Using New Technologies to Support the Learning of Aboriginal Pre-Service Teachers

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ABSTRACT

This action research project focuses on the incorporation of new Information and Communication Technology (ICT) into the student learning experience in a Bachelor of Education course for Aboriginal students. The research is part of a larger national DEEWR-funded joint research project by Charles Darwin University and the University of Western Sydney. Both universities have considerable numbers of students from equity groups, many of whom are undertaking at least part of their study through flexible and blended delivery via ICT. Many of these students have lower success and retention rates than for other students. The purpose of the joint research is to investigate how to better provide for and support the learning of students from targeted equity groups, including Indigenous Australians, students whose first language is a language other than English (LOTE) and those undertaking a transition from VET studies. The first stage of the project assessed the knowledge and usage of ICT enabled learning amongst equity groups at UWS and CDU. Stage 2 builds on those findings through a series of action research projects to determine how to better provide for and support the learning of the students through new technologies and prepare them for their future careers. The action research reported here examines the learning process and strategies from both staff and student perspectives in the incorporation of new technologies in class, in preparation for students' professional experience teaching in local primary schools.

Keywords: ICT learning; pre-service teacher education; Aboriginal tertiary students; Interactive whiteboards

I. INTRODUCTION

Teaching and learning have changed in many ways over the last decade. As new technologies are developed, their use has been adapted to meet educational needs. At the tertiary level, university systems have changed, with much of the interaction occurring online, for example, through online enrolments, library services, lectures, website information about course and units, interaction with tutors and lecturers via email, and with other students via discussion boards and chat rooms. Current University student populations have also changed. In the main these students come into University computer literate, with a high degree of visual literacy, able to multitask and to attend to inputs from several sources seemingly simultaneously. They expect to interact with their environment in complex ways and are likely to be bored by 'chalk and talk' types of lectures. While the preceding description of students holds true for some Indigenous students it is not the case for all. The action research study reported here is with Aboriginal pre-service teachers who study in mixed mode, attending University for usually 2 week blocks of teaching twice each semester that is supplemented by online learning outside these teaching periods.

This study is one of several action research projects that form the second stage of a large joint project between CDU and UWS. The purpose of the joint research is to investigate how to better provide career preparation and support the learning of students from targeted equity groups, including Indigenous Australians, students whose first language is a language other than English (LOTE) and those undertaking a transition from VET studies. The significance of the project lies in the fact that (a) both CDU and UWS have considerable numbers of students from equity groups living large distances from their campuses, that (b) deployed properly, ICT enabled learning may be a key factor in attracting and retaining such students, and (c) the research literature in this area is mostly silent on how equity groups engage with ICT enabled learning. The first stage of the project assessed the knowledge and usage of ICT enabled learning amongst equity groups at UWS and CDU and set the direction for the second stage.

One study in the second stage involves pre-service teachers who are undertaking a unit on ICT and research in education. Within the unit they are required to prepare lessons that incorporate some form of technology in the lesson plan, and then teach those lessons while on professional experience. When the students go out into primary schools to undertake teaching practice they encounter the use of a range of technology and software (digital technologies), such as interactive whiteboards, PowerPoint, the internet, social networking sites as teaching tools. We will use the term 'digital pedagogy' to delineate the area of our work that has to do with pre-service teachers' use of digital technologies within their teaching practice. It is to be expected that the pre-service teachers who participate in this study will find a base line of digital technologies that they can use while teaching in the practicum school.

Growth in the employment of technology-based teaching and learning has been so rapid that some of the pre-service teachers may not have experienced them in their own schooling, this is particularly so for mature aged students. Further, some students have never used some of the technology and considerable expertise is required to plan, write and teach a seamless lesson with it. As part of this research, a University educator introduced new technologies, demonstrating their use, encouraging student use and obtaining student feedback. Following the first teaching block, the educator reflected on the implementation, and planned improvements for the second block. The educator also planned and monitored online reflections and discussions to support student learning about how to use the new technology when teaching. Students kept a reflective journal to map the progress of their own learning journeys. The aim was to develop strategies to build student skills and teaching capacity with ICTs (digital technologies) and develop a supportive learning community. The details are provided in the methodology that follows a review of the literature.

Three strands have been addressed within the literature review that follows. First is a presentation of provision for, and the learning of, Indigenous learners at the tertiary level, followed by a brief discussion of ICT supported learning at university, and finally the scant literature on supporting ICT learning of tertiary Indigenous students is reviewed.

II.   PROVISION FOR INDIGENOUS TERTIARY STUDENTS.

There have been a plethora of government reports into tertiary provision for Indigenous students and key factors that may contribute to success and retention (DEST, 2005, 2008; MCEECDYA, 2009) Factors identified included cultural awareness, curriculum, anti-racism, student support, governance and representation. However, a 2007 survey of twelve representative universities found that few had developed their own policies or strategic plans related to Indigenous students and the above factors (Gunstone, 2008). Universities that have dedicated Indigenous programs or specialized streams for Indigenous students go some way towards culturally appropriate provision. Students in such programs are provided with student support in the form of a tutor under the national government funded Indigenous Tutorial Assistance Scheme (ITAS). This scheme, while useful when operating properly is often fraught with administrative and other difficulties, such as finding tutors and making appropriate matches (Whatman, McLaughlin, Willsteed, Typhuis & Beetson, 2008) A recent mandate by the Australian government that every graduate

from an Australian University will need to display a graduate attribute related to Indigenous culture, knowledge and perspectives, has meant that Universities are beginning to write programs and units in this area which will be rolled out over the coming years. This will foreground Indigenous peoples and culture in the tertiary sector, and should, therefore, have an impact on policy in the areas mentioned above. One of the difficulties in not providing targeted policies is that Indigenous people are marginalised and disempowered whilst at the same time those from the dominant culture are privileged (Gunstone, 2008, p. 104). Unintended discrimination is a likely result, with resulting alienation and often, withdrawal. If universities are to increase the retention and success of Indigenous students then the above factors need to be addressed at all levels. Pertinent to the present study is the area of curriculum content, design and implementation that is culturally appropriate.

An example of this in practice at the course and unit level was highlighted in a study of how Indigenous students viewed the language demands of University (Malcolm & Königsberg, 2007). They noted that many students found tertiary literacy difficult because of their unfamiliarity with the vocabulary and the 'long and waffling texts' they had to read (p 19). They suggested that course and unit writers needed to provide scaffolding to develop academic literacy and to use language that was more culturally inclusive. Other research addressed the need for effective program design for Indigenous University students (Pearce, 2008). The author of that study, an Aboriginal academic herself, indicated that program designers and facilitators had a difficult task to cater for the needs of Indigenous learners through the management of 'the interface between Indigenous community contexts and knowledge and those of academic knowledge and institutional practices' (p131). She developed some guiding principles and identified successful strategies such as using culturally appropriate teaching materials, employing self-directed learning activities and understanding Indigenous ways of learning and knowing (p133). Part of providing appropriately for Indigenous tertiary learners includes addressing the learning styles debate.

III.   INDIGENOUS LEARNING STYLES AND TERTIARY EDUCATION

There has been substantial literature in the past related to meeting the educational needs of Indigenous students through an understanding of strategies to support their learning styles (see Stewart, 2002 for an overview). While some writers debate the notion of different learning styles for Indigenous learners, others recognise that environmental factors may have some effect. For example, the socio-cultural background and experiences in upbringing and earlier educational experiences will have an impact on learning, particularly when the teacher lacks an understanding of that culture (Partington, 2003). In a study of the learning preferences of Indigenous tertiary students studying veterinary science, it was found that several aspects of Aboriginal cultural practice were evident and could impact on their learning (Barnes, 2000). When interviewed, Barnes found that the Indigenous students were more group oriented, and less concerned with personal achievement; they preferred to learn in a holistic way by having an overview, then major headings prior to detail; they preferred the use of diagrams and visuals to help explain written text; they preferred to learn in practical settings; preferred oral to written exams; and relationships with teachers and other students were important (p15). Recognising learning needs and valuing of Indigenous cultures can address possible student alienation. The development of online systems, courses, units and support units that are not designed to be culturally inclusive, and use academic language, could fall into a pattern of unintended discrimination. Prior to a discussion of the implementation of ICT learning with Indigenous students, it is necessary to review some of the research around ICT and tertiary education in general.

IV.   ICT SUPPORTED LEARNING FOR TERTIARY STUDENTS

Recent research has indicated that ICT learning is socially constructed, is active and engaging and incorporates diverse knowledge systems (McLouglin & Lee, 2010). There are challenges for staff to provide 'personalised learning experiences using suitable learning technologies that cultivate independent learning skills, while also scaffolding learner reflection and the development of generic competencies' (McLouglin & Lee, 2010, p 38). One of the key early studies that investigated changes to learning,

described interactive multimedia as being able to provide a 'situated learning model', in which students are able to learn 'within the context of real world applications', which makes learning authentic, allows for modelling, scaffolding, collaborative knowledge construction, and promotes learner reflection (Herrington & Oliver, 1997, p 127). Several other studies investigated technology and higher education, such as a study of undergraduates use and ownership of emerging technologies (Oliver & Goerke, 2007); a study of interactive media and situated learning (Herrington & Oliver, 1997); a networked learning community approach (Watson & Prestridge, 2003); multimedia, science and distance education (Bowyer & Blanchar, 2003); developing a smart community in higher education (Baskin, Barker & Woods, 2003); and research undertaken at a number of Australian Universities into the use of ICTs learning technology (Moyle & Owen, 2009) but they did not identify the impact for equity groups.

V. ICT AND INDIGENOUS TERTIARY STUDENTS

A scan of the literature indicated that there is very little research into the use of ICT in higher education to support the learning of Indigenous students with some studies mostly seeking to identify barriers to learning via ICT. For example one such study investigated equity and the use of ICT in higher education (Barraket & Scott, 2001). This study found that women, older students, those from low socio-economic groups and Indigenous and rural or isolated students studying in block mode were disadvantaged. The study found that poor levels of information literacy and the resultant lack of confidence led to lack of access to the technology and to technology supports. They further noted that it was students with the greatest need that had the least access. (Barraket & Scott, 2001, pp 3, 8). Another example includes a study of the use of technology by, and techno-literacies of Indigenous tertiary students (Christie, 2001).   In a related area, Dyson & Robertson (2006) investigated the low participation of Indigenous tertiary students in courses to train to become an IT professional.   Another study evaluated the barriers to e-learning opportunities for women, people with a disability and Indigenous people in the Vocational Education and Training (VET) sector (Kilpatrick & Bound, 2003). A study was commissioned that identified three types of barriers to e-learning which contributed towards a 'digital divide' in the VET sector. These were (a) Connectivity, that is the infrastructure and access to the internet; (b) Capability, described as the internet skills and confidence and valuing the internet; and (c) Content that was relevant and useful (Australian Institute for Social Research, SA, 2006, p 3). A study of the engagement of remote and very remote Indigenous students with ICT focused on school-aged students (Wallace, 2008). There were some recommendations, which could be relevant to the present study. For example the researcher indicated the need to scaffold digital learning, to focus on the pedagogy, and to design activities that 'require learners to interact with the technology and a range of knowledge' (p16). Another school-based program was designed to develop students' multi-literacies across texts and technologies as a step towards familiarizing them with later tertiary demands. Outcomes that relate to the current project include designing pedagogy to encourage independent learning and problem solving, building a community of e-learners and developing the technical vocabulary and textual practices around electronic media (Doherty, 2002, p58).

Other examples include a study by McLoughlin and Oliver (2000) that developed a guide for developing culturally responsive web design appropriate for Indigenous tertiary students. As language and culture are intrinsically intertwined and each person is a product of his/her own culture, any text produced will be biased towards that culture in terms of language usage and meanings, visual images, cultural knowledges and mores. As such, unfamiliar cultures will be excluded to greater or lesser extents depending on the proximity of one culture to that which produced the text. Therefore, when a website is developed it will also reflect the mainstream culture of those who created it and will inadvertently be less accessible, or exclude those from other cultures and those who are less familiar with the dominant culture. In creating websites suitable for Indigenous learners McLoughlin and Oliver (2000, p 58) argued for 'cultural localisation, which means incorporating the local values, styles of learning and cognitive preferences of the target population'. They indicated that web designers would have to look beyond surface level design considerations in order to achieve a design that was culturally inclusive. The design guidelines that they

developed are located within social constructivist theory in which learning is viewed as being socially constructed ideally through active participation and real life tasks. The guidelines include: learning tasks that support different learning styles, providing scaffolds, flexibility and choice of tasks, the opportunity for students to collaborate with peers and for them to be able to add cultural content to the site, and learning activities that 'provide bridges to the student's culture and community' (p69). However, an investigation of distance education and equity for Aboriginal students (Gibb 2006, p 21) found that there were differences between the 'preferred Indigenous learning practices and current online distance educational processes' and that students were thus 'doubly isolated', demonstrating that online course writers have been slow to adapt and incorporate the findings of earlier studies.

> Learning has been described as 'a socially situated activity, where the relationship between what the individual learns and the situation and context in which knowledge is acquired and used, shape individual and collective understanding and practice' (Kilpatrick & Bound 2003, p. 9)

Further, when the students have to learn by distance or through block mode internet connectivity and speed issues have an impact on learning. Added to these challenges for university provision and student access and equity, ensuring inclusivity and catering for the learning needs of different cultural groups can be difficult. For example, research has indicated that Indigenous students like to make deep connections and those relationships between students and between students and teachers are most important in supporting their learning (Gibb, 2006). It would therefore seem that by providing blended learning experiences in which students are put into groups and need to contribute to online postings would enhance their learning through the necessary interactions.

The current research will increase our understanding of factors influencing the engagement and success of Indigenous students with ICT learning, and the development of strategies to assist their teaching skills development.

VI. METHOD

The design of the action research study described in this paper follows the participatory model. The project trials the introduction of technology, including interactive whiteboard technology in a unit in which Aboriginal pre-service teachers need to design and implement a lesson in a primary school classroom, using some form of ICT to support their teaching. Volunteers from the group of the students undertaking the unit will be involved in the study. Initial focus groups and interviews with student volunteers give an overview of their familiarity with a range of technology for teaching and learning and with their own access and use of online learning systems. Students also keep a reflective journal to map their own learning process. The journal provides the students with the information they need to discuss in follow-up focus groups. It will also provide data for the lecturer to discuss when interviewed. Focus group and interview data are transcribed and analysed for themes using QSR NVivo computer software (Bazeley & Richards, 2000) to manage the data.

There are two groups of students undertaking the unit, as follows:

> **Fourth year students,** who have all had some experience using technology such as interactive whiteboards in teaching lessons in schools. Some have taught the teacher's prepared lessons with teacher support to assist them when they got stuck with the technology. Others have planned and written lessons using various software and technology e.g. Power Point, u-tube, the internet, and taught their lessons.

> **Third year students,** who have varied experiences with using technology in teaching lessons in schools. Those working as teacher's aides have seen interactive whiteboards and other technology used in teaching, but may not have used them personally. Others

in the group have had no experience with the technology as used for teaching in primary schools.

In Stage 1 of the project volunteer students joined focus groups in which they discussed their familiarity with and use of ICTs to support their learning. The action research phase followed the cycle as outlined below.

A. *Step 1. Plan*

- As part of the Unit 'ICT and Research in Education' students need to design and implement a number of lessons (while on teaching practice later in the semester) using some form of ICT to support their lessons. Students are encouraged to design and implement their lessons using any one or more ICTs, such as the interactive whiteboard, the internet, Power-Point, u-tube. Past strategies for teaching the unit were examined and adapted to incorporate the participatory action learning cycle.

B. *Step 2. Action*

- The lecturer demonstrated a range of digital technologies in class, followed by discussions about the type of pedagogy that is possible, student engagement, interactivity and visual literacy.

- In peer supported learning fourth year students discuss and demonstrate aspects of lessons that they had already taught during previous professional experiences with third year students. These were followed by question and answer sessions about how to undertake effective implementation, good ideas and pitfalls to avoid. This discussion was recorded as an aid for later reflection.

- All students kept a learning journal and to reflect on their use of the technology and how they planned to develop a lesson to implement in the upcoming professional experience.

C. *Step 3. Reflect*

- 5.   The lecturers reflected on their own teaching, student engagement with the technology, and how to cater for students from different year groups with different degrees of experience with a range of technology. Further reflection was around how to incorporate some of the 4th Years' and 3rd Years' experience in schools into next round of action

D. *Step 4. Revised Plan*

Lecturers incorporate improvements into Block 2, prior to and during teaching practice. Gather student feedback on their experience.

E. *Step 5. Reflect*

Students write up their action research project as a scaffold journal article, which will provide further data for analysis by the researchers.

VII.   EVALUATION AND INTERIM FINDINGS

A final evaluation in terms of an analysis of the utility of the technology and strategies found to be effective through student and staff reflection and feedback will feed back into the larger joint project.

Currently, the project is at the initial stage of implementing the action research study with the Year 3 and Year 4 AREP students, so only interim findings can be discussed. Evaluation case study methods

(Guba & Lincoln, 1989; Merriam, 1998; Patton, 2002) will be used to systematically analyse the data sources and evaluate the support given to pre-service teachers in undertaking an action research inquiry in their use of ICT strategies in the practicum classroom. The study will also identify benefits and issues encountered and to propose recommendations for further development.

Prior to starting the action research study, the pre-service teachers were given input on how to undertake an action research study through a series of workshops. In the first workshop the pre-service teachers brainstormed their main concerns in researching their use of ICT in the classroom and collected preliminary data about their knowledge and skills in using ICT in the classroom. In the second workshop, the pre-service teachers developed their inquiry proposal and were introduced to possible methods of collecting information that would help them carry out their research.

The students main concerns are summarised below as well as their knowledge and skills in using ICT in the classroom. The Year 4 AREP students (n=8) generally felt comfortable in using a range of software (PowerPoint, Word, Excel) and using digital cameras to capture images. Also, the Year 4 students undertook 12 days of professional experience in the first semester and have some limited experience in using interactive whiteboards in their teaching. Most of the Year 4 students wanted to learn more on how to create graphs using software and gain more experience in using interactive whiteboards in their teaching. The Year 3 AREP students (n=11) also felt comfortable in using the same range of software listed earlier and have used digital cameras. However, the students had not completed professional experience except for 5 days when they were in Year 1 and so had not used interactive whiteboards in the classroom. All the Year 3 AREP students wanted to be updated in using new technology and software that produced activities that were more interactive and engaging for primary children.

Both Year 3 and Year 4 AREP students were asked to provide preliminary thoughts about what ICT skills they could research in the classroom. Some examples of the inquiries students suggested are listed below:

- How can I incorporate multimodal creativity using ICT in the classroom?
- How can I develop my questioning techniques to promote higher order thinking in Year 2 primary classroom?
- How can I use ICT to help Year 3 primary children write in the classroom?
- How can I use ICT to improve student learning of mathematics in the classroom environment?
- How can I teach students to use ICT in converting data from PDHPE into graphs?
- How can I use ICT to support student learning of phonics in the classroom?
- How can I teach mathematical operations using ICT in the classroom?
- How can I incorporate ICT into lessons that enable students to interact with context?
- How can I use smartboard technologies as a tool to enhance interactivity in the classroom?

To summarise, both groups of students felt comfortable using a range of digital software, for their own leaning and/or for teaching. However the fourth years had experienced teaching using interactive whiteboards, whilst the third years had not. Further, the third years have had fewer practicums than the fourth years, so they felt the need for different learning to increase their experience and optimise their skills. The inquiries they designed reflected those differences.

VIII. CONCLUSION

There have been relatively few studies that investigated the use of ICTs in situated learning tasks for Indigenous tertiary students. The current study uses an action research learning design with Indigenous pre-service teachers studying in the third and fourth years of a Bachelor of education degree. The pre-service teacherswere required to research their own practice in developing lessons, using ICTs, that will be taught in primary schools later in the year. As such the learning will be situated in the real world, which as Herrington and Oliver noted (1997), makes learning authentic. It also allows for modelling and scaffolding, and through their online discussions, the construction of knowledge through collaboration as recommended by Herrington and Oliver, and building a community of e-learners as suggested by Doherty (2002).

The design of the tertiary unit ensures that they will have the 'personalised learning experiences' with ICTs that will 'cultivate independent learning skills', as recommended by McLoughlin & Lee (2010). The action learning cycle employed has built in reflection, which is scaffolded by the lecturer, also suggested by McLouglin and Lee. As students had to select the focus of their own inquiries and then try them out in practice, they are encouraged to become independent learners. At the same time they are developing the technical vocabulary and textual practices around electronic media (Doherty, 2002, p58).

Although only early outcomes related to the Indigenous pre-service teachers' current knowledge and use of digital technologies have been gleaned, later findings will provide an insight into the pre-service teachers' experience in increasing their skills through scaffolded learning and collaborative knowledge building, through the implementation of digital technologies in the classroom during school-based practicums. These findings should expand our understanding of the provision for Indigenous students, of successful tertiary teaching practices around ICTs and will fill a gap in the research literature.

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STEP 1 Begin with reflection

- What is it you wish to change?

- What are you doing now?

⇒ Write a statement that describes your **PRESENT SITUATION**

STEP 2 Plan for improvement

- What can be done?

- How will you do it?

- How will you monitor changes?

⇒ Write down what you want to change or improve - your **FUTURE PRACTICE** or **RESEARCH FOCUS**.

⇒ List possible strategies and what information you will collect

STEP 3 Enact the plan and do the research

- Put strategies into practice

- Gather data and monitor changes

⇒ Write down what you do in a journal and collect samples of student work

STEP 4 Personal reflections and share your professional knowledge

- Reflect on your research and write up inquiry as a teacher case

- Share with colleagues

⇒ Write up your **CASE** and share with colleagues. This may include making recommendations for the future.

STEP 5 START of a new cycle of research.

Guidelines for teachers undertaking practitioner research (Vozzo, 2006)