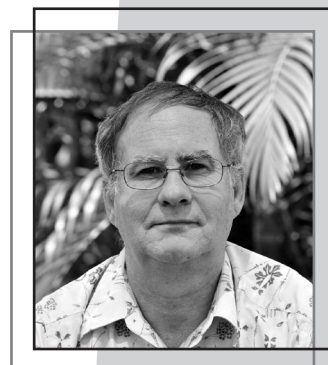


Getting There: Teacher experiences in applying ICT in rural and remote education

ABSTRACT

The application of ICT in education in rural and remote contexts is rapidly evolving and is actively being pursued as a solution to educational issues. ICT in education involves technological as well as pedagogical and social dimensions. This paper examines approaches being taken in developing ICT usage in Northern Territory schools for teaching and learning. It covers both technological and pedagogical issues. It discusses issues of access, professional development, leadership and support. It discusses how teachers in three schools are applying computer-based technology in their classes. The paper highlights the need for teacher professional development, the need for high-speed broadband access for effective application of ICT in rural and remote education and for the sustainability of infrastructure and practices.



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INTRODUCTION

Information Communication Technology (ICT) is commonplace in schools, used by teachers and children alike in a range of supportive roles and this is an evolving feature of Northern Territory (NT) education. Internet access is one indication of ICT use. Despite the significant growth and population penetration in the use of the Internet by Australians (Australian Bureau of Statistics 2010; Miniwatts Marketing Group 2010) there are significant gaps and inequities. Along with Tasmania the NT has the lowest Internet participation rates in Australia. Additionally, people living in remote and very remote locations in the NT have one-third the Internet participation rates of Australians living in major urban centres. Within the NT participation rates of Indigenous Australians living in remote and very remote communities with private Internet access is almost negligible (ABS 2006).

The Northern Territory Department of Education and Training (DET) has made significant effort over the last five years in the development of IT infrastructure and Internet access of schools. Additionally through in-house professional development (PD) programs and through collaboration on full award programmes at Charles Darwin University (CDU), teachers' ICT capacities have been progressively developed. However, as is described here, there is still much to do in IT infrastructure as well as in teachers' capacity development for better ICT supported teaching and learning in the NT.

The Northern Territory

The Northern Territory has approximately 1% of the Australian population spread over roughly 20% of Australia. Outside of the major cities of Darwin, Alice Springs and Katherine, classified as regional centres, the rest of the NT is either remote or very remote. Conditions in small communities and their isolation have often meant that teacher turnover is high (Shaw, Nair et al. 2006) (up to 50% annually) making traditional approaches to the provision of professional development (PD) ineffective. Meeting the needs of Indigenous students in particular is

a challenge. More than 39.5% of students in NT schools are Indigenous and 80% reside in remote or very remote communities (NT Government 2010). In 2010, 37% of NT students were below the national minimum standards in literacy and numeracy (Statham 2010).

ICT in education

Research indicates that there are teaching and learning benefits using ICT in education (Jung 2005). However, in many studies such improvement is marginal (Ting 2005). Researchers and teachers are still learning how to use what is often rapidly emerging and rapidly changing technology. Research shows that there is widespread optimism about the future roles ICT, and that teachers are increasingly involved in the development of educational applications of ICT (Judge 2007; McKenzie 2002). Such optimism is also displayed in policy (AICTEC 2008). However, the technologies and the pedagogies associated with the application of ICT in education are still evolving. In many ways we have only just begun.

ICT in education is firmly embedded in the Curriculum Frameworks of each state. In the NT as well as reference to ICT being made within all the Curriculum Framework documents, the use of ICT as learning technology is explicitly embedded in the Learning Technologies Curriculum Framework (AICTEC 2008). Teachers are expected to use ICT as a tool of teaching and educational management as well as helping students learn to use ICT in their own learning.

The Research

The research underpinning this paper draws on a number of research activities carried out over a three-year period from 2007-2010 (and ongoing). The research involved an analysis of teachers' PD needs in the area of ICT, the development and implementation of a PD program to address these needs, and three

field-based case studies of schools examining application of ICT by teachers and students. The research reflects a sociological approach in recognizing that any study of ICT in education needs to take into account a broad range of cultural, geographic, and social contextual issues that make up the complexity of the learning environment (Lim 2002).

In collaboration with the Departments of Education in South Australia and Victoria, and CDU, NT DET undertook an analysis of the PD needs of teachers in the area of ICT through a capabilities survey. The detailed results of this activity were not published but were for internal DET use. This survey was online (Glover 2005) and initially all NT teachers participated (approximately 2000 teachers participated in 2006) to identify their ICT knowledge and skills, their ability to apply ICT in classrooms, and whether they were able to provide ICT leadership across the school and beyond. Based on this survey, teachers are identified as being located on a continuum in one of four phases of their PD and practice in ICT. Phase One, is where teachers are uncertain and/or hesitant, and require significant base level skill development. Phase Two indicated teachers who are willing to use ICT but in this are dependent upon support and assistance. Teachers identified as being in Phase Three are confident and proficient in the use of ICT, while Phase Four teachers are very confident, enough to provide leadership and enabling of others. The survey indicated that most teachers (75%) were either in Phase One or Phase Two. The survey led to the development by officers from DET and CDU of a Graduate Certificate of ICT in Education as a PD programme. In 2010 the survey instrument and associated tools were further refined and in 2011 this new survey will be launched.

To develop a better understanding of the ICT based needs and issues of teachers in remote NT, visits were undertaken during 2008 to three NT schools. School A serviced a town community and had a majority of non-Indigenous children (although approximately 20% of the students were Indigenous). Schools B and C were located in Indigenous communities with 100% Indigenous students. In these visits a range of data was collected through discussions with teachers, observations of classroom practices and activities and audits of equipment and infrastructure. These visits allowed three case studies to be developed.

RESULTS

The broad results of the survey and field activities indicated:

- That there is a significant number of teachers who have low or very low level skills or lacked confidence in their application and use of ICT (approximately 75%).
- Teacher use of ICT in classrooms directly reflected their identified phase. Teachers with low ICT skills tend not to use ICT tools in their teaching and learning beyond basic and required applications.
- Computer equipment in schools, while undertaking significant development in type and amount, is still in

many cases limited in capabilities and numbers. School A with access to corporate and community support had better and more equipment availability than schools B and C (located in Indigenous communities). While all teachers have their own professional laptop provided by DET, their professional use of these varied significantly.

- Internet access for schools in many remote communities is limited to a 2MB/s satellite link. Up until 2009 this link was restricted to 256KB/s in many remote schools. Most outstation schools do not have any access. Access speed and data transfer rates were frequently poor, particularly when there was heavy access of the school network.
- The application of ICT as a teaching and learning tool is highly dependent upon the enthusiasm and interest of individual teachers. Additionally, where there was one teacher in the school providing ICT leadership across the school community, or acting as an advocate, there was a higher level of general ICT application for teaching and learning across the school.
- Observation of teachers activity in the use of computers in classrooms included the following:
 - Requiring students to use a word processor to prepare materials
 - Requiring students to research information on school database as well as the Internet
 - Having students include digital photograph material in reports and presentations
 - Having students prepare video reports using Movie Maker and iMovie
 - Use of interactive whiteboards
 - One teacher in School A had set up a collaborating arrangement between his class and a class located in Canada. The collaboration involved the use of a Blog (using Blogger), and also e-mail exchanges by students through the teachers e-mail accounts. The exchange was centred on students living in a rural and remote location helping other students also located in a rural and remote context to understand what it was like to live where they lived.

DISCUSSION

Broad-based application of computers in classrooms as a central feature of the teaching and learning processes across all schools in the NT is slowly coming about. However, there is much still to be done – quantitatively and qualitatively. This is despite some significant developments over the last three years including: the continuing rollout of laptops for teachers programme; upgrade of satellite communications infrastructure; increased provision of computers in school classrooms; the limited rollout of laptops to Indigenous students through the One Laptop Per Child (OLPC) programme and, increased PD activity. Such development is also placed within the context of the Federal Government's Digital Education Revolution, which has provided infrastructure and PD funds to facilitate increased take-up in the use of computers as a central tool in NT classrooms (Gillard 2009).

The OLPC rollout has occurred in three isolated NT schools in East Arnhem Land: Yirrkala School and the Yirrkala Homelands Learning Centres (HLCs), Dhalinybuy School, and Shepardson College on Elcho Island. The rollout has been done in collaboration with NT DET staff who have been assisting with technical and network issues. In parallel with the rollout of equipment, there have been a series of staff development sessions and the preparation of appropriate Indigenous language resources. However, the rollout and development of appropriate materials and pedagogy in the NT OLPC Project has been mostly ad hoc.

Between the rhetoric and application of government initiatives (Australian Government 2010) and specific and focused private activity (McLaughlin 2010) progress in the implementation of ICT as a central component of classroom activity across NT schools is still a long way off. In addition to the obvious issues of gaps in and lack of infrastructure and equipment this study identified other issues impacting on a more rapid implementation of the application of ICT in teaching and learning.

Internationally there is movement in the promotion of ICT as a significant component of contemporary classroom activity. However there are well recognised issues and challenges in achieving this objective (Akbaba-Altun 2006; Grant, Ross et al. 2005; Shaw, Nair et al. 2006; Wong, Li et al. 2008). Despite the widespread acceptance of the benefits of ICT in education very few systems have been able to achieve system wide implementation and universal success so far. One reason for this is a lack of clear understanding of how ICT fits into a theory of learning and how that is applied through teacher practices.

Research indicates that ICT application in education for teaching and learning is rather an ad hoc process (Dillon 2004). The theoretical roots for ICT in education come from Computer Science and Educational Technology, which are strongly located in positivists approaches to education such as in Instructional Design (Dillon 2004). Despite a move towards incorporating a more sociological perspective employing constructivist, collaborative and interactive elements (Aviram and Eshet-Alkalai 2005), ICT in education still has a strong information dissemination and information processing character. This characteristic is deconstructed by teachers employing constructivist and more social engaging approaches with ICT, these teachers are often isolated, and few. There is a lack of focused attention to using ICT as a transparent but core component of teaching and learning, despite a lot being said about doing this (Nachmias, Mioduser et al. 2004). While there are curriculum guidelines (for example, the NT Learning Technology Curriculum Framework), which attempt to provide overarching structure within a theoretical framework for Teaching and Learning (Smith and Lynch 2006), the practices of teachers are more often lock stepped, process orientated and single tasking. And, as identified in the Capabilities Survey, many teachers lack the levels of IT skills and appropriate ICT-based pedagogy skills required. Outstanding exemplars of the application of ICT in education in the NT of Australia exist, but they are few.

This study has identified a number of features that has led to success in the NT, as well as issues that are inhibiting success. These are discussed as follows.

A clear goal and purpose

At the beginning of the study there were not a clearly defined objectives as well as suggested approaches and guidelines for the application of ICT in classroom practices for better teaching

and learning. The Northern Territory Curriculum Frameworks developed in 2008 presented some guidance in this respect and these have been further refined in 2010. However, these statements are generic and broad and lack sufficient detail to provide teachers with the guidance that they need, particularly when they are themselves neophyte users of ICT. A disconnect between policy, curriculum statements and teacher practices exists, and this is not unique to the NT (Nachmias, Mioduser et al. 2008). In 2010 further developments by DET through restructuring of learning support divisions and of ICT support are providing more focused help for teachers, particularly also through increased PD programs and access to these. However, without more focused effort in this area reform and changes in classroom practice will be spasmodic and erratic.

Professional development

The study indicated that professional development linked to identification of teachers ICT skills and knowledge of ICT-based pedagogies was critical. Teachers who participated in the formal PD program through CDU (a Graduate Certificate) were required to undertake tasks that had direct relevance to their classroom practices, and this not only provided them with an increased set of skills and knowledge but also provided some models of practice through collaboration with other teachers in the school. Ongoing staff support was also an important factor relating to PD. Staff who were able to collaborate with others and or draw on others' expertise and skills within and outside the school increase their opportunity of applying ICT successfully in their teaching.

Innovation and experimentation

As indicated earlier the application of ICT in teaching and learning is still going through significant development and adaptation. This is certainly the case within classrooms, as teachers themselves are engaging in processes of experimentation and adaptation both in terms of the technology and appropriate pedagogies. In each school studied there were innovative teachers who took on challenges and who attempted to solve problems in order to better use computers for their own teaching and learning. Often, these teachers were the 'fix-it' people in the school, being called on to help others, particularly from the technical point of view. In a number of cases this role had become a problem in that with limited on-site technician support, the IT 'expert teacher' often filled the role of 'computer technician'; resetting accounts, fixing jammed printers, recovering files, etc. Such innovative and self-help approaches are not uncommon in isolated educational contexts (Shaw 2005). In all cases where this was observed, these teachers generally enjoyed the role, and reveled in the problem-solving challenges that are often presented. However, some teachers reported frustration because of their own technical limitations, or because of limitations imposed on them through, lack of funds, lack of equipment, poor support or poor communications and supply of resources, often because of their isolated situation.

Leadership

In this study it was clear when there was strong leadership and support from the principal for the application of ICT for teaching and learning, with a vision for the school as a whole, much more was achieved. However, leadership in the application of ICT did not necessarily follow traditional management lines, but more often came from people who were innovators and advocates at various levels within school. Often these people were placed in positions of providing leadership, such as through in-school PD

activities (typically ad hoc and informal), that were outside of traditional or administrative leadership structures.

Infrastructure

Some aspects in the provision of ICT infrastructure are problematic in the NT. For example, the NT Internet backbone between Darwin and Adelaide is provided by one supplier (Telstra) and this connection has limited capacity. Under the National Broadband Network there are plans for an additional fibre backbone connection between Brisbane and Darwin (NBN 2010). Despite recent developments in increasing access to the Internet in regional and remote locations in the NT, such as the fibre optic link into Northeast Arnhem Land, which now provides a 20 Mb per second connectivity to schools in the region, access in the NT for public and private users of the Internet is limited and expensive. Until 2009 half of the rural and isolated schools in the NT were limited to a 256KB/s satellite-based broadband access. Given that this access for school administration as well as the total school community, including attempts at video conferencing through such connection, it is clear that such connectivity is inadequate. Today there are 60 sites (schools) accessing Internet via a shared and satellite service, which gives the equivalent of a 2 Mb per second connection to most. However, this is dependent upon overall usage and the weather, as cloudy and rainy days can drop connectivity to zero. Generally, outstation schools do not have Internet access. Territory wide, there are also other significant limitations in that the total connectivity rate for all DET users in that the Internet connection (through AARNET) is restricted to 100 Mb per second and between the hours of 10 AM to 3 PM significant congestion occurs most weekdays.

Personnel sustainability

A critical issue in the provision of education in remote communities of the NT is sustainability of staff. Staff turnover in remote schools is very high. One of the schools in this study had four school principals in three years. It is rare for teachers to stay longer than two years, although there are exceptions (Shaw, Nair et al. 2006). Ensuring sustainable development of in-school ICT infrastructure, ICT leadership and approaches to using ICT in teaching and learning is difficult under circumstances where teaching staff turnover is high.

Models of practice and ICT use guidance

In 2007 there was little in the way of exemplars and guidance that teachers could use in their application of ICT for teaching and learning. In 2008 NT DET had a website with links and suggestions for teachers. However, this was limited in depth and scope as were PD opportunities. Professional development essentially was located in the schools themselves and depended upon advocate teachers rather than being systematic. In an attempt to strengthen PD and provide skills and resources to teachers, the Graduate Certificate of Education in ICT in Education at CDU was developed. This program provided exemplars and specific ICT skills training as well

as provided knowledge and skills in ICT-based pedagogy. However, this program and its content were only available to those teachers who chose to undertake it.

In 2009 continuing into 2010 DET strengthened its focus on ICT skill development and ICT-based pedagogy development through the establishment of an 'ICT For Learning' section and an upgraded Website, which in 2010 was moved to a SharePoint site. This site provides a comprehensive collection of tools, exemplars and suggestions, as well as Web links to other resources for teachers. From 2011 a comprehensive and dynamic suite of tools and resources will be available to teachers through a web-based interface that links to a teacher's position on the ICT capabilities continuum.

Professional development though is still ad hoc and dependent upon teachers' interests and the policies and directions of individual schools. In 2011 a new approach to PD will be trailed by DET called AMPeL - Action Mapped Personalised eLearning. AMPeL will provide a structured e-learning based and modularised approach to PD around ICT for learning that is linked to teachers professional standards, teacher registration, pre-service and in-service activity provided by CDU and, will provide credits within a Master of Education at CDU for those teachers wishing to take advantage of this.

CONCLUSION

ICT in rural and remote education

While the application of ICT in education generally is well established, as a principle as well as an evolving practice, there are significant issues remaining when dealing with schools, teachers and children living in rural and remote areas. This is particularly so for the very remote and isolated areas of the NT where especially there is a high Indigenous student cohort. While changes are occurring in the application of ICT in school education in the NT there is still much to be done. This includes significant developments in the upgrading of infrastructure for networked communications, the provision of computers in schools such that every child has an opportunity to regularly use a computer, the further provision of PD programmes for staff in developing ICT skills and ICT-based pedagogy knowledge and skills, and the further development of comprehensive support in school and systems wide for the application of ICT in teaching and learning.

In all of these things it is clear that teachers take a central role in how they use ICT in their professional practice. Drawing on teachers' experiences will continue to be an important part of the further development of the application of ICT in teaching and learning, and this is particularly so in meeting the specific needs of teachers and students located in a rural and remote parts of Australia, especially in the Northern Territory.

BIOGRAPHY

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