TEACHER EDUCATORS AS LEARNERS: ENABLING LEARNING WHILE DEVELOPING INNOVATIVE PRACTICE IN ICT-RICH EDUCATION

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Abstract

It’s time for teachers to consider themselves as learners in ICT-rich learning environments and to become more aware of factors that enable their learning in such environments. The notion of teachers as learners in ICT-rich environments is not new but the focus is usually on school teachers and formal professional development, rather than teachers in universities learning as part of the change-of-practice process. This research investigated the enablers that were identified by teacher educators as most significant in the development of their Technological Pedagogical Content Knowledge (TPACK) while transforming their teaching practice. As part of the evaluation of the effectiveness of strategies implemented to improve graduating pre-service teacher ability to demonstrate innovative use of ICT in education, Most Significant Change Stories were compiled from focus group discussions with teacher educators in four curriculum areas, English, Mathematics, Science and History. The teacher educators were provided with support, an ICT Pedagogy Officer, as they planned, implemented and evaluated innovative ICT-rich learning experiences. The enablers identified by the teacher educators as contributing most significantly to their learning are explained. Findings show that there are common themes across these enablers and that not all enablers are factors over which the teacher educator has control.

Introduction

It’s time for teachers, irrespective of who they teach, to realise that they will always be learners in Information and Communication Technology (ICT)-rich environments and to become more aware of factors that enable their ongoing learning in such environments. It is now a curricula requirement that ICT is integrated into learning (ACARA, 2012a). Given the increasing rate at which new technologies appear, it is no longer sufficient for a teacher to only share with her/his students what she/he learnt about when at school or in teacher training. This extraordinary rate of change of technology makes the on-going learning of ICT-related knowledges both absolutely essential and extremely challenging. Awareness of the enablers of such learning allows teachers to optimise their learning.

The notion of teachers as learners is not new. However, more often the focus is on teachers in schools rather than teachers in universities. The notion of learning in ICT-rich environments is not new. However, more often the focus is on formal models of professional learning rather than factors that enable learning during the change of practice process. So, what enables teacher educators to build up their Technological Pedagogical Content Knowledge (TPACK) and thus improve the delivery of knowledge to their students, our future teachers? This paper reports the enablers that were identified by teacher educators as most significant in the development of their TPACK while transforming their teaching practice. As teacher educators, like school teachers, are engaged in a pedagogical process research previously reported about school teacher learning is considered relevant to informing research into teacher educator learning and thus discussed in the following.

Enablers of innovative use of ICT in education

With the increased use of ICT in education there has been much research reported about the enablers of the innovative use of ICT in education for both teachers (e.g., Papanastasiou & Angeli, 2008; Phelps & Graham, 2010; Voogt, 2010) and pre-service teachers (e.g., Hammond et al., 2009). However, there has been very little reported about such enablers for teacher educators, although
research reported by Drent and Meelissen (2008) did include teacher educators as well as teachers. As early as 2000, enablers (factors) such as peer collaboration, personal reflection and renewal of enthusiasm were being reported as encouraging teachers to use technology in their teaching (Mumtaz, 2000). More recent research has identified four important enablers of innovative use of ICT: encouragement from colleagues, colleague and mentor input, professional engagement, and personal entrepreneurship.

Encouragement from colleagues was a key enabler that accounted for 12% of the variance (second only to the factor “Confidence in using ICT” which accounted for 55%) of teacher use of ICT in teaching in a detailed study conducted in Cyprus (Papanastasiou & Angeli, 2008). This enabler included: teachers in the school using computers for teaching and learning; teachers in the school being well-informed about the value of computers in the school; exchanging ideas with other teachers; discussions in faculty meetings about integration of computers into the curriculum; and direct encouragement from other teachers, the inspector, the principal and the ICT coordinator.

Colleague and mentor input was a key enabler encouraging pre-service teachers to make use of ICT in teaching (Hammond et al., 2009). This enabler included the input from peers, as well as mentors and other colleagues when in school. The pre-service teachers found encouragement in strategies such as asking, watching and observing others when making use of ICT. The pre-service teachers reported that it was easy for them to develop ICT knowledge and skills but this must be viewed in the context of pre-service teachers being in a position where they take responsibility for their learning and are willing to take risks to learn.

Professional engagement was a key enabler in making science teachers extensive users of ICT in teaching (Voogt, 2010). This enabler was measured in terms of professional development activities attended and professional collaboration. The research, involving secondary analysis of data from 22 countries, found that those who were more extensive users of ICT tended to co-teach more often and collaborated more often with teachers from other schools.

Personal entrepreneurship was a key enabler for helping teacher educators to integrate innovative use of ICT into their teaching (Drent & Meelissen, 2008). Personal entrepreneurship was taken as the number of contacts a teacher educator kept (both inside and outside the workplace) for his/her own professional development in the use of ICT. Case studies further showed that personal entrepreneurship also included reflective and active behaviour concerning ICT use.

Enablers of learning about innovative use of ICT in education

The above were enablers of “use” of ICT in education and showed a strong emphasis on engaging with other professionals. An important aspect of making innovative use of ICT in education must be the learning undertaken to enable that use. Focus is now turned to such learning. There has been extensive reporting of research into learning for teachers (e.g., Phelps, Graham, Brennan & Carrigan, 2006; Prestridge, 2007; Davis, 2008; Law, 2008; Schibeci et al., 2008; Somekh, 2008) and some for pre-service teachers (e.g., Barak, 2006). There has been very little reported about learning for teacher educators, although the research reported by Drent and Meelissen (2008) did report about learning for teacher educators as well as teachers.

Before focusing on the enablers of teacher learning, some research on the nature of teacher learning in ICT-use situations should be considered. Research makes it clear that those teachers who make use of ICT in their teaching recognise the importance of their learning about such use of ICT. For example, Voogt (2010) found that strong orientation towards life-long learning of extensive-use teachers was evidenced in the curriculum goals they pursued and in the pedagogical practise they applied in the classroom.
Models have been proposed to facilitate teacher learning about the use of ICT in education (e.g., Prestridge, 2007; Davis, 2008). The model suggested by Prestridge (2007) for learning to transform practice requires teacher action in an investigative context with interplay between three important components: external school context, internal school context and core reflective process. The external and internal contexts could include visions, policies, structures, events, or people. The core reflective practice could include reflection and constructive dialogue. A similarly broad but also layered view of what impacts teacher learning was proposed by Davis (2008) as a model when designing teacher learning, viewing the teacher as nested in various ecologies (classroom, school, district, state/region, nation, global).

The social aspect of learning has been a strong focus of much recent research reported on teacher learning. For example, both Somekh (2008) and Law (2008) reported on socio-related aspects of teacher learning. Socio-cultural theory was proposed by Somekh (2008) as a process to analyse teacher pedagogical adoption of ICT use, so that the change is not considered in isolation. Socio-metacognitive capacities development was considered essential in disruptively innovative situations so that teacher learning went beyond mere knowledge. The model proposed by Law (2008) promoted teacher learning through the involvement of teachers in networks of innovations. Some research has shown that teachers may not recognise the importance of this social aspect of learning. For example, Barak (2006) reported that although pre-service teachers had a positive experience with collaboration built into compulsory activities and assessment, some were competitive in their approach rather than collaborative and some viewed their “social learning” as not really contributing to the use of ICT to promote learning.

There has been some reporting of actual enablers of learning about innovative use of ICT in education. Recent research has identified three important enablers: actively constructing knowledge, working collaboratively and reflective action.

Actively constructing knowledge was a key enabler of learning when teachers were able to make their own choices about their professional development (Schibeci et al., 2008). Changes in teacher ICT use were identified in their approaches to teaching and curriculum development, their ICT use and confidence, and their classroom dynamics. Teachers should be allowed to take control of their own professional development by selecting both circumstances and content.

Working collaboratively was a key enabler of learning for primary school teachers through collaboration with both colleagues and students over extended periods of time during professional development involving reform of both curriculum and teaching strategies (Schibeci et al., 2008). In a large cross-institutional research initiative (Teaching Together) two of the six strategies proposed by Phelps, Graham, Brennan and Carrigan (2006) to get teachers to work together were embedding discussions in staff meetings and informal discussions. These, combined with reflective action processes, introduced a metacognitive approach to the ICT-change process in schools and provided teachers with an opportunity to know “how” to learn.

Reflective action as a process embedded in practice was a key enabler of learning to progress teachers to transforming practice (Prestridge, 2007). Professional development that only “re-tools” just augments the existing curriculum with ICT applications and does not allow true transformation of teacher practice. In the Teaching Together project based on action research with teachers, Phelps and Graham (2010) reported that the embracing of reflective processes was important to teacher learning and to being a part of the complex interplay of planning and implementation.

The enablers of teacher learning (constructing knowledge actively, working collaboratively, and reflective action) combined with those for teacher use of ICT (encouragement from colleagues, professional engagement and personal entrepreneurship) provide support for Barak’s (2006) CASR Instructional Framework (Contextual Learning, Active Learning, Social Learning, Reflective Learning) for learners. This model was based on an analysis of what aspects of the pre-service teacher experience, in Science and Technology, fostered learning about ICT but the variety of research
reported above suggests that it would be equally applicable as a model for categorising learning for teachers and thus perhaps teacher educators.

**Context**

The research was undertaken at the University of New England (UNE) as part of the national *Teaching Teachers for the Future* (TTF) project that aimed to improve delivery of teacher education so that graduating pre-service teachers were able to demonstrate effective and innovative use of ICT in education. The TTF project focused on four Australian Curriculum (ACARA, 2012b) areas, English, Mathematics, Science and History, with each of the 41 institutions involved being expected to implement strategies in two of the four areas. Although UNE focused on Science and Mathematics as their “designated” curriculum areas, work was also undertaken in English and History.

Teacher educators in each curriculum area were provided with support, an ICT Pedagogy Officer (ICTPO), as they planned, implemented and evaluated innovative ICT-rich learning experiences for the pre-service teachers. Across the four curriculum areas there was differing levels of intensity of ICT inclusion and differing approaches to the uptake of offered support. For Science and Mathematics, the designated curriculum areas, the level of innovativeness and the level of ICTO support uptake were higher than for the non-designated curriculum areas, English and History.

For Science, the use of a virtual world, Quest Atlantis (http://atlantisremixed.org), was embedded in the curriculum, learning activities and assessment. The ICTPO provided support with technical and pedagogical aspects of implementation and with research of practice. For Mathematics, the use of VoiceThread (http://voicethread.com) was embedded into learning activities to assist pre-service teachers to analyse student learning. The ICTPO provided technical and pedagogical support. For English, the use of a variety of ICT tools for supporting student learning was embedded as an optional activity in assessment. The ICTPO provided technical and pedagogical support and collaborated to connect the teacher educator with other educators. For History, the use of VoiceThread was embedded into assessment activities to allow pre-service teachers to comment on teaching videoclips and to collaborate in planning teaching sequences. The ICTPO provided some technical and pedagogical support.

**Most Significant Change Stories**

One important strategy used to evaluate the effectiveness of the TTF project was to measure the impact of the changes implemented at each institution by compiling *Most Significant Change Stories*. Stories in relevant curriculum areas were created separately for the teacher educator perspective and the pre-service teacher perspective and then the final (combined) stories for each curriculum area were shared nationally. Although it was only an expectation that Most Significant Change Stories be compiled for the two designated curriculum areas at each institution, at UNE stories were completed for the four curriculum areas because some level of innovation and support occurred in each.

This paper reports aspects of the stories from the teacher educator perspective in each of Science (2 teacher educators & 49 pre-service teachers), Mathematics (3 teacher educators & 612 pre-service teachers), English (1 teacher educator & 22 pre-service teachers) and History (1 teacher educator & 90 pre-service teachers). In Science the pre-service teachers were studying on-campus, in History they were studying off-campus and in Mathematics and English there was a mixture of both on-campus and off-campus. The teacher educators were interviewed as a focus group in each curriculum area using the Most Significant Change Story protocol provided by the TTF Project. After the researcher recorded the interview a two-page story was created from the main points shared. Finally, the stories were shared with the relevant teacher educator(s) to check the accuracy of representation. The relevant part of the story protocol for the research reported here is about the learning that took place as the teacher educator changed her/his thinking about ICT whilst undertaking the implementation of innovative ICT in teaching and describing what contributed to this occurring.

The four stories, Science (Reading & Doyle, 2012a), Mathematics (Reading & Doyle, 2012b), English
(Reading & Doyle, 2012c), and History (Reading & Doyle, 2012d) provided interesting insight into the experiences of the teacher educators as they developed innovative practice in ICT-rich education. These stories are a valuable source of enablers of teacher educator learning because, as Phelps and Graham (2010) pointed out, those individuals who share in the complex interplay of such factors during experience are best placed to understand it. So, the Most Significant Change Stories report their stories, not the stories as observed by others. Thus, the enablers reported below were identified by the people who have succeeded.

The enablers were categorised at two levels. First, they were categorised as either exogenous (non-manipulative) or endogenous (manipulative). These categories were proposed by Drent and Meelissen (2008) for considering enablers of innovative “use” of ICT in education but have been used here to classify the identified enablers of “learning” about innovative use. While the exogenous enablers are of interest, it is the endogenous enablers that are most importance as they are the enablers that can be manipulated to improve teacher learning. Second, the set of endogenous enablers were further categorised according to the CASR Framework (Barak, 2006) into those associated with Contextual Learning, Active Learning, Social Learning or Reflective Learning.

**Enablers of learning for teacher educators**

There were both exogenous (Table 1) and endogenous (Table 2) enablers identified from the stories. Tables 1 and 2 indicate the curriculum areas in which the teacher educators reported about each enabler. The order of curriculum areas, across the columns left to right, is from the area with the most intense ICT innovation to the area with the least intense. Some enablers were identified by teacher educators in just one curriculum area, while others were identified in more than one. It must be remembered that the teacher educators were asked to share what had impacted most on their learning experiences and so just because a teacher educator did not mention any specific enabler, it does not mean that enabler was not impacting her/his learning.

Three exogenous enablers (Table 1) were identified in the teacher educator explanations. Policy stipulating that ICT must be incorporated into teaching can create the pressure to learn, while pre-service teacher capabilities and enthusiasm can motivate teacher educators. These enablers are important but are not directly manipulable and thus not something that can be adjusted to optimise learning.

**Table 1. Exogenous enablers of teacher educator learning**

<table>
<thead>
<tr>
<th>number of teacher educators</th>
<th>Science</th>
<th>Maths</th>
<th>English</th>
<th>History</th>
</tr>
</thead>
<tbody>
<tr>
<td>pressured by need to learn</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>pre-service teacher capabilities</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>pre-service teacher enthusiasm</td>
<td>✓ ✓</td>
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</table>

Eighteen endogenous enablers (Table 2) were identified in the teacher educator explanations. The two researchers (authors) generally agreed when classifying the enablers into one of the four CASR Framework categories but two enablers, recognise potential of use of ICT for learning (contextual or reflective) and identify with ICTPO as mentor (active or contextual) generated some discussion before consensus was reached. As previously explained the teacher educator stories did not necessarily share all enablers, just those that were most significant. For example, learning in the workplace was an enabler that was in place across the four curriculum areas, by the nature of the TTF Project, but only the History teacher educator shared this.

At least one enabler from each dimension of the CASR Framework was shared in each curriculum area except Science where there was no Reflective Learning enabler and History where there was no Social Learning enabler. A possible explanation for Science is that the implementation involved the
most innovation and the greatest direct support from the ICTPO with reflective actions so built into the process that the teacher educators may not have considered it necessary to mention them. For History, the teacher educator utilised the ICTPO mainly for technical and management support and did not collaborate with colleagues, pre-service teachers or other educators. The limited level of learning discussed when she shared her story may be a reflection of this lack of engagement in collaboration.

**Table 2. Endogenous enablers of teacher educator learning**

<table>
<thead>
<tr>
<th>number of teacher educators</th>
<th>Science</th>
<th>Maths</th>
<th>English</th>
<th>History</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

**Contextual Learning**
- have a personal interest
- participate in webinars
- raise awareness through ICTPO contact
- recognise potential of use of ICT for learning

**Active Learning**
- learn in the workplace
- teach in a unit with ICT embedded
- utilise technical support
- utilise ICTPO support
- identify with ICTPO as mentor

**Social Learning**
- collaborate with ICTPO
- collaborate with others
- learn together through teaching together
- learn together with pre-service teachers
- become part of a learning community

**Reflective Learning**
- ask colleagues for ideas
- challenged by others
- change perspective on ICT use in education
- change view of lecturer & pre-service teacher relationship

Considering differences across the curriculum areas, there are four interesting observations. First, the teacher educator (English) who became involved in the experience through personal interest demonstrated strong awareness of the impact of Social Learning and Reflective Learning enablers. Second, two of the teacher educators (Mathematics) who developed a particularly strong collegial relationship by co-teaching the one cohort of pre-service teachers were the only ones to recognise learn together through teaching together as an enabler. Third, the enablers shared by the teacher educator (History) who became involved in the project late in the planning stage as a consequence of replacing another teacher educator, showed more of a focus on Contextual Learning and Active Learning. This was possibly due to the fact that she was also learning about the actual unit she was teaching. Fourth, the teacher educators (Science) who worked together most closely with the ICTPO clearly demonstrated this in some of the enablers they shared but such a collaborative relationship was not necessarily reflected well in their Social Learning and Reflective Learning enablers. This may be because their story focused more on pre-service teacher learning (the TTF project priority) and not so
much on their own learning. This was reflected in the exogenous enablers they identified, pre-service teacher capabilities and enthusiasm.

**Conclusion**

As enablers were found in all dimensions, the results of this research reinforce the relevance of the CASR Framework as a perspective on teacher learning. The similarity of previously identified teacher enablers of learning with those found in this research was not unexpected as teacher educators are in fact a subset of teachers, whose students are pre-service teachers rather than school students.

This research demonstrates that there is a range of enablers that assist teacher educators when they are developing innovative practice in ICT-rich education and that these are consistent with those enablers previously identified for teachers. When teacher educators embark on the journey of improving their ICT-related practice it is strongly recommended that they do as much as possible to take advantage of enablers across the four dimensions: Contextual Learning, Active Learning, Social Learning and Reflective Learning. In particular, the results have shown that enablers associated with supportive action in the workplace and with collaboration nurture learning.

There were three main limitations of this research. First, the nature of the TTF project implementation meant that those teacher educators provided with more support made better professional connections to develop their Social Learning. Second, only a small number of teacher educators shared their stories about learning and it is possible that analysing stories from a wider range of teacher educators may expand on the variety of enablers. Third, the nature of the focus group protocol with teacher educators reporting the main enablers that impacted their learning meant that some enablers were not shared.

This research has implications for both teaching and research. Teacher educators and those responsible for providing learning for teacher educators need to ensure that as many as possible of the identified enablers are put in place to support learning and importantly they should ensure that enablers from all four dimensions of learning are present. There are also implications for further research including the need for a wider analysis of teacher educator stories to expand on the number of identified enablers and an investigation of what may be distinctive about teacher educator learning as compared to teacher learning.

So now it’s time for all teachers, including teacher educators, to realise that they will always be learners and to plan their professional learning accordingly. Whether that learning is organised by others or self-planned it should incorporate as many of the identified enablers as possible to optimise learning.

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**References**


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