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Digital learning: an Australian Research
Agenda

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Digital learning: an Australian research agenda

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Introduction

The use of ICT in education has gained momentum recently with Australian Government announcements of a Digital Education Revolution (DER) (DEEWR, 2008) for which significant funds have been allocated to provide computers plus on-costs and internet access for secondary school students. In addition, priority has also been given to the development of online curriculum content, preservice and inservice professional development of teachers and web portals to encourage education community participation.

The take up of ICT in education has been a national priority since 1995 when the Australian Government together with State and Territory Governments each allocated funds to progress education and training access to the internet and the provision of digital content and services. A multitude of services emerged such as EdNA on a national scale as well as State level web services such as TALE in NSW and Sofweb/Ultranet in Victoria, along with haphazard professional development programs and some small advances in broadband provision to education and training institutions. So what research would be helpful to assist educational decision making processes and maximise such a significant educational investment?

Purpose

The purpose of this paper is to provide some suggestions for consideration of directions for Australian educational research about ICT in education, more recently being called digital learning.

A number of agencies in Australia, Canada, Europe, New Zealand, the UK, and the USA have already embarked on developing research agendas and undertaking research into the use of digital learning. This report highlights some of the significant areas in which research has been undertaken and isolates those areas where there may be a need for further research or where there are gaps in the research agenda for Australia.

This paper is written as an overview, raising a number of issues relevant to establishing a research agenda for teaching and learning using ICT. However, the development of a national research agenda needs to be the result of discussion and agreement between a number of researchers and experts in the area of ICT in education. This paper is seen a possible starting point for that discussion.

Limitation

This discussion paper uses the word 'research' in its most generic sense to include surveys, evaluations, opinionnaires, data analysis, statistical analysis, literature reviews, case studies and more. No distinctions are made between exploratory

research and empirical research. However, the differences between correlation research where theoretical understandings of the relationships between variables are sought and research into causality do need to be borne in mind. Much education research stops after explaining correlations between variables and fails to go deeper to research and understand causality which can help to understand the effective use of ICT in education.

The research discussed in this paper reflects the interests of national governments in several countries and their implementation by policy bodies charged with the responsibility for supporting or implementing national ICT policies. The focus is about national governments' policies because that is where the ICT in education frameworks and research have been funded in the past and most effort concentrated. However, the efforts of leading universities in the area of ICT in education have not been included because to a large extent research programs in ICT in education respond to the funding from national government policy and implementation programs. This is not entirely the case and several universities (Oxford, Harvard, Athabasca, Manitoba, Curtin, Wollongong) do stand out for the work that they have done and continue to do. However, university research, outside of government policy initiatives in the area of ICT in education, has not been a focus for this discussion paper because it has made a relatively small contribution to education and has not been largely influential even where it has been known.

The research in this paper focuses on ICT in education in the schooling sector although some areas such as open source software, open content, mobile learning and collaboration and research are equally applicable cross sectorally in higher education and training. A further paper on the research gaps in higher education and training would be a useful exercise in pursuing the question of what research would contribute to a mission to improve learning.

Australian background

The national committee of school education authorities, the MCEETYA ICT Schools Taskforce developed both a *Research Strategy* (2003) and an overview of *ICT Data Sets* (2003). The *Research Strategy* (2003) is interesting because it nominates areas for research in Australia listing the following:

Learning in an online world 2003 - 2006 priority areas for research:

- the changing nature of schooling
- student learning
- equity issues
- teacher development
- monitoring progress.

The Taskforce went on to nominate a number of dimensions that would need to be included in research in each of these areas when examining the impact of ICT. They included the conditions of learning, learning possibilities, educational effectiveness and equity.

The issues that still stand today that were nominated in the above areas, in terms of ICT research, are monitoring progress, educational effectiveness including student

learning and assessment, and equity. These are almost greenfield research areas in Australia with the exception of some work completed by ACER. The areas of research from ACER cover student engagement, access, learning environments, pedagogical measurement and several case studies of good practice. An insightful study was Lonsdale's (ACER, 2002) *Review of information gateways in education* which was an investigation into the development of gateways and portals in education. It was a seminal study which isolated the behaviour of users of the internet, and more specifically the use of educational portals, in education, for the first time.

The second Taskforce document was the *Overview of ICT data sets* (2003) which is quite revealing in that the ICT in education data collection in Australia is almost minimal apart from a collection of information access statistics by some groups such as ABS, the work done by ACER for PISA and also work being done in *ICT Literacy* assessment by ACER. The *ICT Literacy* (2005) report did make a suggestion for further research work which will be considered later in this paper.

Australia: current situation

As mentioned in the introduction to this paper, the landscape in Australia for using ICT in education has changed as a result of the 2007 election and the implementation of the DER. In this, there are two issues of immediate note. Firstly, the use of the acronym ICT has fallen from use and has been replaced by the phrase 'teaching and learning in the digital age' which is regarded as acceptable. Secondly, the DER has allocated \$1.2b over three years to provide internet access for students in years 9 to 12, including the professional development of teachers to use ICT which has been allocated \$345m over the same period. More recently an additional sum of approximately \$800m has been provided to cover computer on-costs bringing the total funding for the project to \$2 billion.

The effect of this new injection of funding for education will see a rash of proposals for implementation of computers and networks, infrastructure, teacher support, training teachers and research. However, there is an expectation that the national committee, the Australian ICT in Education Committee (AICTEC), with responsibility for advising policy and practice, will continue to be the body responsible for Federal cooperation and advice.

Currently, three AICTEC advisory committees have been established to pursue predicted issues such as teaching and learning, and infrastructure issues. The committees are the National Interoperability and Digital Architecture Advisory Group (NIDAAG), the Teaching for the Digital Age Advisory Group (TDAAG) and the Intellectual Property and Privacy in Technology Advisory Group (IPPTAG). All three will report to the AICTEC Executive. Two groups are of note for teaching and pedagogy.

The TDAAG group will focus on understanding three areas of concern:

- learning environments using digital technologies
- how teachers learn and
- professional development for teachers using online collaborative technologies.

The NIDAAG group will focus on technical issues that include:

- Technical standards and specifications development and deployment
- E-portfolios for Schools
- Persistent Identifiers for Digital Education
- Repositories for Schools
- Australian Access Federation for Schools
- Integrated E-Learning Technologies, and
- Australian Education Interoperability Framework.

These two AICTEC advisory groups would appear to be seeking to cover issues associated with teaching and infrastructure. However, the infrastructure areas for research, although functional, may suggest that there is a higher policy agenda associated with the local development and storage, and national collection, storage and analysis of student data from student portfolios and school data.

However, there remain gaps in accountability and user-centric research although the research about teaching and functional infrastructure areas would appear to have been planned by AICTEC. In order to satisfy accountability concerns, research into the expectations for the DER program, its progress, the critical success indicators and demonstrations of success are essential areas to be planned very early in the program. In addition, the issues of teaching and infrastructure could be argued to be short term issues whereas user-centric research to examine teaching capacity and student use of ICT, and the associated success criteria could be seen as long term issues.

In summary, the AICTEC planned areas for research would appear to be focussed on teaching and infrastructure, both of which could be considered to be short term program issues. However, consideration also needs to be given to program accountability research for system accountability and user-centric research for the purpose of informing learning improvement.

Outside of the DER and AICTEC there is some work being done on cyber safety by the Department of Broadband, Communications and the Digital Economy (DBCDE). The DBCDE Consultative Working Group on Cyber-safety comprises people from national government and industry, and the research in that arena is focussed on technical measures and industry measures which have been largely unsuccessful and ill advised, and community responsibilities. However, the track record to date in this area has not been particularly successful and schools have not been engaged for consultation.

UK: current initiatives

In the UK there are a number of agencies responsible for leadership about learning in the digital age. Perhaps the best known in the schools sector of education is the British Education and Communications Technology agency (BECTa) responsible for disseminating grants, research into critical educational issues and issues such as ubiquitous education internet access, ICT take up, online safety, personalisation, policy information and pursuit of the further education strategy. BECTa, funded by and responsible to the Department of Children, Schools and Families (DCSF), partly modelled on the structure of Education.au Limited in Australia, has developed a

robust research agenda of some note internationally that has been notably absent in Australia with the exception of some work done in 2003 mentioned above.

BECTa's research portfolio includes the distribution of research grants to pursue a government research agenda, an online research network, managed research and a number of important publications. The research areas take forward the UK Government's *Harnessing Technology Strategy* for learning using ICT in three main areas for 2008/9:

- The learner and their context
- Pedagogy and curriculum
- Business processes for delivery.

BECTA's research priorities change annually and are lead by a directorate within BECTa which has a large number of online education participants engaged in its research network. The research network also provides ideas and suggestions emanating from school users for research, many of which are taken up. This indicates the vibrant and dynamic nature of the online network which is extremely well managed and also highlights the reciprocal nature or a two-way flow of information between users and managers of the service.

In the UK the Joint Information Systems Committee (JISC) which is a joint body between the two sector funding bodies, the HE Council and the FE Learning and Skills Council, is better known in the further education and higher education sectors than in the schools sector. JISC is a world leader in technical and network research along with issues associated with the business and management aspects of research networks. Australia and the UK through JISC developed the e-Framework for integrated information environments for post school education institutions.

Other UK groups well known are the British Education and Research Association (BERA) which has done some research into educational learning outcomes using ICT, and the Department of Children, Schools and Families (DSCF) which formulates and implements government policy such as the *Harnessing Technology Strategy* and the *ICT Impact* and *ICT Landscape Studies* and surveys.

USA

In the USA, there are a large number of national bodies engaged in research into the use of ICT in education in schools. However, the two most influential professional bodies are the Consortium of Schools Networking (CoSN) which has done some work on networks and devices as well as the total cost and value of ownership, and the International Society for Technology in Education (ISTE) publisher of the SITES work on the take up and use of ICT in schools. Both CoSN and ISTE work in cooperation with the US Department of Education and its organs such as the National Center for Education Statistics (NCES) and Office of Educational Technology (OET).

Other influential bodies include the International Association for the Evaluation of Educational Achievement (IEA) responsible for TIMSS and the National Science Foundation (NSF) where education, especially courses and graduate numbers, as well as cyber infrastructure are major endeavours.

Canada

Canada has recently embarked on a program to establish a research agenda for ICT in education. Terry Anderson, Athabasca University, recently presented at the SCOPE Online Conference about the need and requirements for a Pan-Canadian elearning research agenda in tune with distance education. However, these issues are not entirely consistent with the current Australian issues. Anderson publishes a regular blog on elearning and distance education and has a substantial global following of professional researchers and educators.

Of more significance in Canada, is the leadership of online research bloggers such as Stephen Downes, at the National Research Council and George Siemens, at the University of Manitoba. Downes publishes a daily commentary on news and research as it is published around the world and is directly relevant to ICT in education. He has developed a massive ICT in education research archive and has a very large global following. Siemens is a theorist who has developed a theory of learning for the digital age called 'connectivism' Siemens publishes a blog weekly on education theory and research about ICT in education and also has a very large global following. Both Downes and Siemens are now considered to be among the most knowledgeable of the leading thinkers and researchers in the world on the topic of ICT in education.

What is notable about Downes, Siemens and Anderson is that they engage a process of inclusion through using the assets of ICT by blogging. This way they have established themselves as leaders in the field, are regularly called on to undertake research and reviews, and have been very successful in attracting funded projects.

NZ

In New Zealand (NZ), through the Ministry of Education and the NZCER, a number of research projects have been undertaken mainly focussed on devices such as laptops and whiteboards more recently. Device and application focussed research tends to be limited in scope and of limited use for future decision making. Some work has been started on pedagogies and case studies using ICT.

However, of interest in NZ is their leading work in the area of professional development of teachers in the use of ICT. Helen Timperley et al (2007) for the New Zealand Ministry of Education completed a meta-research in the area of professional development of teachers. Using that research, NZ has enhanced clusters of schools for the purposes of professional development (PD) in using ICT in education (ICTPD). The evaluation of the ICTPD program has reported the development of communities or clusters of professional educators that have formed as a result of ICTPD. The clusters of online networks have become dynamic and robust so that discussions of research into ICT from around the world have become common place. NZ leads the world in the area of teacher PD in the use and impact of ICT on education and in the ways that teachers adapt ICT from the insights of professional practice. There is a rich source of information here for research which when undertaken will also enable NZ to publish their successes.

Europe

The situation in Europe is somewhat different to the other countries mentioned here for two reasons. Firstly, Europe is cooperation between 15 western countries that are now being joined by 25 Middle and Eastern European countries. and secondly, the headquarters for a number of international bodies involved with education are located in Europe. Studies that have provided data about the use or take up of ICT in education at a macro international level include PISA, TIMSS and SITES which are well known so they have not been reported here.

The reports developed by the European Commission, D-G for Education and Culture, and The European Schoolnet for the initial 15 Western countries are worthy of closer scrutiny. A major report, *The ICT Impact Report (2006)*, a meta-research of previous European studies, including from the UK, indicates the areas of concern in Europe. Some areas include the take up of ICT in education, the effect of ICT on learning outcomes and learners, as well as teaching methodologies and teachers. However, other research has been completed on the effects of school partnerships specifically in the wake of the very successful *eTwinning: school partnerships in Europe* project managed by European schoolnet (EUN). However, this type of research relates specifically to the conditions of a specific set of programs operating in Europe such that there is little information that can be transferred to other educational environments.

More recently, of greater interest is the online survey of good practice being undertaken by the EUN inviting teachers to submit their practice, in the use of ICT. The online project, *Study of Technology's Impact on Primary Schools*, known as STEPS, is a powerful way of collecting information from all over Europe about how ICT is making a difference in Europe's primary schools. This survey merits monitoring from a number of perspectives not the least of which is the success or otherwise of the data collection method.

Commonality

There is some common interest in the aforementioned countries on a number of issues about using ICT in education requiring further research including:

- The learner
- Learning outcomes
- Pedagogy
- Learning environments, and
- Professional learning.

However, of all the research undertaken about ICT in education most is qualitative and anecdotal research or statistical correlational research. There is very little research of note that has moved beyond correlation to user-centric research to find out why, where and how students use ICT to support their learning styles and the impact on their learning. Further, if the use of ICT changes the way that teachers teach and learners learn then what are the cultural changes that may be happening in pedagogical and organisational education practice? The meta-research STEPS asks similar questions: how could schooling be remodelled in order to exploit

technology more fully? What are the optimal schooling environments for ICT investments to pay off? These are fundamental questions that need to be further researched and understood if the capacity of ICT is to benefit education. However, before these ICT in education issues can be embraced there is a need to answer the insightful question posed by the STEPS report which states that:

The review shows that current education systems hinder ICT impact and correspondingly impact studies and evaluations often measure against traditional systems. (STEPS, 2006)

And then asks:

Are researchers looking at the wrong outcomes?

Research areas

This discussion paper nominates a large number of areas for research into ICT in education that are being tackled around the world. This section is an attempt to bring those areas together so that they can be judged as a group of issues within the Australian context.

In Table 1 below, the main areas of interest in the countries briefly discussed have been listed.

Table 1: Areas of ICT in education research interest

Australia	UK	Europe	US	Canada	NZ
Educational environments	Educational environments			Educational environments	
Teacher learning	Pedagogy and curriculum			Pedagogy and curriculum	Teacher learning
	Learning outcomes	Student learning		Student learning	Case studies of school use
Infrastructure and technical standards					Infrastructure and technical standards
Repositories			Repositories		
ePortfolios				ePortfolios	
Cyber safety		Safety	Safety		
	Business processes for delivery		Impact and use of emerging technologies and new devices, networks		Laptops
Value of			Costs and		

ownership			value of ownership		
<i>Collection of school and student data¹</i>					

The areas of commonality listed above continue to persist and remain important although there remains a serious gap in user-centric research, which follows from correlational research and identification of learner's and teacher's issues about the use of ICT in education. In the Australian context, the additional research that is needed and which is not obvious at present, is research into the success indicators for digital learning and measurement of the progress of the DER, along with demonstrations of its success, that is, case studies of successful practice arising from the implementation of the DER.

Discussion

The areas of commonality and technical infrastructure would appear to be the current issues in ICT in education although eportfolios and collection of data about schools and learners has some traction. However, the research topics that have been cited or are known about the cultural changes that are occurring in education and beyond that affect learning are difficult to find. How do teachers go about their business today? What do they expect in the future? How have these changes affected the ways that students learn? Can the technologies be used to match learning styles? These and many other questions would appear to be greenfield areas for educational research in Australia.

The report of the National Assessment Program – ICT Literacy Years 6 & 10 report (2005) in its conclusion states:

Students who are favourably disposed to working with computers attain higher levels of ICT Literacy. (MCEETYA, 2005, p. 96)

The report follows on by commenting, 'Of course, the direction of causation is far from clear'. This comment highlights the importance of understanding causality which includes the context and conditions of success in the use of ICT in education. A further research question that arises then is, 'What is successful for learning and why?'

In preparation for this paper a blog was developed and some colleagues were invited to provide feedback about the linked research information and the commentary being made. The issues that were raised included collaborative research, assessment, online peer reviews, assessment of online work, assessing new ways of working, shifts in scholarship and changing practices, knowledge based web sharing and measuring, and resistance to change. Given that we know that there are many issues in the area of ICT in education, how can a research agenda be established and taken forward?

¹ There is no concrete program for this issue at present and its entry here is supposition.

The traditional manner of attracting research efforts and determining research agendas has been to prepare submissions and forward them to funding or decision making bodies for approval. Today this approach is less attractive because of the global technologies that are available. Downes, Anderson and Siemens have taken advantage of the collaborative technologies and as a result of their impact on research into ICT in education, they have attracted a large following and funding for research.

Christensen (2008) argues that implementing ICT in education will not occur through mainstream activities. His argument is strong that new technologies are seen as disruptive and compete for time and attention in the existing milieu of issues that demand the time of educators and therefore will make little impact in the short term. His theory of disruptive technologies argues that change occurs through not competing with the dominant practices but by supporting peripheral practices. For example, that would mean providing web accessible information for students when not at school, students in special circumstances, disabled students, students transferring from state to state, gifted students and so on.

In research, Anderson, Downes and Siemens, all Canadians, have come to dominate ICT research in education globally because they have utilised ICT effectively and not competed with existing research commentary and dissemination. They have done this through high quality and regular publishing using web technologies such as blogs, RSS feeds, emails, messaging, podcasts, videos and graphics/photos.

There may be some lessons that are of merit in this paper. A start could be made by establishing a dynamic presence on the blogosphere and linking to relevant Australian ICT in education research, inviting comment to build a history of high quality research and at the same time provide input to a dynamic and ongoing research agenda. Then at a later time, there may be opportunities to extend the ICT in education research influence beyond Australian research to that which is supportive or complementary to the work being done.

Finally, a brief comment on the differences between traditional research and a new way of thinking and operating called e-research may be appropriate. Appelbe and Bannon (2007) argue that since the year 2000 a new concept has emerged in academic research circles. The term e-research is collaborative and interactive research made possible by the internet and data, and computational grids (Appelbe, 2007, p.83). E-research's characteristics include large scale or on-demand access to information or shared information undertaken by a diversely skilled and distributed research team reliant on the internet and its services. The purpose for mentioning e-research in this paper is to highlight the widening scope of research potential through collaboration with diverse groups interested in the same issues associated with ICT in education. For a more full discussion of e-research or collaborative research see *ICT Trends in education* by White (2008).

There has never been a better time in Australia to collaboratively establish a robust research agenda for teaching and learning in the digital age.

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Referenced websites

AICTEC. www.aictec.edu.au

BECTa <http://www.becta.org.uk/>

BECTa Research <http://partners.becta.org.uk/index.php?section=rh>

Consortium of School Networks (CoSN) www.cosn.org

Digital Education Revolution <http://www.digitaleducationrevolution.gov.au/>

European Schoolnet. www.eun.org

George Siemens <http://connectivism.ca/>, <http://www.elearnspace.org/>.

MCEETYA Schools ICT Taskforce <http://icctaskforce.edna.edu.au>

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