

eLearning and Initial Teacher Education Programs: Insights from the Teaching Teachers for the Future Project

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Abstract: This paper argues that initial teacher education programs (ITE) which build the Technological Pedagogical Content Knowledge (TPACK) (Mishra & Koehler 2006) capabilities of future teachers is critical in enabling effective design and implementation of eLearning for school students. Insights are provided through drawing upon selected research findings from the *Teaching Teachers for the Future (TTF) Project* involving all Australian HEIs which provide ITE programs. The TTF Project, a 15 month long, \$8 million project, funded by the Australian Government's ICT Innovation Fund, aimed to develop the ICT capabilities of future teachers. Findings from the TTF Project indicate that the TPACK conceptualisation used to guide the project, and the Australian Institute for Teaching and School Leadership's *ICT Elaborations for Graduate Teacher Standards* (AITSL 2011a) can inform the design of ITE programs in preparing future teachers for using ICT to support teaching and to support student learning.

Introduction – TPACK Confidence and eLearning

Given that enrolments in the broad field of Education totalled 105 858 students in 2012 (DIISRTE, 2012) which represented 9.7% of the 1 094 672 students enrolled in higher education, and there is the potential for those students, as future teachers, to need to understand, design and implement effective eLearning experiences for school students, the importance of initial teacher education (ITE) programs is important. Therefore, ITE programs need to lead the design and implementation of eLearning approaches, enabling the development of future teachers with the confidence and the capabilities to capitalise upon the potential of new and emerging technologies to enhance learning and teaching. Research (Tondeur et al. 2012; Agyei & Voogt 2011; Drent & Meelissen 2008) has shown that a “crucial factor influencing new teachers’ adoption of technology is the quantity and quality of pre-service technology experiences included in their teacher education programmes” (Tondeur et al. 2012, p. 134). Despite this agreed understanding, Tondeur et al. also note that research findings (e.g. Sang et al. 2010; Tearle & Golder 2008) report that “beginning teachers feel they are not well-prepared to effectively use technology in their classrooms” (Tondeur et al. 2012, p. 134).

Accompanying these understandings, we have witnessed the shift from distance learning to online learning, blended learning, and eLearning approaches being explored and adopted. The technological changes have enabled exploration of new ways of designing learning and teaching, which require new capabilities of teachers. This challenges Higher Education Institutions (HEIs) which provide ITE programs in Australia. In addition, the implication for teacher educators, who teach the teachers, to have the capabilities to model eLearning which, in turn, help to build the capabilities of future teachers to design and implement effective eLearning with their school students. Therefore, this paper explicitly understands that the critically important link between ITE programs, future teachers’ ICT capabilities, and the design and implementation of eLearning in Australian schools.

The aim of this paper is to provide insights from key findings into the *Teaching Teachers for the Future (TTF) Project*, a 15 month long, \$8 million project funded by the Australian Government's ICT Innovation Fund, involving all 39 Higher Education Institutions (HEIs) which provide ITE programs in Australia. The TTF Project was guided by the Technological Pedagogical Content Knowledge (TPACK) conceptualisation (Mishra & Koehler, 2006) whereby teacher educators would design and model eLearning approaches with their students. This required that ITE programs would build the TPACK confidence and capabilities of future teachers. The findings presented will demonstrate that measurable growth in TPACK confidence and capabilities occurred in relation to future teachers' use of ICT to support teaching and to support student learning. Thus, this paper highlights that the TPACK conceptualisation and the *ICT Elaborations for Graduate Teacher Standards* (AITSL 2011a), developed during the TTF Project, can inform the design of ITE programs in preparing future teachers for using ICT to support teaching and to support student learning.

Teaching Teachers for the Future (TTF) Project

More comprehensive details about the project are available elsewhere (see, for example, <http://www.aitsl.edu.au/teachers/ttf/ttf-project.html>). The *TTF Project* focused on "systematic change in the ICT proficiency of graduate teachers in Australia by building the ICT capacity of teacher educators and developing resources to provide rich professional learning and digital exemplar packages" (Australian Government 2010, p. 1). It was a remarkable achievement to efficiently and effectively engage and obtain the agreed involvement of all 39 Australian Higher Education ITE providers. Moreover, the lead agency was Education Services Australia (ESA) and project partners were the Australian Council of Deans of Education (ACDE), the Australian Institute for Teaching and School Leadership (AITSL), and the Australian Council for Computers in Education (ACCE).

Given the involvement of all HEIs, the TTF Project implementation consistently adopted and nurtured an approach which respectfully understood the potential of capitalising upon the 'collective wisdom' of HEIs. The TTF Project adopted an *improvement* agenda rather than an *accountability* agenda (Finger 2013a). This collaborative approach was supported through the establishment of the TTF National Support Network (NSN) and evident through the voluntary contributions of members of the TTF Research and Evaluation Working Group (REWG), and the collegial spirit of participants throughout the project. As outlined in the introduction, central to the TTF Project was the TPACK conceptualisation (see Mishra & Koehler 2006). The TTF Project, in working with AITSL and engaging with the *Australian Professional Standards for Teachers* (AITSL 2011b) developed *ICT Elaborations for Graduate Teachers* (AITSL 2011a) to complement and elaborate upon the standards.

TPACK and Pre-service Teacher Education Literature Review

The emergence of TPACK has made a significant contribution to building upon pedagogical content knowledge (PCK) which has tended to inform the design of ITE programs. The TPACK literature has been well reviewed and synthesised by Voogt et al. (2013) through examining 55 peer-reviewed publications between 2005 and 2011, which concluded that there were different understandings of TPACK, and that teacher knowledge (TPACK) and their beliefs about pedagogy and technology determined whether or not a teacher might teach with technology. A search of the Association for the Advancement of Computing in Education (AACE) EditLib publications, using 'TPACK' as the search term, resulted in 526 papers identified, with 232 papers published in 2012-2013. Elsewhere, Punya Mishra, in providing updates of TPACK research, listed 15 dissertations which utilised TPACK in one of his Newsletters (Alshehri 2012; Anderson 2012; Benson 2012; Bilici 2012, Corey 2012; Easter 2012; Gillow-Wiles 2012; Habowski 2012; Hineman 2011; Matherson 2012; McBroom 2012; Mishne 2012; Mudzimiri 2012; Rathsack 2012; Unger 2012). Clearly, there is an expanding body of TPACK research which can inform ITE programs and the development of future teachers' TPACK capabilities.

Tondeur et al. (2012) identified 12 themes categorised according to themes. More specifically, themes relating to the preparation of pre-service teachers included aligning theory and practice (Angeli & Valanides 2009; Goktas et al. 2008; Jang 2008; Lavonen et al. 2006), using teacher educators as role models (Angeli & Valanides 2009; Tearle & Golder 2008; Thompson et al. 2003; Clift et al. 2001), reflecting on attitudes about the role of technology in education (Goktas et al. 2009; Tearle & Golder 2008, learning technology by design (Angeli & Valanides 2009; Thompson et al. 2003; Sahin 2003), collaborating with peers (Jang 2008; Barton & Haydn 2006; Brush et al. 2003; Thompson et al. 2003), scaffolding authentic technology experiences (Goktas et al. 2009; Tearle & Golder 2008; Brush et al. 2003), and moving from traditional assessment to continuous feedback (Lavonen et al. 2006; Barton & Haydn 2006; O'Reilly 2003; Sahin 2003). At the institutional level, themes were identified as being

technology planning and leadership (Goktas et al. 2009; Haydn & Barton 2007; Lavonen et al. 2006), co-operation within and between institutions (Thompson et al. 2003; Clift et al. 2001), staff development (Goktas et al. 2009; Thompson et al. 2003; Seels et al. 2003), access to resources (Goktas et al. 2009; Haydn & Barton 2007; Thompson et al. 2003; Cuckle & Clark 2002), and systematic and systemic change efforts (Goktas et al. 2009; Thompson et al. 2003; Seels et al. 2003).

Importantly, these themes (Tondeur et al. 2012), the growing TPACK literature (Voogt et al. 2013), and the dynamic, technological changes and challenges provides a context in which the TTF Project was situated. The increasing TPACK literature has provided an evidence-based advocacy of the importance of developing pre-service teacher TPACK capabilities to enable successful eLearning environments and learning experiences for school students.

TTF Project Research and Evaluation Design and Methodology

Three major research and evaluation strategies were designed and implemented; namely, (1) the development and administration of a TTF TPACK Online Survey, (2) the implementation of Most Significant Change (MSC) methodology, and (3) the facilitation of and opportunities for institution-initiated TTF research and evaluation projects. This paper focuses on data analysis obtained through both parametric and Rasch analyses of the *TTF TPACK Online Survey*. The *TTF TPACK Online Survey* data collections were undertaken in mid-June and early November 2011. A total of 12881 participants completed the first survey (T1) and 5809 participants the second (T2). They ranged in age from 17-62 years with an average age of 29 years.

Summary of the *TTF TPACK Online Survey* Findings

Given paper length constraints, this paper only presents some of the findings related directly to future teachers' TPACK confidence and capabilities and obtained from the *TTF TPACK Online Survey*. TTF research and evaluation findings are provided elsewhere in the TTF Project final report (available at <http://www.acde.edu.au/pages/images/TTF%20Final%20Report.pdf>). Importantly, that report reported the outcomes, including the following achievements:

1. For the first time, this involved all 39 Australian teacher education institutions in a national project;
2. Demonstrated an effective model for national organisations to work in partnership within the education sector;
3. Developed a suite of quality resources encompassing the Australian Curriculum, National Professional Standards for Teachers, and ICT in education (ICTE);
4. Fostered significant enhancement in the ICTE capacities of participating teacher educators; and
5. On a national level, increased the confidence of pre-service teachers in using ICT in the classroom, and their confidence to facilitate student use of ICT.

Outcomes of the project have also been disseminated more widely, for example, in a TTF Project Special Edition of *Australian Educational Computing*. That edition provides a summary of key findings from the *TTF TPACK Online Survey* (Finger et al. 2013b), and includes additional scholarly TTF Project Research (Campbell 2013; Chandler & Redman 2013; Gronn et al. 2013; Heck & Sweeney 2013; Henderson et al. 2013; Kearney & Maher 2013; Lloyd & Mukherjee 2013; Masters et al. 2013; Doyle & Reading 2013; Reading & Doyle 2013; Sweeney & Drummond 2013; White & Geer 2013; Williams & Sutton 2013; Zagami 2013). The following sections provide summaries of relevant findings related to the confidence of future teachers to use ICT to support teaching and to support student learning, which are both predictors of the likelihood of effective eLearning.

Pre-service Teacher Confidence: ICT to support teaching and to support student learning

Pre-service teachers were asked to respond to items relating to their confidence, as a future teacher, about their use of ICT to support teaching and to support student learning. Parametric and Rasch analyses were conducted on related items from the *TTF TPACK Online Survey*.

The Rasch analysis outcomes confirmed the measurement properties of two Confidence scales for items related to (1) the use of ICT, as a future teacher, to support teaching, and (2) the use of ICT, as a future teacher, to support student learning. These were confirmed both at T1 and T2, and required the omission of a small number of items and the combining of response categories. The samples report substantive and statistically significant increases in Confidence with using ICT sub-scales, both "for you as a teacher" and "for your future students". The

results are reported as two plot lines (items estimates + SEs) on one graph for each subscale so the differences between item values can be displayed with higher locations on the graphs reporting higher levels of confidence. Growth in confidence was evident for all items between T1 (Blue) and T2 (Red), as shown in Figures 1 and 2 below.

Figure 1: Confidence to use ICT, as a future teacher, to support teaching
(TTF Project TPACK Online Survey Items 18C, 19C & 20C combined)

Figure 2: Confidence to use ICT, as a future teacher, to facilitate student use for learning
(TTF Project TPACK Online Survey Items 21C, 22C & 23C combined)

Similarly, the parametric analyses were based on the two data collections – T1 and T2. In response to these items **about pre-service teachers' confidence to use ICT to support teaching**, growth in confidence was evident for all items between T1 and T2, as shown in Figure 1 above and in Figure 3 below. Means were calculated and the range of ratings extended from approximately 4.2, where a rating of 4 is equivalent to being moderately confident through to approximately 5.6, where a rating of 7 would be extremely confident and a rating of 6 would also reflect a high level of confidence.

At the individual item level, as illustrated in Figure 3, participants were *most likely* to be confident that ICT would support teaching in relation to engaging with colleagues to improve professional practice, teach specific subject areas in creative ways, use ICT for reporting purposes such as reporting to parents/carers, select and organise digital content and resources, use a range of ICT resources and devices for professional purposes, and to collaborate for professional purposes such as online professional communities. However, they were *least likely* to be confident to use ICT to support teaching to teach strategies to support students from Aboriginal and Torres Strait Islander backgrounds, manage challenging student behaviour by encouraging responsible use of ICT, teach digital citizenship to promote student demonstration of rights and responsibilities in the use of digital resources, and in engaging parents and families in their child's school through ICT, and to teach strategies responsive to diverse student backgrounds.

Figure 3: Average confidence of pre-service teachers to use ICT to support teaching
(Q18-20 items arranged in ascending order; Scale 0-7 where 7 is the highest level of confidence)

In response to items which sought **pre-service teachers' perceptions of the confidence to use ICT to support student learning**, growth in confidence was evident for all items between T1 and T2, as shown in Figure 2 above and in Figure 4 below. Participants were *most likely* to be confident that ICT would support student learning in communicating with others locally and globally, gathering information and communicate with a known audience, develop understandings of the world, demonstrate what they have learned, and to provide motivation for curriculum tasks. In contrast, they were *least likely* to be confident that ICT would support student learning in relation to facilitating integration of curriculum areas to construct multidisciplinary knowledge, to understand and participate in changing knowledge economy, synthesise their knowledge, to acquire awareness of global implications of ICT-based technologies, and develop functional competencies in a specified curriculum area.

Figure 4: Average confidence of pre-service teachers to use ICT to support student learning
(Q21-23 items arranged in ascending order; Scale 0-7 where 7 is the highest level of confidence)

The findings reported here showed that the TTF Project resulted in gains in the overall confidence of pre-service teachers to use ICT to support teaching and to support student learning. Furthermore, this research has identified specific areas of strong confidence, and has also identified ongoing areas needing attention.

Future Directions and Recommendations

A limitation of the TTF Project was that it received funding to support this project for a limited time. Consequently, each HEI was required to develop an Institutional Action Plan aimed at sustaining and building upon the TTF Project initiative. The Final TTF Report (see <http://www.acde.edu.au/pages/images/TTF%20Final%20Report.pdf>) appropriately identified the following recommendations derived from the Action Plans:

1. Recommendations for Universities

- 1.1 Each Faculty or School responsible for Teacher Education should develop, maintain and add to on a regular basis, an easily accessible repository of resources to enable all staff (and students) to access these resources as necessary.
 - 1.2 Each Faculty or School responsible for Teacher Education should develop a leadership team to help staff to use these resources in a manner that is consistent with the TPACK model.
 - 1.3 Each Faculty or School responsible for Teacher Education should redesign certain key units to provide both a model of integrated ICTE strategies and a model of effective redesign processes to form the basis of a broader redesign initiative across the school/faculty.
 - 1.4 Each Faculty or School responsible for Teacher Education should develop institutional processes/systems to enable sustainable improvements in curriculum, pedagogy and assessment in relation to ICTE dimensions, and graduates that can demonstrate the ICTE dimensions of the National Standards for Graduate Teachers.
- 2. Recommendation for the Department for Education, Employment and Workplace Relations**
- 2.1 Future capacity building and change implementation projects in the use of ICT in education (ICTE), implementing the Australian Curriculum and National Professional Teacher Standards should emulate the collaborative model tested and proven to be very successful in the TTF project.
- 3. Recommendations for the Australian Council of Deans of Education (ACDE)**
- 3.1 ACDE should assume responsibility for sustaining facilitation of a collaborative national support network of ICTE experts across Australian teacher education institutions. As part of this responsibility ACDE will encourage and support:
 - 3.1.1 Each Faculty or School responsible for Teacher Education should develop and share exemplary ICTE pedagogy in one additional Australian curriculum area and in one cross-curriculum priority and generic capability statement.
 - 3.1.2 The development of informal State and Territory networks to ensure ICTE elements of the Australian Curriculum include local content and technological priorities.
 - 3.1.3 Collaborative research in areas of need identified by the TTF Project Evaluation.
- 4. Recommendation for expression of the ICT statements**
- 4.1 Consideration should be given to preparing holistic statements against the National Professional Standards for Teachers rather than against Focus Areas within Standards.
- 5. Recommendation for developing future online professional learning resources**
- 5.1 Consideration should be given to the development of a suite of resource packages to support Phase 2 of the Australian Curriculum, utilising reviewed model of existing TTF resource packages.

Conclusion

This paper provided a summary of the TTF Project and established the importance of ITE programs in preparing future teachers who have the TPACK confidence and capabilities needed to support teaching and to support student learning. The literature review established the growing TPACK research base (e.g. Voogt et al., 2013) and the key themes (Tondeur et al., 2012) relating to teacher preparation for ICT use and institutions. The TTF Project, guided by the TPACK conceptualisation, focusing on ITE programs and institutional leadership and collaboration within and between HEIs in Australia appropriately addressed key themes identified at the teacher preparation programme level and at the institutional level.

Importantly, this paper has argued that the TTF Project research and evaluation findings have demonstrated that pre-service teachers' TPACK confidence and capabilities, which both support teaching and support student learning, were enhanced, and these are needed to enable the design and implementation of eLearning. Given the central importance of teachers in eLearning, continuing attention needs to be focused on TPACK in ITE programs, and the TTF research provides evidence of measurable improvements, which can guide the preparation of future teachers.

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