ascilite 2011
CHANGING DEMANDS, changing directions.
Wrest Point | Hobart Tasmania Australia | 4–7 December 2011

Auditing education courses using the TPACK framework as a preliminary step to enhancing ICTs

Chris Campbell
The University of Queensland

Aspa Baroutsis
The University of Queensland

The *Teaching Teachers for the Future* (TTF) project is a Department of Education, Employment and Workplace Relations (DEEWR) project that involves all 39 Australian teacher education universities. This study uses the TPACK framework and focuses on future teachers to ensure they are afforded the best learning opportunities in an increasingly online world. Specifically, the project supports the ongoing development of information and communication technology (ICT) proficiency of graduate teachers across Australia by building the ICT capacity of teacher educators and through the development of appropriate resources. This paper focuses on the initial auditing and mapping of the electronic course profiles (unit outlines) that occurred at The University of Queensland's School of Education which in turn provided a basis for the specifics of the project. The initial findings of the mapping process indicate that generally, course coordinators under-represent the technology components in their courses.

Keywords: TPACK, pre-service teacher education, Australian curriculum.

Introduction

Teaching Teachers for the Future (TTF) involves all 39 universities that are involved in teacher education in Australia and is a $7.8 million DEEWR funded project which is part of the Australian government's Digital Education Revolution initiative. This project aims to "embed ICT into everyday classroom learning by transforming the delivery of teacher education" (Department of Education Employment and Workplace Relations, 2010). This project takes the notion that teachers who are expert at teaching ICT will assist universities to transform their teaching courses to include more ICT that improves pre-service teachers' technological knowledge and thereby empowering the next generation of school teachers with the necessary skills to make ICT integral to their classroom pedagogy.

While the research indicates that there is a lack of theory and conceptual frameworks that actually guide esearch in the area of teaching with technology (Angeli & Valanides, 2005; Koehler & Mishra, 2008; Mishra & Koehler, 2006; Niess, 2005), the TTF project is underpinned by the *Technological Pedagogical Content Knowledge* (TPACK) framework. This paper specifically addresses the auditing and mapping of university courses which all universities were required to undertake as part of their implementation plan. The mapping task audited the current state of all teacher education courses (units/subjects) in each university with regards to technology implementation. Results from this one university provided more data than expected as well as some unanticipated strengths in current teacher education courses.

Technological pedagogical content knowledge (TPCK, also TPACK) forms the basis of "good teaching with technology" (Mishra & Koehler, 2006, p. 1029). This component identifies the knowledge teachers' use when integrating technology into their subject area. This understanding emerges from the interactions among content, pedagogy, and technology knowledge (Koehler & Mishra, 2009). They stress that good teaching is not simply a matter of "adding technology to the existing teaching and content domain" (Koehler & Mishra, 2005, p. 134). Mishra and Keohler (2006) explain that good teaching with technology requires an understanding of the concepts of technology. As such, Mishra and Keohler (2006) believe that developing technological pedagogical content knowledge should be a critical goal of teacher education. The TTF project focuses on this dimension of TPACK.

Methodology

The electronic course profiles that were analysed were identified as core units for each of the Bachelor of Education (Primary and Secondary) programs, with science and mathematics being specifically targeted. A total of 22 core profiles were reviewed for the Bachelor of Education (Secondary). These comprised of 13 compulsory core units incorporating education theory and professional practice, and curriculum. With regards to the curriculum courses, there are a total of four maths and five science courses. The program also consists of teaching specialisation courses. There were 26 core units identified in the Bachelor of Education (Primary), however, only 17 of these were downloaded and analysed as the Bachelor of Education (Primary) is a new degree and the remaining nine profiles were either not available until semester 2 or not offered until 2012. The course profiles were audited to determine the technological, content and pedagogical knowledge (T, C and P) evident throughout. The following sections of the course profile provided the basis for categorising the course material into the various areas: general course information, aims and objectives, learning resources, teaching and learning activities, and assessment.

Results

The technological knowledge that was evident in lectures, tutorials and assessment in the course profiles has been summarised in Table 1. The knowledge is divided into straightforward uses and complex uses. The straightforward uses were identified as low-level tasks that did not require comprehensive technology skills while the complex uses where identified as those requiring high-level processing skills and technology knowledge. Studies in the United States indicate that while teachers are using technology, it is predominantly used for low-level tasks such as word processing and internet research (Ertmer, 2005) and presentation software and management tools (Harris, Mishra, & Koehler, 2009). Nor should it be assumed that graduate teachers enter the teaching profession with an appropriate level of technology capabilities (Jamieson-Proctor, Finger, & Albion, 2010).

Table 1: Technological knowledge used in teaching (T) and assessment (A)

Straightforward uses	Complex uses	Complex uses continued
Blackboard for information dissemination, delivery of learning modules, submitting assignments (T, A)	Blackboard discussion boards and online quizzes (T, A)	Technology workshops and clinics, Online technology-based activities for students (T, A)
Videos (T)	Concept mapping (T)	Peer teaching (T)

Video taping (T)	IWB flipcharts –developed by students (T, A)	Graphics calculators (T)
Email communication (T)	IWB flipcharts – developed by lecturers (T)	Robotics (T)
Web searches – literature, research material (T, A)	Digital storytelling (T)	Digital literacy (T)
Digital images (T)	Wikis and creating them (T, A)	Online Blog (A)
Online activities (T)	Mobile learning (T)	Wequests (A)
TurnItIn T)	Second Life (T)	Evaluation of digital resources (A)
Internet resources (T)	Web 3.0 (T)	Digital portfolios (A)
Presentations (T)	CMS for website development (T)	Literacy profile (A)
Word processing (T)	Electronic journals (T)	Produce a learning object and develop online games (A)
Multimedia lab sessions (T)	i-Lectures and Podcasts, Slidecasts (T, A)	Form an online learning community (A)
Complete online certification courses (A)	Video Production (A)	
Analyse technology (A)		

When focusing on the complex uses of technological knowledge, the outcomes are advantageous to both the pre-service teachers and the lecturers. While the development of technological knowledge and skills equips the pre-service teachers with the tools that are necessary for the successful integration of ICTs, it also creates a pathway for the integration of technological knowledge and skills within the students' subject area. Further, the students gain practise in developing technologically-rich learning experiences that enhance learning outcomes.

A number of examples identified in this paragraph elaborate on the benefits of integrating complex uses of technology into the teacher education courses. In one course, the students' course evaluation feedback identified over two consecutive years and since the courses inception, received positive feedback and high ratings which "affirmed the value of the highly interactive and experiential lectures and workshops" (The University of Queensland, 2011). This course had a significant technology focus and incorporated many complex uses of *technological pedagogical content knowledge*. In another course, the lecturer runs technology workshops where the students research and design a project that uses complex ICTs and present these to their peers. One of the student presentations in a previous year demonstrated the use of Google Earth software for integration in mathematics classes. The lecturer is now taking steps to become familiar with the software application and incorporate it into that particular mathematics course. Assessment activities also promoted higher order thinking, in both technological and content knowledge, for example the development of online games, and acknowledged real-world experiences, such as preparation of material for a YouTube Channel. While no definitive claims are being made, at the initial mapping stage, it appears as though technology-rich pedagogy enhances the teaching and learning experiences of both staff and students.

A range of technological knowledge is evident in the course profiles, however, following meetings with the course coordinators and lecturers of the audited courses to discuss the mapping, it becomes apparent that the course profiles under-represent the degree of technological knowledge demonstrated in most courses. For example, in one course, which is mandated for study across all three degrees, little or no technological knowledge is acknowledged on the course profile. The course profile identified Blackboard and videos as the only technology used in the course. An informal discussion with the course coordinator revealed that social networking was a central component to the learning that occurred in this course. The School of Education is now investigating this phenomenon further and looking at ways of improving statements of ICT usage in course profiles.

Conclusion

The results indicate that the School of Education courses are both creative and innovative in relation to technology integration. Ferdig (2006) explains that "innovation must contain authentic, interesting and challenging academic content" (p. 750). As the discussion on lectures, tutorials and assessment identified in the course profile will attest to, many of the complex uses of technology (see Table 1) demonstrate the innovative practices in technological knowledge. Further, Ferdig (2006) suggests that teaching and learning practices need to have "authentic, real-world problems, because they are interesting and meaningful to the students and thus engaging" (p. 750). Innovation and creativity was found in the mapping of many of the course profiles and in particular, in the assessment practices of many of the courses. Banas (2010) explains that teachers need to move from a level of "no technology use" to one of "learning from" technology and finally through to a "learning with" technology level (Banas, 2010, p. 126). With many of the complex uses of technology identified in this study, it is hoped that many of the pre-service teachers begin their practice at the "learning with" level (Banas, 2010, p. 126).

The results from the mapping and auditing components of the study suggest that there is a diverse range of technology used across courses in both learning activities and assessment. As a result of the informal conversations with the course coordinators that following the mapping and auditing phase, we became acutely aware that the staff were also using other technologies in ways that have not been identified in the course profiles and consequently not mapped during the audit. This is perhaps a unique situation for an Australian university with further research in this area a future possibility.

This mapping divided technology usage into straightforward and complex uses. After completing the TTF project, this university will have an extensive repertoire of complex technology related teaching and learning experiences for use with primary, middle years and secondary courses. The anticipated changes will be post-tested at the conclusion of the project with another mapping task, where the results will enable a comparison and measurement of the change. Any improvement would benefit graduating pre-service teacher and enable them to commence their careers as individuals who are able to "learn with" (Banas, 2010) technology while also integrating and evaluating technology, for its content and pedagogical appropriateness (Niess, et al., 2009), thereby enabling their *technological pedagogical content knowledge*.

References

Angeli, C., & Valanides, N. (2005). Preservice elementary teachers as information and communication technology designers: an instructional systems design model based on an expanded view of pedagogical content knowledge. *Journal of Computer Assisted Learning, 21*(4), 292-302.

Angeli, C., & Valanides, N. (2009). Epistemological and methodological issues for the conceptualization, development, and assessment of ICT–TPCK: Advances in technological pedagogical content knowledge (TPCK). *Computers & Education, 52*, 154-168. https://doi.org/10.1016/j.compedu.2008.07.006

Banas, J. R. (2010). Teachers' attitudes toward technology: Considerations for designing preservice and practicing teacher instruction. *Community & Junior College Libraries, 16*(2), 114-127.

Department of Education Employment and Workplace Relations. (2010). Digital Education Revolution. Retrieved 15 June, 2011, from http://www.deewr.gov.au/Schooling/DigitalEducationRevolution/DigitalStrategyforTeachers/Pages/ICTInnovationFund.aspx

Ertmer, P. (2005). Teacher pedagogical beliefs: The final frontier in our quest for technology integration? *Educational Technology, Research and Development, 53*(4), 25-39.

Ferdig, R. E. (2006). Assessing technologies for teaching and learning: Understanding the importance of technological pedagogical content knowledge. *British Journal of Educational Technology, 37*(5), 749-760.

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

Jamieson-Proctor, R., Finger, G., & Albion, P. (2010). Auditing the TK and TPACK confidence of pre-service teachers: Are they ready for the profession? *Australian Educational Computing, 25*(1), 8-17.

Koehler, M. J., & Mishra, P. (2005). What happens when teachers design educational technology? The development of technological pedagogical content knowledge. *Journal of Educational Computing Research, 32*(2), 131-152. https://doi.org/10.2190/0EW7-01WB-BKHL-QDYV

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. 3-29). New

York: Routledge.
Koehler, M. J., & Mishra, P. (2009). What is technological pedagogical content knowledge? *Contemporary Issues in Technology and Teacher Education, 9*(1), 60-70.
Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers College Record, 108*(6), 1017-1054. https://doi.org/10.1111/j.1467-9620.2006.00684.x
Niess, M. L. (2005). Preparing teachers to teach science and mathematics with technology: Developing a technology pedagogical content knowledge. *Teaching and Teacher Education, 21*(5), 509-523.
Niess, M. L., Ronau, R. N., Shafer, K. G., Driskell, S. O., Harper, S. R., Johnston, C., et al. (2009). Mathematics teacher TPACK standards and development model. *Contemporary Issues in Technology and Teacher Education, 9*(1), 4-24.
Shulman, L. S. (1986). Those who understand: Knowledge growth in teaching. *Educational Researcher, 15*(2), 4-14. https://doi.org/10.3102/0013189X015002004
The University of Queensland. (2011). Education and Creativity: Pedagogical Content Knowledge - Course Profile. Retrieved 8 June, 2011, from https://www.courses.uq.edu.au/student_section_loader.php?section=1&profileId=39066

Acknowledgements

This project was funded by the Australian Government Department of Education, Employment and Workplace Relations through the ICT Innovation Fund.

Teaching Teachers for the Future

Author contact details:
Chris Campbell chris.campbell@uq.edu.au
Aspa Baroutsis a.baroutsis@uq.edu.au

Please cite as: Campbell, C. & Baroutsis, A. (2011). Auditing education courses using the TPACK framework as a preliminary step to enhancing ICTs. In G.Williams, P. Statham, N. Brown, B. Cleland (Eds.) *Changing Demands, Changing Directions*. *Proceedings ascilite Hobart 2011*. (pp.200-204). https://doi.org/10.14742/apubs.2011.1855