



Transforming pre-service teacher curriculum: Observation through a TPACK lens

Dr Jennifer V. Lock
Faculty of Education
University of Calgary

Petrea Redmond
Faculty of Education
University of Southern Queensland

This paper will discuss an international online collaborative learning experience through the lens of the Technological Pedagogical Content Knowledge (TPACK) framework. The teacher knowledge required to effectively provide transformative learning experiences for 21st century learners in a digital world is complex, situated and changing. The discussion looks beyond the opportunity for knowledge development of content, pedagogy and technology as components of TPACK towards the interaction between those three components. Implications for practice are also discussed. In today's technology infused classrooms it is within the realms of teacher educators, practising teaching and pre-service teachers explore and address effective practices using technology to enhance learning.

Keywords: pre-service teachers, international online collaboration, TPACK

Introduction

Preparing today's pre-service teachers to be tomorrow's teachers can be a daunting task. Teacher educators are challenged to design learning that meaningfully integrates content and pedagogy to foster the development of twenty-first century skills using current and emerging technologies to prepare teachers for a technology-driven, knowledge society. It is more than learning about the technology and how to use it. Rather, Niess (2008) advocated that "[t]omorrow's teachers must be prepared to rethink, unlearn and relearn, change, revise, and adapt" (p. 225). Teacher preparation courses need to guide "preservice teachers toward the abilities, strategies, and ways of thinking for teaching *today and tomorrow*" (Niess, 2008, p. 224).

As teacher educators, we grapple with the question of how to transform curriculum to best meet the needs of pre-service teachers so they are prepared for tomorrow's classrooms. Using TPACK (Technological Pedagogical Content Knowledge) as a lens, this paper will examine the transformation of curriculum aligned with technology integration through an innovative online international project involving pre-service teachers, in-service teachers and teacher educators through two teacher education programs.

Theoretical Framework: Technological Pedagogical Content Knowledge (TPACK)

“TPACK emphasis the connections among technologies, curriculum content, and specific pedagogical approaches, demonstrating how teachers’ understandings of technology, pedagogy, and context can interact with one another to produce effective discipline-based teaching with educational technologies” (Harris, Mishra, & Koehler, 2009, p. 396). Effective technology integration requires the intersection among the bodies of knowledge that are represented by pedagogical content knowledge (PCK), technology content knowledge (TCK) and technological pedagogical knowledge (TPK) and finally the intersection of all these knowledge areas to be that of technological pedagogical content knowledge (TPACK) (Koehler & Mishra, 2008).

Angeli and Valanides (2008) have suggested that TPACK is what enables teachers to use their knowledge about technology, pedagogy, content, learners, and context to provide transformative teaching and learning experiences. TPACK “helps us to identify important components of teacher knowledge that are relevant to the thoughtful integration of technology in education” (Mishra & Koehler, 2006, p. 1044). From this premise, we have examined our international project to see how we are providing a learning experience where pre-service teachers are engaged in meaningful technology integration.

Online collaborative project examined using TPACK

Context of the international online collaborative project

The University of Calgary and the University of Southern Queensland do not offer traditional ICT methodology courses in their Bachelor of Education programs. Rather, with both institutions a general strategy for technology content and pedagogical learning is through an integrated process throughout the program. As such, teacher educators need to carefully design and implement learning opportunities where pre-service teachers not only experience learning and using technology with curricular context, but also observe the modeling of best practice in the use of technology.

A cross-institutional international online collaborative project has been designed and implemented for pre-service teachers. Working within a constructivist approach and in a technology-enhanced environment, the aim of the project was to advance educational thought and practice and give pre-service teachers an opportunity to live the experience of being online collaborators investigating real-world teaching issues. The goal was to give pre-service teachers an opportunity to develop global relationships, increase understanding of diversity and inclusivity, and to model how ICT can be effectively and appropriately integrated to enhance and enrich learning and teaching outcomes.

A blend of online asynchronous communication and face-to-face teaching and learning has been utilized to support the project. The project has involved the following three phase inquiry process:

- *Phase One:* Introduction of participants and a book rap triggering event. The shared experience of reading one of four novels which acted as a catalyst for online discussions where pre-service teachers began to identify and explore issues (e.g., cultural differences, cyberbullying); develop inquiry questions to guide their research; and initiate online discussion among their peers from the two universities.
- *Phase Two:* First, pre-service teachers were required to explore their inquiry questions by drawing on their prior experiences and knowledge, sharing resources, and supporting their work with relevant literature. Second, following their discussion with colleagues, experts (e.g., in-service teachers and teacher educators) were invited from Canada and Australia to join the pre-service teachers in the online dialogue.
- *Phase Three:* A videoconference occurred where participants explored pedagogical practices and classroom applications. The final activity required pre-service teachers to engage in critical reflection

based on their educational experience with the project and their learning.

Research design

Case study methodology was used given the exploratory nature of the research. As noted by Merriam (1998), the “interest is in the process, rather than outcomes, in context rather than a specific variable, in discovery rather than confirmation” (p. 19). The study was conducted over a seven week period. Twenty-six pre-service teachers from the University of Southern Queensland and the University of Calgary participated in the research, along with eleven experts and two teacher educators who also assumed an expert role in the expert discussion forums. The following questions framed the research:

- How can online collaboration promote inquiry into teaching within diverse contexts?
- What role does technology play in developing understandings of multiculturalism and inclusive classrooms?
- How does personal experience in online collaborations build capacity to teach with technology?

Transcripts from the online discussions were analysed using Henri’s (1992) content analysis model. Thematic analysis was used for the focus group interview data and for the online expert discussion forums. Responses were analysed to identify common themes and areas of conflict which have been mapped against the indicators from Henri’s (1992) framework and the research questions.

Observation through a TPACK lens

For this paper, the primary focus was on expert discussion forums and focus group interview data relating to technology integration. Using TPACK as a lens, the following has provided an examination of how the project was designed and facilitated to support pre-service teachers in their development of content knowledge, pedagogical knowledge, technological knowledge and technological pedagogical content knowledge as part of developing an understanding of teaching in today’s inclusive, digital classrooms.

Content Knowledge (CK)

Content knowledge may also be referred to as subject or domain knowledge. One of the design elements of this project was for the content to be learner-driven. Although the novels were selected to stimulate discussion around key themes within digital and diverse classrooms, one of the initial bookrap activities provided the pre-service teachers with the opportunity to identify specific issues related to diversity, inclusivity and technology integration. Yet, within all areas the topics for discussion were driven by pre-service teachers. Through the initial facilitated discussion, pre-service teachers began to drill down around ideas and issues which resulted in more questions being asked, exploration of associations related to sharing of experiences and literature, and the sharing of common understandings. The following are some of the content themes that emerged through the discussion: cultural diversity, English as a second language (ESL), ICT integration, and cyberbullying.

Pedagogical Knowledge (PK)

Pedagogical knowledge has been defined as generic knowledge about understanding, designing, managing and implementing student learning. It includes not only what teachers know about learning, but also what they do to ‘make learning happen’ for a diverse range of students within their classrooms. Within teacher education there has been a blurring of the lines when trying to separate content and pedagogy because pedagogy is also the content. During the project, pre-service teachers confronted both components concurrently. The focus was not solely on the development of knowledge about key issues or on the ways in which teachers might make modifications to make knowledge accessible to others.

From a design perspective, the key phase for pedagogical knowledge development was during the discussions with experts. However, pedagogical knowledge was explored during all three phases. Experts were asked questions by pre-service teachers that explored issues of why, how and what can be done in classroom situations. The dialogue supported linkages between experience, literature and classroom

practice. Data presented in Table 1 was reflective of the nature of the pedagogical knowledge examined by pre-service teachers and experts.

Table 1: Expert discussion forum sub-themes of Pedagogical Knowledge

Major Theme: ICT Integration		
Sub-Themes	<ul style="list-style-type: none"> • Development of discerning consumer of information skills • Purposeful planning with technology • Generation Y • Game-based learning • Strategies and techniques to assist teachers in developing competencies with ICT integration 	<ul style="list-style-type: none"> • Changing role of educators • 21st century learning environments • Understanding and modelling best practice • Cyber safety • Educating parents • Digital divide • Anytime and anywhere learning

Technological Knowledge (TK)

Technological knowledge (TK) is the knowledge of how to use technologies. TK is “to be developmental, evolving over a lifetime of generative interactions with multiple technologies” (Harris, Mishra, & Koehler, 2009, p. 398). As such, the project was designed to expose pre-service teachers to a range of technology experiences including different learning management systems and to videoconferencing. Blackboard™ was the course management system used to host the project and was a new environment for the Australian pre-service teachers and experts. All documentation, online discussions, resources, images, and reflective artefacts were hosted in the Blackboard™ project shell. As such, all information was public to its members rather than private. Hence the experts, teacher educators and pre-service teachers had access to all information and discussions. Further, all participants had an opportunity to engage in a videoconference which also included the use of Wimba, for some Australian participants, to link students and experts together across two hemispheres. Further in the discussions, individuals shared their experiences and observations with regard to the use of other technology (e.g., interactive whiteboards).

Technological Pedagogical Content Knowledge (TPACK)

TPACK is at the intersection of content knowledge, pedagogical knowledge, and technological knowledge. It is here where the whole is more than the sum of the parts. Rather than looking at the three components in isolation it is an understanding of “how these forms of knowledge interact with each other” (Mishra & Koehler, 2008, p. 10).

TPACK, the heart of technology integration, was evident in our project. First, the learning was generative. The project was structured around major themes and three phases, yet the nature and depth of exploration by each participant was dependent on their level of commitment and passion for the topic. The type of content and the depth of exploration emerged from the pre-service teachers’ interests, curiosity and engagement in the subject matter. The evolution of the learning was driven by what participants wanted to learn and/or understand and their negotiation of meaning through online discussion. One pre-service teacher posted the following reflection: “Though we were all sitting miles away from each other, we were able to discuss openly and freely about issues at anytime of the day. It has allowed for extensive conversations to happen.”

Second, interactions with colleagues and experts, and the sharing of resources and experience helped to inform professional practice. As the project progressed, theoretical explanation progressed to practical application. Pre-service teachers wanted to develop knowledge and strategies that they could use in their school placements. The following was a pre-service teacher’s reflection on the experience: “This assignment has made it clear how important ICT is to students in this era. It has given me thoughts on how I can expand my teaching abilities to have things like this forum used in classrooms.”

Third, the dynamic, organic nature of the work was far from being a canned commodity ready for duplication. Rather, the responsiveness to the questions and the sharing of resources kept participants continually returning to the online discussion forums to either read and/or respond. United in learning, there was no separation between pre-service teachers or experts from the two countries; rather it was a matter of groups of like-minded people sharing their understandings and perspectives in support of each others' learning. Such conversations were not saved for the online environment; rather they spilled into the face-to-face classroom learning environments. One pre-service teacher commented that "very rarely are we presented the opportunity to participate across continents in a study surrounding some of the most important issues we face as teachers." Another stated, "The project was a great example of how ICT can be integrated into the classroom... This project has shown how diverse technology can be and how it can be used as a tool to expand on our knowledge."

Implications

From our work, we have identified three key implications that need to be further investigated. First, from a program perspective, what knowledge, skills and attitudes do teacher educators need in order to make TPACK live within their programs? What leadership is required to change practice in teacher education programs so that pre-service teachers and teacher educators develop capacity based on TPACK? How can teachers and teacher educators provide and model innovative learning experiences for pre-service teachers with regard to the integration of ICT across all curricula? TPACK has great potential. However, for this potential to be reached, it will require a major shift in teacher education programs.

Second, what long term impact will this experience have on pre-service teachers in terms of their practice of integrating technology? How has this project impacted how they design learning in technology-enhanced learning environments? By modelling and giving pre-service teachers this learning experience, are they now further developing an understanding of TPACK? Or is more explicit instruction required so that they appreciate the whole rather than looking at the individual components of TPACK?

Third, the data collection instruments used in our research provided a limited insight into the complexity of TPACK. As such, what instruments can be used to gather data of the nexus of the three knowledge domains? How can that data from these instruments be mapped to curriculum re-design to strengthen and enhance current practice?

Conclusion

The TPACK model has challenged us to think about how, why and the impact of these knowledge areas when designing and facilitating robust learning with technology. As teacher educators, we are pleased with how we have designed and implemented our project in relation to TPACK. The project was learner-centred, learner-content driven, and provided a pedagogical example of how technology can be integrated. It has also provided opportunity for knowledge development of content, pedagogy and technology. Through the use of TPACK lens, we continue to explore ways in which we can design innovative learning that effectively integrates technology to foster transformative curriculum.

References

- Angeli, C. & Valanides, N. (2008). TPCK in pre-service teacher education: Preparing primary education students to teach with technology. Paper presented at the annual meeting of the American Educational Research Association, New York City, NY.
http://punya.educ.msu.edu/presentations/AERA2008/AngeliValanides_AERA2008.pdf
- Henri, F. (1992). Computer conferencing and content analysis. In A. R. Kaye (Ed.), *Collaborative learning through computer conferencing: The Najaden Papers*, (pp. 117–136). Berlin: SpringerVerlag.
- Harris, J., Mishra, P., & Koehler, M. (2009). Teachers' technological pedagogical content knowledge and learning activity types: Curriculum-based technology integration reframed. *Journal of Research on Technology in Education*, 41(4), 393-416. <https://doi.org/10.1080/15391523.2009.10782536>

- Koehler, M.J. & Mishra, P. (2008). Introducing TPCK. In AACTE Committee on Innovation and Technology (Ed.), *Handbook of Technological Pedagogical Content Knowledge (TPCK) for Educators*, pp. 1-29. New York, NY: Routledge for the American Association of Colleges for Teacher Education.
- Mishra, P. & Koehler, M. J. (2006). Technological Pedagogical Content Knowledge: A framework for teacher knowledge. *Teachers College Record*. 108(6), 1017-1054.
- Mishra, P. & Koehler, M. J. (2008). Introducing technological pedagogical content knowledge. Paper presented at the Annual meeting of the American Educational Research Association, New York City, NY. http://punya.educ.msu.edu/presentations/AERA2008/MishraKoehler_AERA2008.pdf
- Merriam, S. (1998). *Case study research in education: A qualitative approach*. San Francisco: Jossey-Bass Publishers.
- Niess, M.L. (2008). Guiding preservice teachers in developing TPCK. In AACTE Committee on Innovation and Technology (Ed.), *Handbook of Technological Pedagogical Content Knowledge (TPCK) for Educators*, pp. 223-250. New York, NY: Routledge for the American Association of Colleges for Teacher Education.

Author contact details:

Dr Jennifer V. Lock
Faculty of Education
University of Calgary
jvlock@ucalgary.ca

Petrea Redmond
Faculty of Education
University of Southern Queensland
redmond@usq.edu.au

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