

ARC (Australian Research Council) funded Discovery Project (2014-2016)

PROJECT TITLE: Making a digital difference? An investigation of new technologies in secondary schools

Brief summary of project for public release: This project examines – and then looks beyond – the complex and often compromised nature of digital technology use in secondary schools. Combining large-scale surveying, in-depth ethnography and participatory design, the project will provide rich insights into how the full potential of digital technology might be realized within Australian schools.

Longer summary of project: This project addresses the long-standing question of why digital technologies have largely failed to have a consistent impact on the core processes of schools and schooling. The overarching aim of the project, therefore, is to identify the socio-technical adjustments that might be made within schools to facilitate ‘better’ uses of digital technology. Using an innovative combination of large-scale surveying, in-depth ethnographic study and critical participatory design, the project will:

- i) provide rich insights into why digital technologies are often not being used to their full potential in schools;
- ii) actively collaborate with school communities in experimenting and constructing alternatives.

Making a digital difference? An investigation of new technologies in secondary schools

AIMS AND BACKGROUND

Aims and objectives

This project addresses the long-standing ‘problem’ of schools and digital technology. In particular it addresses the question of why digital technologies such as computers, the internet and other recent forms of personalized and portable digital media have failed to lead to substantial change of schools and schooling. Most importantly, the over-arching aim of the project is to investigate the socio-technical adjustments that might be made within schools to facilitate ‘better’ uses of digital technology. The project is therefore distinct in focusing on the ‘state of the actual’ rather than the ‘state of the art’ of educational technology – aiming to develop detailed understandings of the ‘messy’ realities of digital education *in situ*. With these aims in mind, the project combines elements of the social sciences and design disciplines to actively collaborate with those who work within schools in experimenting and constructing alternatives to current forms of digital technology use. Using an innovative combination of large-scale surveying, in-depth ethnographic study and critical participatory design, the project will therefore develop rich insights into why digital technologies are often not being used to their full potential in schools, and then ask what might be done about it. This research will be of international significance in empirically exploring these issues on a large-scale, comparative basis – providing empirical insights that are of genuine practical significance as well as lasting academic importance.

In short, we will endeavor to use the outcomes of the project to improve conceptual understandings of the current realities and future opportunities for Australian schools and schooling in the digital age. As such, the project will work to the following key objectives:

- Gain new insights into the relationships between the ‘ecology’ of school settings and digital technology use;
- Understand how these insights can improve outcomes in terms of student learning practices; motivation and educational engagement;
- Understand how these insights can improve outcomes in terms of teaching, pedagogic practices and professional development;
- Understand how these insights can improve outcomes in terms of the organization, management and governance of teaching and learning in schools;
- Draw upon the technological expertise and personal experiences of those who work within schools (i.e. students, teachers, school administrators and school leaders) in designing new models of school technology provision and practice;
- Identify ways in which these research insights can be applied to improve the future effectiveness of schools’ technology use;
- Engage with institutions and agencies (e.g. state and federal government, teaching and subject groups, IT industry) that have interests in and commitment to such improvements.

Background

There has been a long history of integrating computers, the internet and other digital devices and applications into Australian schools. From the early use of microcomputers in the late 1970s through to the current multi-billion dollar 'Digital Education Revolution' federal initiative, digital technologies have become accepted and expected features of contemporary schooling. Spending has grown to the point that the Australian market for education IT in 2012 was estimated to be \$2.8 billion (IDC 2012). This sustained integration has been based on a well-rehearsed set of understandings regarding the educational potential of digital technology that have developed over the past 30 years. Indeed, there is now a robust body of evidence detailing the *possible* benefits that digital technologies bring to schools – encompassing teaching and pedagogic practice; student practices and learning; and the organization, management and governance of teaching and learning in schools and in the home (see Luckin *et al.* 2012). As such, long-held assumptions persist that digital technology provides a ready infrastructure for transforming the experience of teaching and learning within the organizational setting of the school.

The perennial 'problem' therefore facing policymakers, practitioners and other stakeholders is that there are few tangible indications that such significant shifts are *actually* taking place on a substantiated system-wide basis. Set against the scale of pressure inviting radical reform, the state of digital technology use within schools suggests forces of inertia rather than forces of transformation. The effect of digital technology as a presence in schools is real enough (i.e. investment has been substantial) but the extent of its effect on change and innovation in terms of what gets done (and what gets learned) is less certain. Indeed, there is little doubt that schools (whether in Australia or elsewhere in the world) do not make optimum use of digital technology. Instead, digital technology use is often shaped and bounded by dominant structures and 'grammars' of schooling – not least formal assessment and curriculum requirements, tacit expectations of time, space and place, and management regimes of accountability and performativity (see Selwyn 2011). As such, it is perhaps understandable that considerable 'digital divides' persist between and within Australian schools. For instance, a recent survey of the digital lives of over 6400 Queensland high-school students found technology use to differ significantly in nature between different types of school, as well as between different types of student (Smith *et al.* 2013). The undoubted educational potential of digital technology is clearly being experienced unevenly at an institutional and individual level.

This well-established gulf between the rhetoric and reality of schools technology has led to a noticeable polarization within the field of educational technology. On one hand, an established body of practitioners and academics continue to make innovative use of digital technology, exploring the possibilities of technology use in education, and anticipating the widespread adoption of these practices within schools. This 'business as usual' approach has been evident within the established fields of 'Computer Assisted Learning', 'ICT' and the recent promotion of 'Technology Enhanced Learning'. On the other hand, however, enthusiasm grows for using digital technology and media as a basis for reforming radically the 'industrial era' model of mass compulsory schooling. Increasing numbers of educators and academics are now working to use digital technologies to redesign schools and schooling – as evinced in recent calls for 'school 2.0' and the 'flipped classroom'. Some educators and academics are even exploring ways of using digital technology to reject the idea of formal schooling altogether - as seen in recent enthusiasms for 'self-orientated learning environments' and other forms of networked self-education.

While all these approaches have considerable merit, ultimately they are of little immediate use to improving the use of digital technology within schools in the near future. Despite their obvious limitations, mass compulsory schools are an obdurate and dominant form of education provision. Moreover, while clearly bounded and compromised contexts for technology use, schools are

certainly not incompatible with innovative technology use. As such, the starting point for this project is that the compulsory mass-attendance school needs to be taken seriously – at least in the short to medium term - as a key site of digital technology use and technology-based learning. However, it is essential that any effort to support the increased use of digital technology within schools starts from a grounded, realistic and pragmatic perspective. The starting point of this project, therefore, is the avoidance of either a false optimism or a fatal cynicism – recognizing instead ‘what might be done, even while remaining fully aware of inauspicious forces of circumstance’ (Ball 2007, p.154).

RESEARCH PROJECT

This project is designed to provide a detailed and rigorous understanding of how and why digital technologies are actually being made use of in schools, and then exploring how schools might be supported to make better use of technology in the immediate future. The project therefore addresses a number of issues of academic significance – providing a critical and sociologically rich account of schools and digital technology. As such, the project positions itself within a rich tradition of research into the varied – and often constrained – use of digital technologies in Australian schools (see Lankshear *et al.* 1997, Meredyth *et al.* 1999, Pegg *et al.* 2007, Snyder *et al.* 2008, Beavis *et al.* 2014). In particular, the project builds upon the applicants’ previous well-received work on schools and technology (Selwyn 2011, Johnson 2009, Bulfin & Koutsogiannis 2012) - this ARC proposal developed directly from a smaller seeding grant project conducted by two of the CIs in 2010/11 (Johnson & Bulfin, 2011). In extending this work, it is intended that the project will make substantial contributions of international significance to the academic literatures on education and the critical social study of digital media. In particular the project is significant in combining three powerful but under-utilized methodologies in educational technology research – large-scale surveying of school populations; in-depth comparative ethnographic study of different institutions; and critical participatory design with students, teachers, school administrators and leaders. It is therefore anticipated that the project will lead to considerable methodological and conceptual advances to the research literatures in the area of schools and digital technology.

Conceptual framework

It is accepted in the general educational literature that the nature of innovation and change in schools is highly complex and contingent on a complex of often-contradictory influences over time (Fullan 2007). However, within the educational technology literature the nature of technology-related innovation and change has been under-researched – resulting in a short-termist tendency within the educational technology literatures to attempt to describe the ‘impact’ and ‘effects’ of technology on schools. This project is therefore based upon the premise that any study of technology-related change and innovation needs to recognize the *systemic* nature of educational activity, and strive to develop understandings of the dynamics of how new tools become embedded in the broader ‘ecology’ of local practice. Such an ecological approach also serves to clarify the institutional policies, practices and routines that serve to manage that appropriation. As Zhao and Frank (2003, p.807) describe, the ecological metaphor offers “a powerful analytical framework for understanding technology use in schools” - highlighting the number of existing influences at the level of the individual teacher, the layered school ‘context’ of the classroom, school, local community, state and nation, as well as the presence of many different competing innovations at any one time. A number of separate studies have each highlighted examples of the kind of dynamics that we should expect to expose and understand within the school ecosystem. For example, Wong and Li (2008), in surveying many factors that link with effective technology implementation, highlight the importance of the ‘socio-cultural setting’ as well as structural characteristics of the

school. Similarly, Bielaczyc (2006) highlights the importance of the ‘social infrastructure’ of schools.

As such, it is important to recognize that the range of individual, school and community factors that bear on the success of technology-related change is large. Zhao *et al.* (2002) stress individual differences in teacher attitude. Selwyn (1999) stresses prevailing subject sub-cultures and the cultural and epistemological ‘fit’ between digital technology and different subject disciplines. Wood *et al.* (2005) stress technical support, access to resources, and poor troubleshooting, while Deaney *et al.* (2006) invoke the ‘practical theories’ imported by teachers to the innovations that they engage with and which shape the nature of their experience with them. Lim and Chai (2007) identify the constraining frame of high stakes assessment strategies and the struggle to reconcile them with digital learning and teaching. A complementary set of factors is also offered by the model developed by Ball *et al.* (2011) in their recent account of policy enactment within schools – highlighting the importance of school history and values, alongside the material contexts of schooling, and individuals’ ‘interpretation, translation and narration’ of discourses of change and innovation. All of these ‘ecological’ factors – from the ‘micro’ to the ‘macro’ level of analysis – therefore need to be included in any examination of technology-related innovation and change.

Research questions

Based upon this framework, the project will address the following four sets of research questions:

1. **What are students, teachers, administrators and leaders claiming to use digital technology for in schools?** In what ways have digital technologies ‘fitted’ in and around the structures and grammars of schooling? Conversely, what ‘clashes’ and barriers have emerged? How does the use of digital technologies co-exist with other ‘non digital’ aspects of the ecology of schools and schooling?
2. **How is this use and non-use patterned?** What ‘hierarchies of access’ to digital technology exist for different individuals and groups within schools? What determining factors lie behind use and non-use of digital technology? What are the social, cultural and economic reasons behind the (non)use of digital technology? What are the social contexts of digital technology support within schools?
3. **What are the consequences and outcomes of this (non)use of technology?** How are different instances of digital technology use supporting organizational changes in terms of (i) teaching, pedagogic practices and professional development; (ii) student practices and learning; (iii) school/home relations; and (iv) school organization, management and governance of teaching and learning;
4. **How could digital technologies be better configured and designed to support schools and schooling?** What practical improvements can be made to digital devices, applications and other products for schools? How could digitally-based services and practices be better configured and arranged to ‘fit’ the needs and circumstances of school communities? How can the tacit knowledge and life experiences of students, teachers, administrators and leaders contribute to the design and development of new digital technologies?

Research design and methods

The project addresses these four research questions through an iterative mixed-methods research design. Firstly, patterns of current uses (and non-uses) of digital technology will be mapped by a **large-scale survey** of all students, teachers, administrators and leaders within three contrasting schools in Victoria - providing a detailed quantitative data set of how different groups are actually engaging with technology. These data will be supported by detailed **in-depth ethnographic studies** within the three school sites, providing insights into the changing nature of technology use within different types of institutional setting and triangulating the findings from the self-report survey. The final stage of the project will use these insights to inform an innovative stage of **participatory design activities** with small groups of students, teachers, administrators and leaders who will be supported in the participatory design of digital processes/practices/products that better 'fit' their working lives and needs.

Further details of each stage of the project are as follows:

STAGE 1: Mapping patterns of digital technology use in three secondary school settings [research questions 1&2]

Given the range of different factors that are known to influence existing patterns of technology use within schools, the project will be undertaken within three socially and geographically diverse secondary schools in Victoria. While, of course, not providing a wholly generalizable picture of technology use throughout the Australian school system, it is intended that these cases will support the development of a rich understanding of the factors within and between schools. In selecting the schools, the research team will aim to ensure diversity in relation to what are identified as key factors such as population density and population characteristics (such as ethnic and cultural background, levels of educational achievement, socio-economic status). Preliminary indications are that the following three schools would provide the diversity needed:

- Inner-city school – located in an highly-populated urban area, typical in many ways of a state capital city with considerable polarization in terms of education, income and ethnic/cultural diversity;
- City suburb school – located in an suburban area, typical in many ways of a state capital city with considerable polarization in terms of education and income and some ethnic diversity;
- Rural school – located in a predominantly rural area with a low population density, with high levels of poverty in some parts.

The first stage of the project will take the form of a survey within these three diverse schools of all students, teachers, school administrators and leaders. Closed survey instruments for each group will be developed, drawing on instruments developed in previous projects (Bulfin *et al.* 2010, Selwyn *et al.* 2010). As such, survey items will cover present and past uses of digital technologies (both within the school context and outside of school), perceived outcomes of this technology use, as well as personal/professional background characteristics. These data will therefore provide a comprehensive understanding of the patterning of digital technology use across the three school settings.

STAGE 2: In-depth ethnographic case studies [research questions 2 & 3]

These survey data will frame the in-depth ethnographic study of digital technology use in the three different school settings. The research team will then conduct sustained ethnographic studies of technology (non)use within each of the school settings over the course of a complete academic year. Using a classic school ethnography approach (see Erickson 1984, Delamont 2012), ethnographic techniques such as interviews, observations, extended field notes, and document and policy analyses will be employed to gain a detailed, ‘thick’ sense of how different actors negotiate competing discourses in regards to digital media and innovation (Merriam 1998). Deliberately selected groups of ‘high-using’ and ‘low-using’ students, teachers, administrators and leaders within each of the study schools will be identified from the survey data as suitable ‘cases’ for sustained study. These participants will also be asked to write narrative or critical incident reflections over the two semesters via email, a journal or blog that focuses on their work with digital technology.

STAGE 3: Participatory design activities [research question 4]

The final stage of the project will use these insights to inform an innovative stage of ‘participatory design’ research with groups of students, teachers, administrators and leaders who will be supported in the participatory design of new digital practices/products that better ‘fit’ their school roles and needs. This stage of the research will therefore draw on the experiences of participants in designing and conceptualizing technology-related artifacts, work flows, and work environments. It will also act as a means of bridging the abstract, analytic findings emerging from the project with participants’ tacit knowledge. These workshops will follow a participatory design methodology (see Spinuzzi 2005), where researchers and participants cooperatively design possible artifacts, services or practices that might address the issues emerging from the first two stages of the research. Groups of between four to six students, teachers, administrators and leaders in each school will be identified and then supported over a six month period to work together and actively participate in the development and refinement of a set of technology-based practices and/or products. A series of four workshops will start with initial exploration and co-interpretation of the findings emerging from stages 1 and 2 of the research project; then ‘discovery processes’ of co-designing responses to these interpretations; and then the ‘paper prototyping’ of corresponding designs and solutions. As well as the practical work of the design activities, the researchers will ensure the systematic collection of data from these workshops in the forms of ethnographic observations, interviews and analyses of the eventual artifacts.

Data analysis

The project offers no exceptional challenges with regards to data handling and analysis. The data from the student, teacher, administrator and leader surveys will be used to test and extend models relating to the (non)use of digital technologies. Using a mixture of log linear and regression-type models, we will explore the significance of organizational and socio-economic determinants in patterns (non)use of technologies (Hair 2009). In terms of these latter stages of ethnographic data collection, data analysis will proceed first with typical qualitative strategies: memoing, selecting, summarizing and coding; theme construction; constant comparison and theory building (Denzin & Lincoln 2005, Mason 2002). Analysis will then employ additional conceptual tools drawn from institutional ethnography (cf Nichols & Griffith 2009, Smith 2005) and discourse analysis (Fairclough 2003). As such, analysis of the data will be an on going part of the research (Miles & Huberman, 1984). This will involve moving backwards and forwards between data collection and elaboration of theory. Categories of analysis will be developed which relate both to the background theory and analysis of the data. When appropriate computer-based techniques will be used for analyzing the qualitative data.

Research plan and proposed timelines

The project has been designed carefully to be conducted and completed within a realistic 36 month timeframe and an efficiently costed budget. The three-stage iterative mixed-methods design of the project has been designed to ensure the production of a large volume of high-quality data. The majority of the budget has been directed towards researcher time and the employment of one full-time researcher – for whom the project will be the sole focus of their job. The conduct of the project will adhere to the following timeline (starting Jan 2014):

Months 1-6	Planning, development of survey instruments, finalization of access with study schools
Months 6-12	Stage 1 data collection: Survey of all students, teachers and administrators/managers
Months 12-24	Stage 2 data collection: In-depth ethnographic studies (3 schools)
Months 24-30	Stage 3 data collection: Participatory design activities
Months 30-36	Final data analysis, writing-up and dissemination activities

Benefits, expected outcomes and likely impact of the research

The project has been designed to be of considerable real-world significance to secondary schools and the wider educational sector. Indeed, it is intended that the main outcome of the project will be the enhanced understanding of school reform and improvement in relation to digital technology. The issue of the unrealized potential of educational technology is a long-standing policy problem in advanced educational systems such as Australia. This research project offers a school-focused perspective on the issues underlying this ‘under-use’ of digital technology, and a set of practical but powerful school-focused solutions. As such the project is intended to be of clear policy significance. In particular the project deliberately addresses themes prominent in the Australian Government’s ‘Digital Education Revolution’ reform program. The project also corresponds with the Victorian Government’s ongoing ICT and e-learning programs. The project’s findings and outcomes will also be of international policy interest – addressing directly current policy concerns in Europe, North America and East Asia.

It is also intended that the project will be of clear significance to practitioners and other organizations that work in the area of schools technology. An explicit focus of the project is to establish links and work with the range of these stakeholders. These include school leaders and managers, advocacy groups and non-governmental public organizations, organizations and professionals that work with educational technology, and IT industry actors that play a key role in the resourcing and support of school technology use. The project has been designed to provide a range of practically useful insights for all these groups in terms of how digital technology can best fit within school settings, fitting with a number of concurrent concerns (e.g. with school design and ‘contemporary learning spaces’). In particular, in terms of its significance to education professionals, and those that work with educational professions the project has potential implications for educational practice, where issues relating to teaching training, pedagogy, school leadership and management are explicitly addressed. As such, the research will provide valuable information to educational technology professional groups as well as general teaching unions and school leadership associations. Finally, the research will provide information about the changing nature of schools as socio-technical environments, and will be of considerable interest to businesses seeking to sustain involvement in the schools technology marketplace.

Plans for communicating research results

i) Scholarly communication and dissemination

The outcomes of this research will be of value to academics and researchers in several disciplines:

- For researchers in **Education**, it will develop the analysis of contemporary school change and innovation via a more elaborated account of the institutional shaping of teaching and learning practices, and of the convergence of digital practices and processes with existing institutional structures. The project will also help to feed into broader understandings of the changing nature of educational institutions and the professional practices of teachers and the learning practices of students.
- For those in the field of **Communication, Cultural and Media Studies, Library and Information Management**, the research will provide an account that addresses the practices and issues of technology use by young people at home and at school – adding to empirical understanding of recent areas of interest such as technology use and ‘risk’, digital exclusion/inclusion and the domestication of technology in institutional settings.
- For those in the field of **Business and Management Studies**, it will provide a detailed account of the socio-technical nature of digital technology implementation in institutional settings – providing a much-needed theoretical sophistication to current literature and debates over the ‘barriers’ to ‘effective’ technology use in public sector institutions such as schools. It is intended that the project will make a major contribution to the theoretical basis of organizational understandings of educational technology.
- For those in the field of **Policy Studies**, the research will help to bring the key issue of the implementation and reconstitution of national educational policies in local institutional settings over time – allowing for the association of changes over time within schools and the school system with previous policy initiatives and drives. The primary data collection phase of the project will specifically focus on the relationship between changing school practices and policy development.

In terms of scholarly engagement, we intend to hold a large-scale academic seminar towards the end of the project that will report on the project findings and include invited papers from other researchers in the field. Funding is also requested for staff to attend external academic conferences. These would include 2 x international conferences (e.g. American Education Research Association and Asia Pacific Education Research Association conferences); and 3 x national conferences (e.g. Australian Association for Research in Education, Australian Computers in Education Conference and Australian Sociological Association conferences). It is anticipated that the project will result in an authored book: interest can be anticipated from major international publishers such as Routledge and MacMillan, with whom the research team have published previously. Opportunities will also be sought to contribute to edited collections, especially in the academic areas outlined above. Articles will also be produced for international journals which will include: *British Educational Research Journal*, *Teachers College Record*, *School Effectiveness & School Improvement*, *Computers and Education* and others. The project will also make use of emerging forms of online academic dissemination and debate, via a bespoke project website and social media platforms.

ii) Public communication and dissemination

The project aims to involve and promote dialogue among a wide range of stakeholders from the outset, rather than seeing this simply as a matter of ‘dissemination of findings’. As such, the project has been designed to build directly on the public engagement work of the research team, and make use of other networks and partnerships established through earlier research. Good relations with a

range of stakeholders have already been established, and the project will provide an opportunity to sustain and develop these. The issues addressed by the research are highly relevant to current debates over the future of school organization and governance, and in some areas the public debate has been extremely polarized. There is a clear need for an increased public, professional and policy debate in which schools, teachers, local authorities, parents, students, IT industry actors and other stakeholders can come together to debate the issues constructively. This creates significant ethical challenges for the researchers, in terms of retaining an independent stance and a rigorous focus on evidence, while working closely with stakeholders who may have very divergent interests.

In seeking to achieve this, regular contact will be maintained with a range of stakeholders throughout the research. However, more formal stakeholder engagement events will also begin from a very early stage, and be maintained throughout: these events will be recorded, and this will in turn provide data for our ongoing analysis. Representatives of key stakeholder organizations will be invited to join a project Advisory Committee: these include representatives from key **industry bodies** (e.g. Microsoft Education, Apple Education, Promethean), **policy actors** (e.g. the ICT-Ed division of Victorian DEECD, Education Services Australia) and **professional/ advocacy organizations** (e.g. Australian Council for Computers in Education) - many of whom contact has already been made.

A particular aim of the stakeholder engagement programme as it moves forward will be to develop more sustained and constructive dialogue between these different groups. In the initial 18 months of the project, we will hold separate events with representatives of industry, policy actors and professional/ advocacy organizations at intervals as the project proceeds: separate meetings of this kind should permit more in-depth examination of these groups' particular concerns, as well as perhaps less inhibited discussion. These groups will then be brought back together for the final conference, together with two other groups, educators and academics. Additional dissemination and consultation with **educators** will build on existing networks established with relevant professional and subject associations as well as with teacher unions; and a further seminar will be held for educators in collaboration with Australian Council for Computers in Education. Networking with **academic** colleagues will be sustained through our ongoing 'Learning with New Media' seminar series within Monash, as well as through attendance at the five conferences mentioned earlier.

Finally, a key aim for the project will be to ensure that future public debate in this area is better informed, more balanced and more constructive. To this end, we will seek to promote the research through popular publications (e.g. newspapers and education magazines – such as 'ACER Teacher' and 'Australian Teacher' magazines), media and online forums (e.g. Digital Education Research Network, DML Central), and via the use of social media applications on a project website. We will also explore possibilities for disseminating the findings to students and parents themselves, for example by creating accessible summaries of the research that can be linked to social networking sites and by collaborating some of our stakeholder groups who work directly with children and young people.

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