongly agreed or agreed that the Innovation Mini Teach was a worthwhile activity, and 87% planned to use the innovations in the future. Although the students responded positively, four focus groups (four to eight students in each) allowed us to probe more deeply by asking students how they went about learning the technology tool they were assigned, and what they perceived to be the lasting effects of this project in terms of the influence upon their future teaching.

At the beginning of the project, instructors created groups, assigned an innovation, and gave some class time for students to compose a contract that would outline a detailed project plan. The rest of the preparation took place outside of class time. Students had to quickly get to know each other and support one another as they shared their individual expertise and collected external resources. Most students said they felt comfortable helping each other to learn their assigned technology. As one student put it, "We just kinda collaborated on it and just used each other, so it was pretty easy. I was surprised." Likewise, cross-group collaboration was initiated by students and in many cases occurred informally outside of class. During group presentations, students reported a sense of comfort with risk-taking, in that "everyone in the classroom was so willing … to help you through it if they knew something about it."

Reflection on Student Views of the Innovation Mini-Teach Project

Although we sought to take proactive measures to support group successes (e.g., mandated group contracts, provided class time for an initial planning meeting, provided a procedure for student-initiated instructor mediation), focus group conversations helped us see that some struggles with group dynamics were inevitable, and that surmountable struggles were healthy and supportive to the development of students' collaboration skills. We learned from students that "life happens" outside of class and that we should expect those kinds of struggles; our responsibility is to discern when to step in and what minimal support we could provide to still help them perform to the maximum level of independence. We found that, for many students, relying upon collaboration created a shift in their views about themselves as technology users and about their views of how learning happens when they witnessed for themselves that they have a lot to offer one another (Foulger, Williams, & Wetzel, in press).

Many students declared they had changed because of the position they were put in of grappling with new technology tools and becoming experts, juggling schedules outside of class for group work, and presenting themselves as experts with technology. The Innovation Mini-Teach project created a situation whereby our preservice teachers determined their own learning and learning conditions, offered learning opportunities to classmates, and then were capable of lending their expertise to one another. They had limited experience with these roles.

Most students reported plans to use technology innovations in their future teaching. Some even noted "turning points" (Erikson, 1968) in their abilities to function more confidently and independently as tech-savvy learners and teachers (Foulger, Williams, & Wetzel, in press).

By design, the class wiki is available through postgraduation as students become teachers, and we learned that some students had already accessed the wiki as a resource for reasons outside the requirements of our course (personal and course related). But for most students, when specifically asked if they would use the wiki in the future, the thought of a "never-ending course" had not occurred to them.

We think we could strengthen two areas to ensure lasting effects as students enter the profession: First, the majority of our students still held an old paradigm about taking university courses that had a distinct beginning and end. We needed to find ways to transition students to participating in coursework as an ongoing professional development process and help them see how the wiki (and continued access to each other) was the beginning of a lifelong endeavor to use a variety of readily available resources to further their careers. The second area of concern—one that we are still pondering—is the fact that the constructivist teaching roles we continue to explore in our course are not widely practiced by other undergraduate instructors in the college and were met by resistance from some students.

Second New Assignment: Wisdom of Our Elders Project

The Wisdom of our Elders project required interweaving of all three key sources of TPACK knowledge: technology, pedagogy, and content. Previous course assignments did not do this. For example, before 2007 we taught digital video editing skills (technological knowledge) within an assignment in which students provided a picture of how they would use technology to accomplish academic goals in their future classrooms (technological pedagogical knowledge). TPACK caused us to think differently. We wanted: (a) our pedagogy to become explicit and experiential, and (b) academic content to provide the context for the project. The Wisdom of our Elders project focused on state historical content, project-based pedagogy, and video-editing technologies. In this assignment, we asked students to be historians by chronicling the eyewitness accounts of their elders. Students collected and edited video, audio, and digital images to then produce digital stories of family members, friends, or other people they got to know through their research. To research the topic and write the interview questions, students learned to conduct searches using historical indexes with guidance from their technology instructor and the education liaison librarian. (See library guides developed for this course at https://librarynews.blog.asu.edu/2008/05/07/videocontest/?triedWebauth=1.) Figure 3 (page 70) illustrates the interconnectivity of the elements of the TPACK model applied to the Wisdom of our Elders project.

The pedagogical knowledge reflects the tenets of project-based learning (Katz & Chard, 2000) as students conducted research on their topics, planned, storyboarded, videotaped, edited, and presented their projects. Finally, their projects were entered into a statewide contest (an authentic audience). In addition to the higher education division, there are K–12 divisions, so our students were able to participate in a project with K–12 possibilities. The project was presented to the students as an experience in which they would have opportunities to engage in the activity as students as well as to reflect on and discuss the processes of teaching and learning with technology as future educators.…

To scaffold the student's processes, the project was broken into five phases with built-in checkpoints. Each of the following phases helped the preservice teachers navigate the complex digital storytelling process:

Orientation. Students were organized into groups and determined the historical topic of their story, then read and discussed background material about digital storytelling in PK–12 curriculum, conducted research on the history of the event or person, and prepared interview questions about their historical content.

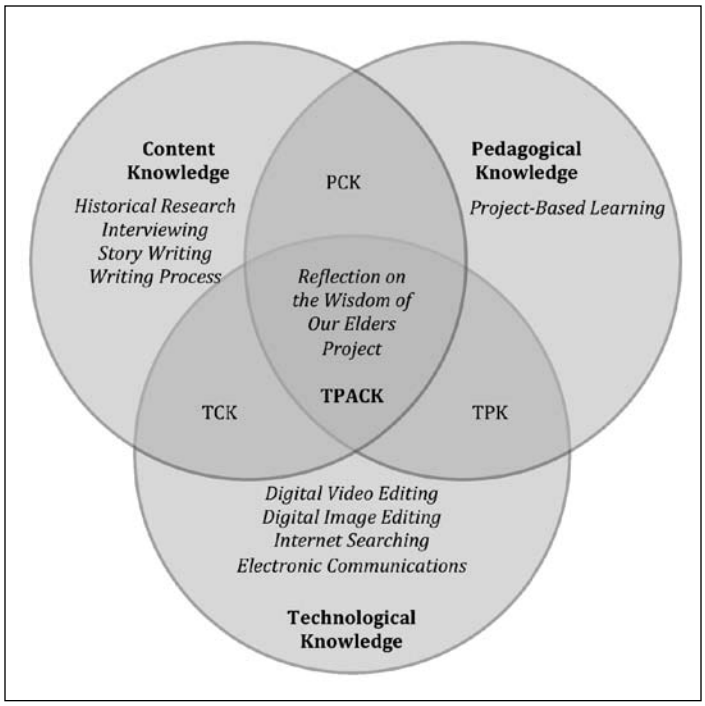

Figure 3: The Wisdom of Our Elders project allows preservice teachers to experience all three knowledge areas of TPACK from the student perspective.

Plan. Students conceptualized their story and organized it into scenes using a storyboard technique. This process can be likened to a "rough draft" when crafting a text-based story with looping back, resistance, struggling with ideas, and reflection (Buckingham, 2007).

Collect footage and digital images. Students obtained permission to use image/information collected through digital images/video they shot, primary sources interviews, and any graphics they collected, and they created any other graphics they needed.

Edit. Students craft their stories using video editing software, supported by structured tutorials (written, video, and live demonstrations), technology lab staff, and each other.

Finish. Students finalized their digital videos and uploaded them to a digital portfolio and to the contest Web site (see https://icademy.asu.edu). They also shared their final stories with classmates and reflected in writing on the learning process and experience.

Action Research on the Wisdom of our Elders Project

In response to items on the end-of-semester survey, students were asked anonymously to "describe your experience collaborating with your video team members." Responses revealed that collaboration did not always occur. Twenty-one percent opted to work alone; 11% indicated that when they did work in small groups, their partners did not do their fair share; and 7% indicated they had collaboration problems due to scheduling conflicts. As a result of this finding, we probed more deeply with students. We found that even those who did not officially collaborate with another student did not work alone. Many collaborated with a family member or significant other who helped them conduct interviews or handle the video camera, and some collaborators became part of the project team by helping to identify and arrange for meetings with elders. (This definition of team was acceptable to the contest directors.) On the same end-of-semester survey, 83.4% of students indicated they strongly agreed or agreed that the Wisdom of our Elders project was a worthwhile learning activity, and 70% indicated that completing the digital storytelling project as a student prepared them to teach a similar assignment in their future classrooms.

Reflection on Students' Views of the Wisdom of our Elders Project

Regarding the 18% of students reporting problems with partner participation and scheduling conflicts, we decided this problem was a good problem because it provided the learning opportunity for students to hone their collaboration skills. In only a few cases did instructors need to intervene to ensure harmony.

Regarding the student response to being "prepared to teach a similar assignment in their future classrooms," we conclude that the positive responses of 83% of the undergraduate initial licensure students seem to indicate that the assignment was effective. However, the survey also indicates that 30% of the students thought the project did not prepare them to teach a similar assignment in their future classrooms. In response, we think we can do a better job guiding student reflection to make explicit the TPACK framework and how they learned content, pedagogy, and technology skills. Also, the historical content is but one context, and some students are not as interested in history as others, especially those not planning to teach history. For those students, the transfer of learning to another content area may not be evident. Also, the 70/30 split might point to a limitation of a required educational technology course approach and suggest that the TPACK framework needs to be addressed beyond the course level (i.e., departmental organization level). The latter will be explored in the Next Steps section.

Discussion

Our course has evolved over time. Prior to spring 2007 the course was organized around two major themes and accompanying projects: (a) the acquisition, organization, and publication of information, where students learned to evaluate Web sites, create safe Web-based vehicles for PK–12 students to use the Internet for research and other knowledge acquisition activities, to use tools that would help them organize and present or share the knowledge they acquired, and (b) vision of technology integration, in which students were asked to articulate their vision for technology use in their future classroom by creating a 3–5-minute digital video.

Beginning in Spring 2007, the course changed. Part I (acquisition, organization, and publication or sharing of information) was reduced by removing the knowledge-sharing component of the activity. Our justification for removing the product-sharing step was that our students chose PowerPoint as a tool for knowledge sharing, and this was becoming a familiar and well-understood tool. Thus, a description of the intended sharing rather than creation of a PowerPoint document was adequate. We eliminated the vision of technology integration video in favor of the Wisdom of our Elders project, which required similar digital video skills but was situated in collaborative groups and created knowledge of history in rich local contexts. To tie up the many facets of the course at the end, instructors asked students to write a course reflection or write a take-home final on their vision of their future classroom, which took a fraction of the time required by the initial vision video.

How do you make the required educational technology course more meaningful and ensure that students are learning to integrate technology in teaching and learning? We used two approaches, one based on action research (AR) and the other based on new conceptual understandings. Both played a role in facilitating change, but it appears that AR methodology could take us only so far. AR has the advantage of occurring in a real context, and it has helped us make changes that positively impacted student learning. We hope other instructors benefit from the lessons we learned, as they often struggle with similar issues (for example, helping students collaborate successfully). Equally important, however, is considering significant changes in approaches to teaching and learning. Eisner (1982) explained that all forms of representation reveal and conceal. We found the TPACK conceptual framework provided another

form of representation that revealed more far-reaching changes that we needed to make in the course. The two examples discussed are first steps in accommodating course design to conceptual framework and may not directly apply to other teacher education programs. But the rethinking of the conceptual framework is a constant challenge for all educators, and we hope that our explanation of instantiating theory into practice assists others with this shift as well.

Next Steps

We realize that this course cannot stand alone in the panoply of courses that students are required to take. TPACK conceptual framework should certainly cause us to think broadly, at the program level rather than just at the course level. We should think iteratively, from the technology integration side to the content side as well as from the content side to the technology integration side. We plan to make the Technology in the PK–12 Curriculum course a transformative experience in which students take the skills, dispositions, and technologies into their other teacher education courses. We foresee a two-step process: transfer of the knowledge and skills (a) from the TEL 313 students to other courses, and (b) from faculty who have these students in their courses. We encourage our students to use Web 2.0 and video-editing technologies in other courses. At the same time that we made the course changes described in this article, we submitted a college-supported Excellence in Research Award (ERA) grant proposal to enable faculty to learn Web 2.0 technologies and use them within pedagogical and content courses. In the grant-sponsored workshops (summer 2008), faculty members learned tools such as Google Docs, Google Calendar, Google Sites (wiki), VoiceThread, social bookmarks, podcasts and Skype that can enhance learning for our teacher education students by helping them facilitate a community approach to learning. After the workshops, faculty will receive a stipend if they follow through by creating and implementing a curriculum plan in which they integrate one or more of the social networking tools in a class, creating a plan to evaluate student learning of content through student use of the social networking tool(s) and writing a reflection on their evaluation of the implementation. We think this is a beginning step at the program level to build on the new conceptual framework. As we evaluate the ERA grant effort, we will report in a future article on the intersect of students prepared in the TEL 313 course and faculty prepared in the ERA project.

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Keith Wetzel is professor of educational technology in the College of Teacher Education and Leadership at Arizona State University. His research interests include teacher professional development and the integration of technology in teacher education programs and K–12 schools.

Keith Wetzel
College of Teacher Education and Leadership
Arizona State University
P.O. Box 37100
Phoenix, Z 85069-7100
keith.wetzel@asu.edu

Teresa S. Foulger is an assistant professor of educational technology in the College of Teacher Education and Leadership at Arizona State University, where she teaches educational technology courses at the undergraduate level, and innovations and action research in education at the doctoral level. She is currently the communications officer of the International Society for Technology in Education's SIG- Teacher Education. Her research interests include innovative approaches, collaboration, and technology uses that support change.

Teresa S. Foulger
College of Teacher Education and Leadership
Arizona State University
P.O. Box 37100
Phoenix, Z 85069-7100
teresa.foulger@asu.edu

Mia Kim Williams has been one of the educational technology course instructors since its conception more than 5 years ago. She currently works as a clinical assistant professor at Arizona State University's Education Downtown. Her research interests include the use of technology to transform teaching and learning in K–16 environments, innovative and critical pedagogy, and teacher identity.

Mia Williams
College of Teacher Education and Leadership
Arizona State University
P.O. Box 37100
Phoenix, Z 85069-7100
mia.williams@asu.edu