REDEFINING EDUCATION FOR THE DIGITAL AGE: A SNAPSHOT OF THE STATE OF PLAY IN THREE QUEENSLAND SCHOOLS

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Abstract

As curricula change, so must the tools used by learners and teachers and the plethora of mobile digital devices will likely play a major role in redefining education. The Digital Education Revolution (DER), with funding of more than $2 billion, was intended to provide Australian students with a world-class education system underpinned by the effective use of Information and Communication Technologies (ICT). In Queensland, DER funding provided 141 000 laptops to students in Years 9-12. However, now that DER funding has ended, the Queensland government and schools are considering BYOD options, in order to maintain a 1:1 ratio of computers to students. This paper reports the progress made by three Queensland schools with the use of mobile digital devices, whether supplied by the schools or the students themselves, and outlines significant positive outcomes and challenges experienced by these schools as a guide to other schools when embarking on mobile digital initiatives. Further, the study is framed within the methodological context of the Vital Case Studies undertaken in England (http://edfutures.net/Research_Strategy) and draws comparisons between the results of those studies and other schools across Australia involved in the Australian Snapshot Studies.

Context

As school curricula change, so must the tools used by learners and teachers. There is an increasing diversity of digital devices used in education systems worldwide and enhanced classroom access to personal mobile digital devices by students and teachers is an emerging trend. These devices enable students to choose how, when and where they access learning opportunities and afford teachers opportunities to redefine their pedagogy. The Digital Education Revolution (DER) was funded with more than $2 billion from the Australian Government, to provide Australian students with a world-class education system underpinned by the effective use of Information and Communication Technologies (ICT). In Queensland, DER funding provided, among other resources, 141,000 laptops to students in Years 9-12. Now that DER funding has ended and 1:1 computing is becoming an expectation within school communities, the Queensland government is considering Bring Your Own (BYO) options (Bita & Chilcott, 2013) in order to sustain and expand a 1:1 ratio of computers to students. Lee (2012) distinguishes Bring Your Own Device (BYOD) from Bring Your Own Technology (BYOT), though both require pupils to bring their own digital devices to school. The Queensland Department of Education, Training and Employment (2013) coined the term BYOx to include models in which students are allowed to bring only devices with a specific specification (x).

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This project investigated the progress made by three Queensland schools with the use of mobile digital devices, whether supplied by the schools or the students themselves. The results reported in this paper, informed by content analysis of the three school data sets, indicate that the introduction of a 1:1 approach had encouraging outcomes including enhanced learning opportunities and motivation for learning. This paper reports the experiences of the three schools and notes implications as a guide to other schools when embarking on 1:1 computing initiatives.

Mobile Learning [m-Learning] and BYOD/T

m-Learning is one of the fastest growth areas in the study of ICT in education (Pegrum, Oakley & Faulkner, 2013). It embraces learning that is mobile, facilitated by a digital tool that can be carried anywhere the learner goes. The popularity of mobile handheld devices has increased dramatically in the past couple of years. The *Horizon Report* in 2011 suggested that by 2015 80% of people accessing the Internet would be doing so from a mobile device and Internet-capable mobile devices would outnumber computers (Johnson, Smith, Willis, Levine & Haywood, 2011, p. 12). The 2013 Horizon Report (Johnson, Adams, Cummins, Estrada, Freeman, and Ludgate, 2013) identified that "Tablets, smartphones and mobile apps have become too capable, too ubiquitous, and too useful to ignore" (p. 17). Norris and Soloway (2011) predicted that by 2015 every K-12 student in the USA will be using their own mobile device. Given the apparent rate of uptake for smartphones in Australia and the long history of 1:1 computing in Australian schools (Albion, 1999) it seems reasonable to expect that Australian schools will experience similar trends.

Technologies have the potential to support a range of pedagogical approaches and educators around the world are exploring the affordances of each new technology to enhance and transform curriculum, learning and teaching. Numerous research studies have investigated the impact of mobile technologies on education (Hwang & Tsai, 2011). Australian studies include the 2011 *iPads for Learning* project in Victorian schools (DEECD, n.d.), which concluded that "quality of teaching, combined with purposeful and effective use of ICT contributes to improved learning".

It must be remembered that mobile digital devices were not specifically designed for education and must be repurposed for learning and teaching contexts (Traxler, 2010). For example, the small size of some screens, while making the device more mobile, also poses problems for emerging readers. While individual devices have specific affordances and constraints in education contexts, a BYO approach poses challenges of a different kind in terms of "the standards and specifications of the devices permitted to be used in class and, in particular, to log into an institution's network, with all of the attendant implications for institutional policies as well as IT support" (Pegrum, Oakley & Faulkner, 2013, p. 70). BYO will require careful attention to network speed and capacity, as well as network security (Traxler, 2010). Pedagogically, it has been suggested that teaching in distributed, 1:1 personalised environments, such as those created by BYO, will pose a new set of challenges for teachers, requiring them to acquire a new pedagogical skill set. Mobile literacy will require explicit development and therefore explicit teaching (Parry, 2011). Pegrum (2010) has suggested that BYO will intensify issues that exist to some extent in all networked learning contexts, but it may be more problematic for teachers within a mobile 1:1 BYO environment to guide, capture and document learning (Pegrum, Oakley & Faulkner, 2013).

Studies have indicated that the success of 1:1 projects is reliant on the school context; for example the school community socio-economic status; the readiness to embed vision and policy aligned with 1:1 computing; the teachers' attitudes and beliefs about 1:1 computing; the capacity to implement the innovation; and the support for technology adoption including technical support and professional development of staff (Fleisher, 2012). If sections of the school community are not open to the use of 1:1 devices to enhance learning and teaching, and the policies and practice are not in place, limited success will be achieved.

BYO programmes are based on the premise that mobile devices are in widespread use among young people (CoSN, 2012). Schools, it is argued, can benefit from using these devices in classes because the

students are already familiar with them, removing the need for technical familiarisation (Azzurri, 2011). Ofsted (2011) see further benefits as BYO can engage students and parents in learning at school and at home.

Method

The three Queensland school cases reported in this paper represent a subset of thirteen Australian schools studied using a similar methodology between September and December 2013. The three Queensland schools were purposefully selected as they had been identified previously as schools that were pioneering the use of mobile digital devices for teaching and learning and were convenient to the university campuses of the researchers. Table 1 summarises the demographic characteristics of each of the three Queensland schools.

Table 1 Summary of the three Queensland schools

	School F	**School G**	**School T**
Type	Independent co-educational	Independent	Catholic Boys
Location:	Fraser Coast	Gold Coast	Toowoomba
Phase	F-12	F-12	5-12
Students enrolled	470	1200	750
No of teachers	32	80	70
Digital technology strategy	5 shared class sets of iPads & laptops (years F-6); 1:1 iPods (Years 7-9); BYO laptop (Years 10-11)	1:1 iPads (Years 5-12)	1:1 iPads (Years 8-10); laptops years (11–12)
Year group & subjects observed	Year 9 SOSE & Year 6 English	Year 7	Year 8 History

The research design in each of the three Queensland schools followed the approach devised for the Becta Tablet PC Evaluation (Twining et al., 2005) and also used in Vital's 22 case studies (see http://edfutures.net/Technology_Strategy_Case_Studies). The data were collected using questionnaires, audio recorded focus groups and interviews, classroom observations and viewing a small group of students' work portfolios. The main difference between the Queensland school studies and the Becta/Vital studies was that all the data collection was undertaken in one school day in each of the Queensland schools, as opposed to several days spread over at least three weeks. The participant sample in each school was pre-arranged using the basic design formula outlined in Table 2, and two members of the research team visited each school in October 2013. One member of each research pair was the same for all three schools, and this researcher also led the Becta and Vital studies noted above. The completed questionnaires were collected on the days of the school visits. The data were analysed manually using an emergent theme analysis building upon the themes that had previously been identified in the Vital Studies (see http://edfutures.net/Digital_technology_trends).

Table 2 Participants and instruments used in each of the three Queensland schools

	School F	School G	School T
Questionnaire		Deputy Principal ICT coordinator Yr 7 Teacher	Principal ICT coordinator 4 teachers Parent
Interview	Principal ICT coordinator Yr 6 Teacher Yr 9 Teacher Parent	Deputy Principal ICT coordinator Yr 7 Teacher Parent	Principal ICT coordinator Teacher HOD SOSE Teacher HOD English ICT technician Parent
Focus group & Portfolio (Student work)	1 Yr 11 & 2 Yr 9 students	3 Yr 7 to 10 students	4 Yr 8 to Yr 10 students
Observation	Yr 6 ICT Yr 9 SOSE	Yr 7 Japanese	Yr 8 Humanities

Results and Discussion

The School Contexts

The three case study schools, located on the Fraser Coast (F), Toowoomba (T) and the Gold Coast (G) in Queensland were described fully in three EdFutures publications available online as indicated in the Table 3.

Table 3: The context, vision, technology strategy, impact and emerging trends of the three Queensland schools

School	Location of report
F	http://edfutures.net/images/1/11/SS4_report_final.pdf
T	http://edfutures.net/images/4/40/Snapshot_Study_5.pdf
G	http://edfutures.net/images/6/60/Snapshot_Study_6_Report.pdf

Commonalities and differences among the 3 Queensland schools

Brief analyses of each school are presented below followed by a discussion of common issues emerging from them.

School F

Teacher, parent and student participants in **school F** all commented about: the affordance of mobile technology to allow students to work in groups; problems with the various forms of technology tried so far; older students being more likely to own a laptop leading to the BYOx approach they had adopted for Years 10 and 11 who could bring their own laptop; using tools such as browsers and built-in cameras rather than apps; students having 'fun' with iPods; being able to communicate with the class online; ideal classroom scenarios; and the need for teachers to retain control of the classroom situation.

Participants approved of the school's BYO device policy and user agreements. The educational vision expressed by the Principal, however, did not converge with that of the teachers, parent or students. The Principal's broad-brush vision related to students "feeling better about themselves today than yesterday. Knowing they had learnt something today they didn't know yesterday". The teachers, parent and students' visions all related to specifics of curriculum requirements and using technology to enhance learning and teaching.

Participants also commented that teachers have to be willing to integrate technology, and possess effective classroom management skills to handle student use of 1:1 devices. Teachers require professional development (PD) on how to use technology to transform pedagogy and facilitate learning with technology. The option of moving toward a BYOD/T model was discussed by the Principal, ICT Coordinator, students, parent and both teachers as a more sustainable option for the school. The Year 9 teacher spoke a lot about doing curriculum tasks with prescribed software where there was no scope for students to choose the software/app for themselves. She was concerned that students could not use a specific piece of software she thought they should know how to use and the variety of experiences and technology tools often resulted in her having difficulty in maintaining control in the classroom. She believed it was important for teachers to maintain an expert persona with technology in the classroom. This links with the need for ongoing PD. The same teacher also described the ideal classroom scenario with technology as "when everything works perfectly, every child would be engaged and doing what they needed to with their own technology tools. Teachers would have the classroom management skills to handle students' free use of technology for learning without blaming the technology for causing the problem". The concept of 'problems' with the students using technology in the classroom related specifically to the technology malfunctioning and/or disruptive students, and was raised by the Principal, both teachers and the students themselves. The school has tried to deal with these 'problems' through *management arrangements* (e.g., user agreements, ICT policies, confiscating devices and removing user privileges, and organisation of devices for class use on powered trolleys) but the prevalence with which 'problems' were mentioned indicates that they are still of concern and a focus of attention at School F.

School G

In **school G** the basic structure of lessons had not yet changed though there was much greater variety in the activities that students undertook as a result of having the iPads; for example, the ability to easily share files had increased peer-peer collaboration in some classes. Some teachers were concerned about students being distracted as a result of having access to the iPads, though others felt that the level of off-task activity was similar before the 1:1 iPad strategy was implemented. A key difference was that off-task behaviour was less disruptive of the whole class than it had been before the iPads were introduced. The use of email had increased the speed of communication with parents, though this was not entirely seen as a positive.

Overall, the move towards 1:1 in school G was seen as inevitable, with two key factors learned by the administration from the process so far: ensuring WiFi capacity to meet growing use, and the need to engage all stakeholders, including parents who need support in knowing how to manage their children's use of the devices at home. Teachers, initially daunted, found many "easy, creative and amazing things out there" that could be implemented quickly, though they acknowledged that it may take years for fundamental pedagogical change. Whilst younger students preferred to use iPads rather than laptops, there was more resistance to iPads in the senior years. This reflected the greater complexity of the work that the older students needed to do and raised questions about whether iPads were the best device across the whole school. In practice the older students had already started bringing in laptops as well as their iPads with the school moving to a Many:1 model in Years 10 to 12, in which students used the iPad as a companion device, but could also bring in other devices such as laptops.

School T

In **school T** the parents, ICT coordinator and teachers all referred to the ongoing PD made available for both the staff and parents as one of the successful strategies of the project. The workshops and information provided to parents continued beyond the introduction of the devices, and parents have valued being kept in the loop throughout the implementation. There has been an increased use of the technology by teachers who might be labeled 'laggards'. However, much of the use has been to replicate what they had previously done with pen and paper or a standard whiteboard rather than being innovative. Interestingly, parents, students and teachers all identified the issue of off task behavior as a concern. As with school G though, the off task behaviours largely had little impact on other students.

The students appeared to have no difficulty with the new technology; however, parents thought that they often did not have the technical skills to use or monitor student use of the device, especially at the

beginning. Parents did perceive that their children were more motivated to complete their school work when using their iPads. As with the other schools, the students perceived that they were working collaboratively more often, they were also producing assessment responses that included more digital information (e.g., photos, data) or presentations (e.g., digital video) due to access to the devices. There was ongoing exploration, by students and teachers, for additional apps that might be provided on the iPads to enhance learning and teaching. A future goal of the school was to explore a more blended approach for their teaching and learning.

Implications

Notwithstanding some of the issues raised in each of the schools, there were positive outcomes from these three cases related to the use of 1:1 devices which enhanced learning opportunities and increased motivation for learning. For schools exploring 1:1 projects the data from the three Queensland schools identified four areas which need to be considered: sustainability, device selection, off task behaviours, and training for all.

Schools should consider their context when investigating sustainability. They need to decide who pays and how much they are prepared to pay, for both the initial outlay and ongoing maintenance of the devices and infrastructure. The funding considerations should include the ongoing development of the network infrastructure such as wireless network, software/apps, technical support and so forth. The use of BYOD/T/x places a significant proportion of these costs on to the parents and in some schools this may lead to equity issues. Schools moving to BYOD might consider whether there is capacity for them to modify how they use their current IT budget for the provision of laboratories, class sets of devices or school owned 1:1 devices and wireless networks. Who provides the device will impact on the students' feelings of ownership.

When selecting devices schools should bear in mind initial and ongoing costs, support and maintenance required, screen size, battery life, how quickly they start up, ability to complete specific tasks related to software available, ability to lock down or monitor the use of the devices, and access to networks. Different devices offer different opportunities; for example, laptops can be locked down (less feeling of ownership, less distraction) whereas iPads cannot be locked down (more ownership, more scope for distraction). Another consideration that emerged from the data was whether the school required each student to have the same device or were their teachers comfortable with students having access to a range of different devices even within the same category of devices (e.g., laptops vs iPads, or merely different brands of laptops)?

Strategies for dealing with off task behaviours, both at home and at school, need to be investigated and implemented. Parents and teachers need to be aware of strategies to overcome this issue. It would also be useful to discuss with students what they can do when they realise they or their peers are off task.

Initial and ongoing training should be provided for students, parents and teachers. Prior to providing students with access it is beneficial to provide teachers access so they can develop competence and confidence with the devices. Teachers also require continuing professional development as they try new apps, devices and teaching approaches. These three studies indicate that students required minimal support; however, parents benefitted from access to a range of training and information sessions.

Conclusions

The three Queensland Snapshot studies confirmed several of the emerging technology trends noted by the Vital studies in England: provision, network, funding, management, professional development, pupil and teacher roles (see Twining, 2014). They highlighted the need for schools to have a shared educational vision and for all stakeholders (Principal, teachers, parents, students, IT managers) to have input into creating the vision, understand the shared vision and most importantly, know how digital technologies might be used to enable the school to achieve their vision. Pedagogically focussed

professional development for teachers is a critical element that will afford teachers and schools the ability to unpack and examine the ways technology can be used to achieve the school's vision. Beyond these fundamental pillars, issues related to the robustness and suitability of devices and networks need careful planning to ensure sustainability of any 1:1 program. The data from these three schools also confirmed that no single device will do everything that schools, teachers and students from F-12 require, and schools should be prepared to vary the device requirements based on year level and curriculum requirements.

The rapid rate of development of new technologies, and the parallel speed of uptake of them by the community at large, has caused educators and researchers in the field to caution that there is a danger that the technology will be emphasised at the expense of pedagogy and content (Pegrum, Oakley & Faulkner, 2013). A powerful argument has been framed to suggest that, especially in education, pedagogy and content should be privileged over technology (Dudeney, Hockly, & Pegrum, 2013). What is important in the field of m-Learning is not the technology per se, but *how* it is used to support learning and teaching.

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