

## THE INTEGRATION OF TECHNOLOGY ENHANCED LEARNING IN INITIAL TEACHER EDUCATION PROGRAMMES: COLLABORATIVE RESEARCH FROM AUSTRALIA AND SOUTH AFRICA

Jenny Lane (*Edith Cowan University, Perth Australia*)  
Arend E Carl (*Stellenbosch University, Stellenbosch South Africa*)  
Sonja Strydom (*Stellenbosch University, Stellenbosch South Africa*)

### Abstract

Initial teacher education programs have been charged with failing to keep pace with the use of technology in the workplace by not modelling technology-rich pedagogy to pre-service teachers. This paper aims to inform the development of contemporary models of learning design in initial teacher education, which focus on pedagogical processes while making authentic use of information communication technologies (ICTs). Research teams in two large schools of education, one in Australia and one in South Africa, engaged in a collaborative process to address the following research questions: What is the current progress of the integration of technology enhanced learning in initial teacher education programmes? What approaches to learning design can assist teacher educators to facilitate technology rich teaching and learning activities? The research teams modeled a socio-constructivist approach to as they combined face-to-face visits and online collaboration to develop the research agenda. The researchers undertook a series of visits and semi-structured interviews involving nine universities to gather data on the design and implementation of a ICT- rich mode of delivery in undergraduate teacher education programs.

### Introduction

Rapid changes in technology use and the demands of the workforce raise challenges to the education system. In pre-service teacher education there is criticism that many tertiary institutions are still using educational models formed in the Industrial Era, oriented to mass production, that no longer respond to the requirements of the modern time, oriented to knowledge creation (Johnson, Adams Becker, Cummins,, Estrada, Freeman,, and Ludgate, 2013, Kozma, 2011). The quality and relevance of Teacher Education has been an area of growing concern in many countries (Billing, 2003, Bradley, Noonan, Nugent, & Scales,2008, Delors, 1998). A number of international studies have indicated that Teacher Education is failing in the use and integration of new technologies (Chickering, & Ehrman,1996, Commonwealth of Australia,2009). Schooling systems are reliant on Teacher Education Courses to produce teachers who have traditional, as well as digital literacy skills. Teachers need to have the skills to select and use technology to prepare students for the workplace (Lane,2012, Bowden, Hart, King, Trigwell, & Watts, 2000, Business Higher Education Round Table,2002). These sentiments have been supported by research undertaken in Australia which indicates that the business community is not satisfied that the schooling system is preparing school students to take their places in the competitive online, digital work environment (ACER,2008, Barrie, 2009, Boud,2010, Curtis, & McKenzie, 2001). To address this challenge many countries have initiated renewal of their educational systems in order to prepare the students by embedding the skills required in the workplaces in the teacher education curriculum. There is a need for research to monitor the progress of these curriculum renewal initiatives. A number of studies have identified a set of skills that are required in the

workplace and will be important in the future. These are commonly referred to as twenty first century skills, namely: creativity, critical thinking, efficient learning skills, complex problem solving, collaboration and communication (Johnson, Adams Becker, Cummins,, Estrada, Freeman,, and Ludgate, 2013). In addition to the traditional literacies, pre-service teachers also need to have developed a set of skills in the area of digital literacy. Renewal of curriculum in pre-service teacher education is complex and evolves over time, because it involves a paradigm shift regarding learning and teaching among teacher educators, many of whom lack confidence in the use of ICT and pedagogical innovations (Lane,2012). This paper describes research investigating initiatives to integrate technology enhanced learning in undergraduate preservice teacher education courses. The research project was undertaken in two countries and has provided a rich set of data. A framework to consider the level of change and the impact on student learning was developed and used to analyse and discuss the curriculum renewal initiatives in the institutions. The analysis and findings have revealed useful insights to guide teacher educators as they initiate curriculum renewal in teacher education.

## Literature Review

An extensive literature review was undertaken to develop a theoretical background to guide this study. The literature was used to develop a framework to compare policies and reforms on ICT implementation in education. This conceptual framework informed the development of the research questions and the data collection tools. The constructs of levels of knowledge were used in the analysis and discussion of the data. Two main theoretical frameworks were used to guide the development of this study. Firstly key aspects of Severin's (2010) work were selected and adapted and used to inform the development of the research questions about the design, implementation, monitoring and evaluation of ICT projects in the undergraduate teacher education programmes. Severin's framework (2010) included five components (process and procedural) to achieve the desired goal of technology enhanced learning namely infrastructure, content, human resources, management and policy. For each component input, processes and products, development stages and impact were defined. Kozma (2011) goes beyond process and procedures and delves deeper into the learning process. Kozma (2011) postulates that in managing change processes special attention needs to be given to the connection between the level of knowledge the project aims to achieve, and the components that needed to be changed so that the changes are sustainable. To ensure changes are embedded the following aspects within an organisation need to be considered policy, professional development, pedagogy, curriculum, assessment, school organization and ICT use. Kozma (2011) distinguishes between four levels of knowledge: *Basic Education*, *Knowledge Acquisition*, *Knowledge Deepening* and *Knowledge Creation*. According to Kozma (2011) the *Basic Education* level refers to the essential skills and processes required to function in society for example in ICT keyboarding skills, word processing and digital communication skills, the *Knowledge Acquisition* level means using ICT to enhance learning in traditional subject matters in order to acquire factual knowledge. At this level the pedagogical use of ICT relates to the use of ICT as a learning tool for example, using computer-based tutorials and digital content materials, presentations and task management. ICT initiatives aimed at achieving the *Knowledge Deepening* level focus on students' preparation for the workplace, which requires real-life problem-solving and communication skills. According to Kozma to achieve the *Knowledge Deepening* level the curriculum needs to change to emphasize deep learning with a reduced focus on the volume of content but more interdisciplinary themes. Another important aspect of Kozma's *Knowledge Deepening* level is the development of important learning skills such as complex problem solving and collaboration. Teaching is based on students' intrinsic motivation by allowing them to learn authentic themes, active learning and carrying out inquiry-based collaborative projects (Kozma, 2011). The *Knowledge Creation* level extends the *Knowledge Deepening* and "include the ability to use a range of technological tools and digital resources; to search for, organize, and analyze information; to communicate effectively in a variety of forms; to collaborate with others of diverse skills and backgrounds; and to think critically, innovatively, and creatively" (Kozma, 2011,

p.25). These skills are required in the modern innovation and creativity oriented global society. In Kozma's framework ICT serves for networking across learning and practice communities, interacting with experts and peers, to produce a new knowledge.

### Blended Learning

In reviewing the literature the notion of blended learning emerged as a strategy used by a number of higher education institutions to increase the integration of ICT in TE. Blended learning is developing into a growing field of practice and research in higher education and numerous other sectors (Drysedale, Graham, Spring, & Halverson, 2013; Halverson, Graham, Spring, Drysdale, & Henrie, 2014). Attempting to define the notion of blended learning usually includes but is not limited to a reference to a combination of more than one delivery mode, the combination of a number of technologies and pedagogical approaches, the integration of different didactical methods and the fusion of traditional face-to-face with online delivery (Partridge, Ponting, & McCay, 2011). Despite the many attempts to define such an approach, a blended mode of delivery typically aims to create opportunities by which academics and students alike are able to engage in ways that are not normally afforded or available in face-to-face or distance educational models (Bath & Bourke, 2010). This could potentially result in approaches whereby time (e.g. usual face-to-face opportunities as opposed to recorded sessions), location (e.g. face-to-face tutorial or large online discussion) and people (e.g. a lecturer podcast or a virtual classroom which create opportunities for both residential and off-campus students) are "blended" according to particular learning outcomes and needs (Bath & Bourke, 2010). Academics are often motivated by aspects such as the enhancement of the learning and teaching experience (e.g. active learning, timeous and quality feedback) (LTEU, 2010; Partridge et al., 2011), the development of particular student skills (e.g. graduate attributes or digital literacies) (LTEU, 2010); the development of a more efficiently managed course (e.g. integrated and improved administrative functions and procedures) (Partridge et al., 2011) and to accommodate growing student numbers both on or off campus (LTEU, 2010). From an institutional perspective blended learning creates opportunity for the efficient utilisation of lecture space and amongst other the use of online resources and recycling of particular learning objects (Partridge et al., 2011). The transformative potential of blended learning is highlighted in many studies and articles (Partridge et al., 2011; Stacey & Gerbic, 2008) by which it is argued that it provides opportunity for the complete redesign of the curriculum and not the often artificial "add on" of technologies to illustrate the integration of ICTs into the curriculum. A paradigm shift in terms of the approach to teaching and learning is therefore required whereby it is acknowledged that collaboration, online social networking, interactive activities and so forth all form part of the learning process (Diaz & Brown, 2010).

### E-Learning

E-learning or electronically assisted learning is a term broadly used to describe learning that is facilitated by online tools. This notion of online learning has grown significantly in higher education institutions since the commercial use of online learning managements systems (LMS) emerged in 1995. These LMSs have grown in use and functionality from initially being a repository of course resources to the current applications, which are engaging interactive systems addressing all aspects of the teaching learning cycle. Conole (2013) argues that we now have the following capacities: social networking and a range of modes for interaction and communication, which include live real time video conferencing and more significantly a short from the LMS being a content repository to one that allows user content creation. Today LMSs' have evolved to have the facilities to support a wide range of academic- student interactions from content delivery to collaborative task production. The affordances of the LMS support multimodal online learning objects, which can include video, audio, animations, text, slides and notes. Many LMS' include "mash ups" which can included a combination of links to external sources for example you-tube videos and resources in external repositories with user generated content. The latest versions of LMSs include collaboration tools, which allow students to work in online groups, post discussions, and answer questions using polling and quiz functions.

According to Weller (2011) the facility for students to engage in peer review of online tasks supports teaching and learning in new ways. Many LMSs have a range of assessment functions. These online assessment tools support student learning in a fully online environment by facilitating a complete workflow for the assessment process. This begins with digital resources outlining the assessment task (videos, audio or text based) leading to the online submission of student work, online marking, instructional marking rubrics, plagiarism detection, online moderation tools, mark collation in an online gradebook and finally the electronic submission of the grades into the institutions marks recording system.

## **Setting the context for the research**

This research was undertaken by academics in two continents in the Southern Hemisphere, Africa and Australia. The work resulted from a series of collegial professional visits as visiting scholars travelled between two institutions with large schools of education sharing their contexts and resources.

### **A brief historical background to teacher education in South Africa**

In South Africa (SA) the higher education sector currently consists of 25 universities. Teacher training currently resides in faculties of education at 23 of these universities. But how did this dispensation come about after decades of racial segregation which impacted on all spheres of life in SA? SA has 176 years of teacher training in the southern African region as the first teacher training institution was established at the Moravian mission station in Genadendal (“valley of mercy”) in 1839.

Teacher training colleges expanded rapidly as by 1930 there were 30. New and separate educational institutions for different races were established after the National party came into power in 1948 and by 1994 there were more than 100 teacher training colleges. Universities also trained teachers (Higher Diploma in Education; BEd four year degree programmes). Universities believed they equipped students with a better knowledge base (academic emphasis), whilst colleges focused on skills/practice. (Report on National Review of Academic and Professional Programmes in Education, 2010)

### *Changes to teacher education in South Africa post 1994 to reflect a democratic society*

Modification to governance and curricula of teacher training programmes were required after the first democratic election in 1994. There were at that time 102 colleges, 20 universities and 15 technicons, these institutions were reduced to 23 institutions. All teacher-training colleges were either closed or merged with universities. This had a major impact on impact on teacher supply and demand. Downscaling and rationalisation of school teaching posts meant that teachers could not get posts. There was a decline in prestige and attractiveness of teaching as a profession, which led to lower numbers of students in teacher training programmes. Supply did not always meet demand: excess and shortages differed from province to province and shortages of classrooms and schools were also experienced. The biggest problems regarding TE was the poor quality of programmes and that it was not always cost effective. Restructuring of teacher education was thus necessary as the cost effectiveness of colleges was also low (low student-staff ratio). Colleges were incorporated into the higher education sector and one single coordinated national system was established. With the mergers many staff members were not re-employed; there were a reduced number of students who wished to enter the profession; and the image and attractiveness of teaching dropped further.

The shift from college to higher education sector had a positive effect as teachers would be seen as independent, knowledge-producing professionals. Institutions were involved not only in teacher training, but also created and defined official knowledge in TE by creating conditions which could enhance and influence the quality of education (Parker & Adler, 2005: 61 in Report on National

Review of Academic and Professional Programmes in Education, 2010).

New policies for teacher training were developed, namely the Norms and Standards for Educators (2000) which focused on the identity of the teacher (Seven roles of the teacher: learning mediator; interpreter and designer of learning programmes; leader, administrator and manager; scholar, researcher and lifelong learner; assessor, community, citizenship and pastoral role; learning area specialist; Integrated and applied competence: implications with regard to the integration of theory and practice (Report on National Review of Academic and Professional Programmes in Education, 2010).

Currently teacher training is underpinned by the Minimum Requirements for Teacher Education Qualifications (MRTEQC). Why a new teacher education policy? It was to align teacher education policy with the new 10-level National Qualifications Framework (SAQA) and the Higher Education Qualifications Framework (CHE/HEQC). Previously there was no national academic qualifications policy framework in higher education for teacher training. Now teacher education no longer has its 'own playing field' but forms an integral part of a broader higher education system. All teacher training programmes had to be aligned with this policy.

Teacher education in South Africa thus faces many challenges, ranging from providing enough teachers for the school system to ensuring relevant teacher education programmes that equip student teachers to function optimally as teachers in the school sector. The training of teachers to utilise learning technologies in their daily teaching, is one of the major challenges faculties of education face today.

Technological innovations and connectivity opportunities challenge leaders in higher education to strategically position their institutions to provide alternative learning opportunities which have the potential to "effectively and efficiently transform higher education institutions" (Garrison & Vaughan, 2013 p.24). The rationale for such emphasis in higher education normally resides in attempts to address a number of potential institutional challenges (i.e. managing growing student numbers, increasing flexibility of provision etc.), to contribute to more efficient delivery of courses, the development and enhancement of student skills and the enrichment of the learning and teaching experience (Sharpe, Benfield, & Francis, 2006).

It is suggested that information and communication technologies (ICTs) could for example impact on teaching and learning, educational outcomes, pedagogical practices and so contribute to developing graduates and citizens for the information age (Jaffer, Ng'ambi, & Czerniewicz, 2007, p.131). In addition it is argued that in order to be able to participate as fully-rounded individuals and engaged citizens within society, certain levels of digital skills are required (Littlejohn, Beetham, & McGill, 2012). Concomitantly an increase in the implementation of blended learning modes of delivery and research related to this phenomenon (Halverson, Graham, Spring, Drysdale, & Henrie, 2014) both at a local and international level (Drysdale, Graham, Spring, & Halverson, 2013) has been noticeable in recent years.

In the South African context, the integration of technology in teaching and learning emerged as a potential tool of driving transformation (e.g. National Plan for Higher Education of 2001; National Research and Development Strategy of 2002 and the White Paper on e-Education, 2003) and enhancing the quality of education. It is argued that technology has the potential to "add value to education, improve teaching and learning, encourage innovation, and contribute to transformation" (Brown, 2012, p. 41).

## A brief historical background to teacher education in Australia

Teacher education in Australia has grown and developed over the past one hundred years from two-year certificate courses to three-year courses offered by teacher training colleges. Currently all teachers need to be registered in order to teach by the accrediting bodies in each state. This requires teachers to have a four-year university degree or a three-year degree and a graduate diploma in education or a Masters Degree in Education. In 2008, Australian Education Ministers declared the Melbourne Declaration on Educational Goals for Young Australians aimed to improve educational outcomes for all young Australians by promoting equity and excellence, and developing (a) successful learners, (b) self-confident and creative individuals and (c) active and informed global citizens (Melbourne Declaration, 2008). The Action Plan focused in eight areas: “developing stronger partnerships, supporting quality teaching and school leadership, strengthening early childhood education, enhancing middle years development, supporting senior years of schooling and youth transitions, promoting world-class curriculum and assessment, improving educational outcomes for Indigenous youth and disadvantaged young Australians, especially those from low socioeconomic backgrounds, strengthening accountability and transparency” (ibid, p.10). As a part of this Action Plan, the Australian Government initiated the Digital Education Revolution (DER) initiative targeting to promote the meaningful integration of information and communication technology (ICT) in the Educational System. A component of the DER, Teaching Teachers for the Future (TTF) project aimed to provide Information and Communication Technology in Education (ICTE) proficiency of pre-service teachers and meaningful ICT integration in the classroom.

“In the twenty-first century, Information and Communication Technology (ICT) has become integral to how we access and process knowledge in every field of learning. ICT is also transforming pedagogy by providing new ways to learn.” (AITSL,2011).

### *National Support for a technology rich curriculum in pre-service teacher education in Australia*

The TTF planning strategy was based on involving the academic community in decisions making related to ways of achieving the goals (Romeo, Lloyd & Downes, 2012). It included three components: (1) National Professional Standards (NPS) for teachers that also defined criteria for accreditation of all courses in the pre-service teacher education programs (APST, 2012); (2) Resources for the Australian Curriculum, which included rich digital content resources and repositories (especially in the core subjects – sciences, mathematics, language and history) available for pre-service, in-service teachers and teacher educators; and (3) Capacity building in pre-service teacher education, expressed in establishing a wide National network of ICTE experts leading to systemic change in ICTE curriculum and pedagogy in Teacher Education (Lane, 2011; AITSL, 2011). The 39 Australian Tertiary Teacher Education institutions cooperated in the project. The TTF, led by the Australian Learning and Teaching Council (ALTC), impacted on 55,000 pre-service teachers in Australia. A set of National Professional Standards for Teachers, were developed as part of this project. These seven standards relate to three domains of teaching: Professional Knowledge, Professional Practice and Professional Engagement (Romeo, Lloyd & Downes, 2012). They define what teachers should know and do at different stages of their development: graduate, proficient, highly accomplished, and lead. A set of ICT iterations, were developed to describe the ICT skills and competencies required for each standard and substandard. These ICT iterations were focused on the graduate level standards. According the TTF project all Australian teacher education institutions will implement new standards in their pre-service courses by 2015 (AITSL, 2011).

The project focused on supporting pre-service teachers to achieve competence in the use of ICT to improve student learning. An action of the project was the appointment of ICT pedagogy officers, for one year, in all the institutions to support teacher educators to embed Information and Communication Technology in Education (ICTE) in all aspects of the pre-service teacher education curriculum. This was funded for 2011 and part of 2012 but TTF Project funding has now ceased for these positions.

### *ICT in Australian Schools and the implications for pre-service teacher education*

The introduction of the new Australian curriculum in 2012 by the Australian Curriculum Assessment and Reporting Authority (ACARA) motivated an increase in the use of technology in Australian schools. Although concerns have been expressed that Australian teachers are not yet prepared to implement the levels of technology described in the curriculum (Peluso,2012, Lane,2012). A key feature of the Australian Curriculum (ACARA, 2012), is a set of seven general capabilities that span all curriculum areas. Information and communication technology (ICT) is one of the general capabilities.

“general capabilities refer to an integrated and interconnected set of knowledge, skills, behaviours and dispositions that can be developed and applied across the curriculum to help students become successful learners, confident and creative individuals and active and informed citizens” (ACARA, 2012,p.1).

The Australian Curriculum states that the ICT general capability aims to “transform the ways students think and learn and give them greater control over how, where and when they learn” (ACARA, 2012, p.41). This notion of using the technology to transform the learning experience can be a challenge for many teachers who have not experienced this use of technology in their own education and many reported a lack of support for ICT by the educational system and school leaders (Attard & Curry, 2012).

The ICT general capability of the Australian curriculum sets the expectation that, students use ICT ‘to access and manage information but also to create, present, problem solve, communicate, make decisions and reason’ (ACARA, 2012, p. 26). However according to Lane (2012) who surveyed over 240 Australian Teachers not all teachers are prepared for the use of technology for higher order thinking as described in the curriculum. In some cases teachers reported that the roles were reversed and the students are teaching the teachers how to use new technologies. This supports the need to include more ICT in preservice teacher education courses. However the challenge for teacher educators is how best to address this shortfall caused by the inadequate integration of ICT leading to inadequately prepared teachers in the classroom in TE as illustrated by this comment from a teacher reported in the by Lane, 2012.

“I am finding that not all teachers are ready to integrate technology until they are thoroughly trained and see practical applications. I’m finding that if I teach my students using Web 2 tools they will carry their knowledge to other classes. In some cases, teachers asked what tool they are using and the students teach the teachers creating less of a divide.” (Lane, 2012)

### **The research plan and methodology**

The South African National government provided funding for the enhancement of teaching and learning, the so-called Teaching Development Grant. This created the opportunity for institutions to apply for funding in various fields. The Faculty of Education at Stellenbosch University applied for funding to launch projects on student support/tutoring, development of young academics, postgraduate supervision and the enhancement and utilisation of learning technologies in teaching and learning. This paper reports on the latter project which focused on the empowerment of staff to integrate blended learning in their curriculum, and also to gather data at a national level of the state of blended learning in teacher training programmes at the various faculties of education at South African universities. A parallel project was undertaken at Edith Cowan University in Australia.

A decision was made to visit seven of the larger institutions, which provide pre-service teacher education in South Africa and at one university in Australia, which has a large school of education. Arrangements were made with representatives and interviews were held. Interviews were audio recorded and field notes were taken. Audio recording were transcribed and analysed a series of themes emerged from the data. These themes were used as headings and the data was grouped in tables. This allowed for analysis and discussion of the findings guided by the literature.

*Interview schedule and research questions*

The following interview schedule formed the basis for the discussions:

- Share experiences with regard to technology enhanced learning in the faculty at
  - Strategic level
  - Program level
  - Individual level
- How is curriculum development approached to enhance technology-enriched learning?
  - Programme level?
  - Module/subject level?
- Probe the current opportunities and processes associated with staff support and staff development.
- How are students supported in the use of technology for learning?
- What is the role of mobile devices in the faculty?
  - “Bring your own device” (BYOD) or is prescribed tablets envisaged?
  - Examples of projects
- Portfolios
  - Paper portfolios VS e-portfolios? Any preferences?
- Software, hardware and social media
  - Role of Inter-active whiteboards (training and support; usage by staff; student support)
  - Any preferences regarding software?
  - The role of social media as a learning tool?
- Any current on-line courses (undergraduate and post-graduate) courses for teachers?
- Attitude of staff regarding the utilisation of learning technologies?

**Findings and discussion**

The responses to the interviews from eight universities were collated and a series of tables were developed. Each table contains data relating to one theme which emerged from the literature review. Selected tables will be shared and the findings will be discussed in the section below.

TABLE 1: The institutional approach to technology enhanced learning

<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>
Part of institutional policy as a strategic priority.  All faculties encouraged to consider programme redesign with emphasis placed on integration of ICTs.  Focused staff development	Not institutional policy.	Institutional support via e-Learning division of the university, but no clear strategic priority.  Each faculty has T&L committee member and T&L specialist.	Formal institutional strategy regarding technology integration.  Formal faculty policy and vision regarding blended learning & curriculum development.

programme.  Centre for Learning Technologies and Centre for Teaching & Learning assist in curriculum renewal across faculties.  Appointment of blended learning coordinators in all faculties to assist with integration of learning technologies in the curriculum.			
<b>E</b>	<b>F</b>	<b>G</b>	<b>H</b>
All students on campus are required to complete an academic information management course.  Forms part of institutional policy as a strategic priority.	All students on campus are required to complete an academic information management course.  Forms part of institutional policy as a strategic priority.	No formal institutional policy regarding technology integration.	Part of institutional policy as a strategic priority.  All faculties encouraged to consider programme redesign with emphasis placed on integration of ICTs.  Centre for Learning and Development for to assist in curriculum renewal across faculties.  Appointment of ICT coordinators in the faculties to assist with integration of learning technologies in the curriculum.  B-Ed degree has one unit of ICT.

The data represented in the table above addressed some of the many layers of institutional and procedural aspects that Severin (2010) identified were required to support or block institutional changes in curriculum. Three of the eight institutions in the study did not have a strategic institutional policy with regard to the integration of learning technologies in teaching. One of the institutions without formal institutional support did provide limited support for staff wanting to integrate ICT. Three institutions had dedicated centres to support staff to redevelop curriculum to include ICT. Only half of the B-Ed degrees in teacher education included core modules or units of study to develop key technological skills. The academics that participated in the interviews stated that they viewed skills development and staff support as an important part of curriculum re-development. Participants also indicated that more staff training was needed for academics to acquire the skills to implement a technology rich curriculum. Although lecturers reported a lack of confidence and skills to use ICT for learning the lecturers' attitudes were in general very positive towards the use of more technology in teacher education.

**Table 2 Curriculum development regarding ICTs**

<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>
Development of blended learning action plan in faculty aligned with strategic aims of the faculty.	No formal approach.  Academics encouraged to provide evidence of ICTs in the curriculum.	No formal approach.  Good practice opportunities available in faculty.	Vision for the curriculum.  Faculty developmental plan with emphasis placed on self-directed learning.

<p>Curriculum advisor plays role in curriculum renewal.</p> <p>Identified BEd Hons as programme to renew by means of ICT integration.</p> <p>Targeted staff development programme for colleagues.</p> <p>Educational Psychology embarking on similar approach toward curriculum renewal.</p> <p>Teaching development grant (TDG) made funding available for ICT-related projects in the faculty.</p>			<p>diversity and blended learning.</p>
<p><b>E</b></p>	<p><b>F</b></p>	<p><b>G</b></p>	<p><b>H</b></p>
<p>ICT one of the compulsory subjects in B.Ed.</p> <p>Each student required to demonstrate the use of technology in classroom.</p>	<p>Education Information Technology a compulsory module for BEd.</p> <p>Each student required to demonstrate the use of technology in classroom.</p>	<p>No plans in this area.</p>	<p>Education Information Technology compulsory for BEd.</p> <p>Curriculum redesign to integrate ICT- to align with university graduate attributes and policy.</p> <p>Masters by research program for cohorts of teachers includes ICTs.</p> <p>Faculty small grants available.</p>

In the majority of the institutions blended learning or the enhancement of learning technologies form an integral part of curriculum development initiatives. In most of the institutions student support and training are provided. Yet in terms of Kozma’s (2011) framework of the levels of knowledge namely *Basic Education, Knowledge Acquisition, Knowledge Deepening and Knowledge Creation* much of this work is occurring at the *Basic Education* level. It has been found that despite the perception that young people are technologically savvy, they lack skills and knowledge with regard to the use of learning technologies in their learning. Students know how to use online tools in a social context but often lack skills in integrating it sensibly in the academic context. They need to acquire the functional skills to work in 21<sup>st</sup> century environments.

Yet in order to support even this *Basic Education* level the institutional support is required. The five process and procedural components identified to achieve the desired goal of technology enhanced learning namely infrastructure, content, human resources, management and policy were lacking in many if the institutions. For each component input, processes and products, development stages and impact were considered. In terms of infrastructure and resources very few of the institutions provide any hardware for students use in the general teaching spaces although each institution indicated they had a shared computer room/ laboratory for teaching and most had work spaces often in or near the library where students could use computers and access the internet. In most institutions Wi-Fi access for students and staff was described as problematic and unreliable. One of the institutions has negotiated a free or reduced cost Internet access package for student with a private provider. Only two institutions have included mobile devices (tablets) as part of the curriculum. In one of the institutions where mobile tablet devices are provided provided, is not embedded but part of a trial for example in one case of tablets are provided as part of a project on utilising e-portfolios to enhance learning during

teaching practice. When examining curriculum documentation it appears as if few institutions encourage the use of mobile devices as a particular outcome.

When considering the range of the activities and the learning design in the majority of the institutions the focus was on the process and procedural aspects of ICT integration few institutions reported the higher levels of technology enhanced learning as described in Kozma's model. One example of curriculum change working at the *Knowledge Deepening and Knowledge Creation* levels (Kozma, 2011) was the use of e-portfolios developed by the students as part of their teaching practice. E-portfolios were not widely used in the South African Institutions. Notably one institution in the South African study was making innovative use of E-Portfolios as part of a trial linked to teaching practice. In the Australian University E-portfolios are widely used and have been for over ten years. The University provides an E-Portfolio Platform called PebblePad, which is integrated into the LMS. Staff and students are encouraged to use this platform. Not all the academics used the platform provided by the university for the E-Portfolios, some citing it as being difficult for the students to access. In some cases academics use other platforms for example Google Sites, Word Press or Edublogs for students to develop their E-Portfolios. The academics stated that using the freely available resources allows the students to continue to build their portfolios after they graduate and gives the pre-service teachers experience in using platforms that they can access and use when they are in schools.

Only some institutions in the South African study used a Learning Management System. There was no consensus on which LMS to use. The main platforms used by the institutions were Moodle, Sakai, and Blackboard. In most cases the LMS is being used as a repository of resources for example PDF copies of notes. Three of the institutions included multi-media slide shows. The Australian University has a policy that all modules and units of study have to have an LMS site containing all the resources. A range of other applications to promote technology enhanced learning namely Interactive Whiteboards, PowerPoint, blogs, Prezzi, tablets and cell phones were also being used mostly by one South African institution and the Australian institution.

The South African institutions that were visited were all on-site campuses and did not offer distance education. No on-line courses were found to be in place at the faculties of education who were visited. In Australia E-learning or fully online courses are growing in popularity. The Australian Institution has recently introduced a fully online Bed Degree. This degree has a specific learning design with an inquiry focus where students work through a series of tasks or challenges to encourage deep learning and authentic problem solving. There is minimal use of content delivery for knowledge acquisition instead students are posed authentic challenges where they have to become the producers or creators of knowledge as they research and design their response using technology to deliver and share their responses. This learning design falls within the upper levels of Kozma's (2011) model namely *Knowledge Deepening and Knowledge Creation* in that the students are actively using the ICT to produce and share understandings with their peers not merely consuming artifacts developed by their lecturers and others. The fully online B-Ed degree is delivered using Blackboard LMS supplemented by extensive use of a video conferencing platform called Adobe Connect Pro. This platform provided a "real-time" streaming video and audio with interactive chat facilities to encourage student engagement. Over 85% of the students enrolled in the fully online B-ED degree indicated that they were new to fully online learning and needed support with this way of learning. Many of the Universities in the study indicated that the development of on-line courses form part of their future plans.

## Conclusion

In concluding this study it is encouraging to note that 95% of the institutions in the study are well on the way in the journey towards technology enhanced learning in the teacher education courses. There are

the institutional restraints of process and procedure and a lack of infrastructure and widespread institutional support was cited as hampering the initiatives. Although these initial teacher education programs have been charged with failing to keep pace with the use of technology in the workplace there was much evidence of academics modelling technology-rich pedagogy to pre-service teachers. Although much of this is still at the level of *Basic Education* and , *Knowledge Acquisition*. There were fewer examples of students using the technology and developing their own resources. This could be due to the considerable costs associated with “hands on” personal use of technology. A few of the institutions have introduced a LMS’s which is a further step in the journey to support technology enhanced learning yet it was noted that where they are being implemented being used as repositories not for *Knowledge Deepening and Knowledge Creation* terms of Kozma’s model (2011). However it was encouraging to note that some institutions are venturing further in this journey of technology enhanced learning by embracing blended learning and in one instance e-learning in a fully online model. There research revealed significant shifts in learning design as faculty ventured online in this journey of technology enhanced learning. There is a need for more research on contemporary models of learning design in initial teacher education which focus on pedagogical processes while making authentic use of information communication technologies because so many institutions are still at the beginning stages of this adventure and can benefit by learning from other experiences in this area.

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Author Name: Jenny Lane  
Contact Email: [j.lane@ecu.edu.au](mailto:j.lane@ecu.edu.au)