Exploring the Pedagogical Applications of Mobile Technologies for Teaching Literacy

Report for the Association of Independent Schools of Western Australia
Grace Oakley, Mark Pegrum, Robert Faulkner & Michelle Striepe
EXPLORING THE PEDAGOGICAL APPLICATIONS OF MOBILE TECHNOLOGIES FOR TEACHING LITERACY

Associate Professor Grace Oakley
Associate Professor Mark Pegrum
Associate Professor Robert Faulkner
Dr Michelle Striepe

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1. Overview

This report summarises the findings of the project Exploring the Pedagogical Applications of Mobile Technologies for Teaching Literacy. Conducted in 2011-2012, the project explored the use of mobile handheld technologies in the teaching of literacy, both in the English learning area and across the curriculum, in Western Australian independent schools.

While the project was open to any and all mobile devices, it quickly became apparent that the schools studied were using two mobile devices to the exclusion of almost all others. These were Apple’s iPad, with Apple’s iPod Touch running a distant second. As a result, the project focused almost entirely on these particular devices. It was carried out on behalf of the Association of Independent Schools of Western Australia (AISWA) by a research team from the Graduate School of Education at The University of Western Australia (UWA), with the collaboration of AISWA staff.

1.1 Introduction to the project

Using a multiple case study strategy, this project set out to explore how independent schools in Western Australia were using mobile technologies such as iPads and iPod Touches to support, enhance and transform teaching and learning in the English learning area as well as, more broadly, the area of literacy as a ‘general capability’ across the curriculum (ACARA, n.d., c). The project occurred in two phases.

Phase 1. The first phase, involving 10 schools, focused on uncovering schools’ current practices and experiences with mobile handheld technologies in the classroom, primarily, though not exclusively, to teach literacy (Pegrum, Oakley & Faulkner, 2012). Initial findings were disseminated to the wider community of independent schools in two sets of professional development (PD) workshops, for K-6 and 7-12 teachers respectively. Following the second workshop, a community of practice was set up, based around the purpose-built MLearnWA wiki (see Appendix 1), where teachers could share developing understandings and insights.

A detailed analysis of the Phase 1 data led to the development of nine key considerations, each revolving around binary possibilities for technology use. Recommendations on best practices were
generated based on these considerations, and were used to underpin the PD support provided to schools and teachers participating in Phase 2.

**Phase 2.** The second phase of the project involved six case study schools, once again with a major but not exclusive focus on the teaching of literacy. In three of the schools, which had already participated in Phase 1, researchers observed classroom teachers and their practices more closely and engaged in regular interactions with the teachers to ascertain their views of the benefits and challenges of working with mobile technologies. In the three new schools which joined the project in Phase 2, researchers supported classroom teachers who were introducing mobile technologies for the first time, observed their classes, and discussed their experiences in some detail.

With all six schools, but particularly the latter three, there was a strong element of professional learning and sharing, with researchers providing guidance to participating teachers based on the considerations established in Phase 1. The participating teachers and researchers thus formed a *community of practice*, which was enhanced by the ongoing use of the *MLearnWA* wiki. The data collected in Phase 2, in turn, allowed the researchers to elaborate on and refine the considerations established in Phase 1.

It is hoped that the professional dialogue which began under the auspices of the project, both in face-to-face settings and on the *MLearnWA* wiki, will continue to inform practice across the sector. With the *MLearnWA* wiki now having been opened up to wider membership, this dialogue has been broadened to include all teachers in Western Australian schools.

### 1.2 Background and rationale for the study

Many schools in Western Australia have started to investigate the affordances of mobile handheld technologies for teaching a range of understandings and skills across the curriculum. However, these technologies are a new addition to classrooms worldwide and there is, as yet, relatively little published research to inform classroom practice, especially regarding newer devices such as the iPad or even the slightly older iPod Touch. The project described in this report aimed to help fill this gap by investigating how mobile handheld technologies were being used, and could be used, to teach literacy in a range of school settings. It was anticipated that the project would assist teachers’ professional development as they engaged in a sustained way with new technologies, interacted collegially with UWA and AISWA researchers and staff, and took part in a process of reflective, collaborative learning.

Several contextual factors provided a strong impetus for this research, aside from the emergence of new mobile technologies. Recently released curriculum documents in Australia highlight the need for K-12 students to be taught how to use information and communication technologies (ICTs) for a
range of purposes. For example, both the Australian Curriculum (English) (ACARA, n.d., a) and the Early Years Learning Framework (DEEWR, 2009) explicitly stipulate the need to teach students how to understand and create digital texts as well as conventional printed texts. It is therefore no longer optional for teachers to integrate digital texts in the classroom. It is of course convenient and appropriate to work with such texts not only on desktop or laptop computers, but on mobile handheld devices. Furthermore, mobile devices can be used to help children learn traditional literacy skills involving, for instance, letter-sound associations, vocabulary and comprehension.

Further to the requirement that students learn to understand and create digital texts, the Australian Curriculum includes ICT Competency as a ‘general capability’. Thus, students need to be taught how to use ICTs effectively across the curriculum, which includes applying social and ethical protocols and practices when using ICTs; investigating with ICTs; creating with ICTs; communicating with ICTs; and managing and operating ICTs. The interrelationship of these elements is represented graphically in the diagram below.

![Diagram of ICT Capability](image)

**Figure 1.3 Organising Elements for ICT Capability in the Australian Curriculum**


The above requirements can all be fulfilled to some extent through engaging in literacy activities using mobile handheld devices. For example, commonly used mobile devices can be used to access the internet via wifi (iPad, iPod Touch) or 3G/4G connections (iPad), whether inside the classroom or outside it. Thus, they allow students to *investigate* (e.g., though web searches) and *communicate*
Mobile handheld devices also allow students to create (e.g., through writing, drawing or speaking apps, many of which involve multimodal literacies), with the work they have composed later being published and/or shared. While using mobile handheld devices, students are acquiring essential ‘digital literacies’ (Dudeney, Hockly & Pegrum, 2013), including the skills to manage and operate ICTs effectively. And, at all times when engaging in digital literacy activities, students can be given guidance as they develop the ability to apply social and ethical protocols and practices in the use of new technologies – especially the ubiquitous mobile technologies which will play such an important role in their future personal and professional lives.

Literacy, for the purposes of this study, is defined in line with the Australian Curriculum, which states that the aims of the English learning area are for students to:

- learn to listen to, read, view, speak, write, create and reflect on increasingly complex and sophisticated spoken, written and multimodal texts across a growing range of contexts with accuracy, fluency and purpose
- appreciate, enjoy and use the English language in all its variations and develop a sense of its richness and power to evoke feelings, convey information, form ideas, facilitate interaction with others, entertain, persuade and argue
- understand how Standard Australian English works in its spoken and written forms and in combination with non-linguistic forms of communication to create meaning
- develop interest and skills in inquiring into the aesthetic aspects of texts, and develop an informed appreciation of literature. (ACARA, n.d., a)

It is important to realise that literacy learning takes place not only in the English learning area, but across the curriculum. Thus, literacy as a ‘general capability’ was included in this study. According to the Australian Curriculum:

- all teachers are responsible for teaching the subject-specific literacy of their learning area
- all teachers need a clear understanding of the literacy demands and opportunities of their learning area
- literacy appropriate to each learning area can be embedded in the teaching of the content and processes of that learning area. (ACARA, n.d., c)

The Australian National Standards for Teachers (AITSL, 2012) also emphasise ICT skills, with several Focus Areas within the Standards specifically referring to ICTs, as shown overleaf.
Table 1.1 ICT-related Focus Areas in the Australian National Professional Standards for Teachers

<table>
<thead>
<tr>
<th>Focus Area</th>
<th>Graduate Teacher Stage</th>
<th>Proficient Teacher Stage</th>
<th>Highly Accomplished Teacher Stage</th>
<th>Lead Teacher Stage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard 2: Know the content and how to teach it</td>
<td>Implement teaching strategies for using ICT to expand curriculum learning opportunities for students.</td>
<td>Use effective teaching strategies to integrate ICT into learning and teaching programs to make selected content relevant and meaningful.</td>
<td>Model high-level teaching knowledge and skills and work with colleagues to use current ICT to improve their teaching practice and make content relevant and meaningful.</td>
<td>Lead and support colleagues within the school to select and use ICT with effective teaching strategies to expand learning opportunities and content knowledge for all students.</td>
</tr>
<tr>
<td>Standard 3: Plan for and implement effective teaching and learning</td>
<td>Demonstrate knowledge of a range of resources, including ICT, that engage students in their learning.</td>
<td>Select and/or create and use a range of resources, including ICT, to engage students in their learning.</td>
<td>Assist colleagues to create, select and use a wide range of resources, including ICT, to engage students in their learning.</td>
<td>Model exemplary skills and lead colleagues in selecting, creating and evaluating resources, including ICT, for application by teachers within or beyond the school.</td>
</tr>
<tr>
<td>Standard 4: Create and maintain supportive and safe learning environments</td>
<td>Demonstrate an understanding of the relevant issues and the strategies available to support the safe, responsible and ethical use of ICT in learning and teaching.</td>
<td>Incorporate strategies to promote the safe, responsible and ethical use of ICT in learning and teaching.</td>
<td>Model, and support colleagues to develop, strategies to promote the safe, responsible and ethical use of ICT in learning and teaching.</td>
<td>Review or implement new policies and strategies to ensure the safe, responsible and ethical use of ICT in learning and teaching.</td>
</tr>
</tbody>
</table>


Beyond this, many of the other standards potentially have ICT dimensions, as indicated in AITSL’S (n.d.) ICT Statements, which apply to the majority of the standards. For example, the Statements for the Graduate Stage of Standard 1 can be seen on the next page.
Table 1.2 ICT Statements for the Graduate Stage of Standard 1 of the Australian National Professional Standards for Teachers

<table>
<thead>
<tr>
<th>Focus Area</th>
<th>Descriptor</th>
<th>ICT Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>Physical, social and intellectual development and characteristics of students</td>
<td>Demonstrate knowledge and understanding of physical, social and intellectual development and characteristics of students and how these may affect learning.</td>
</tr>
<tr>
<td>1.2</td>
<td>Understand how students learn</td>
<td>Demonstrate knowledge and understanding of research into how students learn and the implications for teaching.</td>
</tr>
<tr>
<td>1.3</td>
<td>Students with diverse linguistic, cultural, religious and socioeconomic backgrounds</td>
<td>Demonstrate knowledge of teaching strategies that are responsive to the learning strengths and needs of students from diverse linguistic, cultural, religious and socioeconomic backgrounds.</td>
</tr>
<tr>
<td>1.4</td>
<td>Strategies for teaching Aboriginal and Torres Strait Islander students</td>
<td>Demonstrate broad knowledge and understanding of the impact of culture, cultural identity and linguistic background on the education of students from Aboriginal and Torres Strait Islander backgrounds.</td>
</tr>
<tr>
<td>1.5</td>
<td>Differentiate teaching to meet the specific learning needs of students across the full range of abilities</td>
<td>Demonstrate knowledge and understanding of strategies for differentiating teaching to meet the specific learning needs of students across the full range of abilities.</td>
</tr>
<tr>
<td>1.6</td>
<td>Strategies to support full participation of students with disability</td>
<td>Demonstrate broad knowledge and understanding of legislative requirements and teaching strategies that support participation and learning of students with disability.</td>
</tr>
</tbody>
</table>

This project aimed to enable participating educators to increase their understanding and skills in using mobile handheld technologies in the teaching of literacy, as well as beginning to share their knowledge in a community of practice. In addition, it aimed to disseminate findings about key considerations, and emerging recommendations on best practices, to a broader base of teachers in order to upskill a larger population.
2. Literature review

The literature review covers the major research areas relevant to the project: m-learning, ICTs and teacher learning, ICTs and literacy learning, and issues in m-learning. A list of selected key references is included in Section 7 below.

2.1 M-learning

Mobile learning, or m-learning, is the fastest growth area in the field of ICTs in education, with the 2011 Horizon Report predicting the rapid adoption of mobile devices:

According to a recent report from mobile manufacturer Ericsson, studies show that by 2015, 80% of people accessing the Internet will be doing so from mobile devices. Perhaps more important for education, Internet capable mobile devices will outnumber computers within the next year. (Johnson, Smith, Willis, Levine, & Haywood, 2011, p. 12).

It is therefore timely to investigate these mobile technologies and their potential educational uses.

► Nature of m-learning. Although the relationship between e-learning and m-learning is somewhat controversial, the general consensus is that m-learning emerged from the broader field of e-learning, with which it shares both important similarities and important differences. A key difference, of course, is the characteristic of mobility. While this characteristic was initially seen as associated primarily with the devices themselves, it was soon realised that such an understanding of m-learning was too technocentric. The focus has now shifted from the mobility of the technology to the mobility of the learner. One definition suggests that education in an era of mobile technology can be conceived of as ‘conversation in context, enabled by continual interaction through and with personal and mobile technology’ (Sharples, Taylor, & Vavoula, 2005, p. 6).

Mobile handheld devices allow mobile students to learn anywhere, anytime, including outside the spaces and times of formal education. An alternative term, u-learning, or ‘ubiquitous learning’, has recently been suggested to de-emphasise the idea of mobility and contextual independence, and instead to stress the situated, contextualised learning that mobile devices enable. Significantly, when students learn with personal mobile devices embedded in their own individual contexts, there is much greater scope for customisation of educational processes.
**Affordances of m-learning.** When digital hardware is used in conjunction with web 2.0 or ‘social web’ services, it sits well with collaborative, learner-centred pedagogical approaches. Mobile devices, with their web browsers, social media apps and communicative affordances, can be seen to represent a further move in this direction. They, too, sit well with contemporary pedagogical approaches like social constructivism and related paradigms like inquiry-based learning and problem-based learning.

Mobile technologies allow teachers and students to access and create multimedia materials (e.g., records of lessons or field trips), produce digital narratives, and explore emerging literacies, which range from multimedia/multimodal literacy to network literacy. The devices encourage the integration of in-school and out-of-school education, with the experience of ‘seamless learning’ (Looi, Seow, Zhang, So, Chen & Wong, 2010) giving rise to a new sense of learning spaces and learning networks.

It is possible that learners themselves are changing in some ways, with today’s students thinking and communicating differently from previous generations, although research suggests that the commonly heard claims about a new generation of ‘digital natives’ are rather exaggerated (e.g., Bennett, Maton & Kervin, 2008; Hague & Williamson, 2009; Hargittai, 2010). What is certain is that ever larger numbers of young people make regular use of mobile handheld technologies outside the classroom. Rather than educators ignoring their students’ out-of-school practices, it would seem appropriate to build on them, thereby helping to engage students, making their learning relevant to their present and future lives, and capitalising on the educational potential of the devices.

**Empirical research on m-learning.** In recent years, there has been a considerable increase in the number of research articles published about m-learning, though the available literature is still fairly limited. More findings can be expected to emerge from recent and current m-learning trials. To date, the literature has largely focused on the following key areas:

- **Understanding teacher & student practices & perspectives.** Most current research on m-learning is qualitative in nature, focusing on teacher and student practices and perspectives. These are typically investigated through a combination of surveys, interviews, focus groups, reflective journals and classroom observations (e.g., Franklin & Peng, 2008; Franklin, Sexton, Lu & Ma, 2007; cf. Hwang & Tsai, 2011). Such exploratory research is essential in a new field like m-learning. It helps determine the parameters of the field and allows researchers to establish a baseline of understanding about how mobile devices are being used to support teaching and learning, and how teachers and students experience their benefits and limitations. Early indications from this literature suggest that, as noted above, mobile handheld technologies support existing contemporary pedagogical approaches like social constructivism, but that they also facilitate new ways of learning linked to an altered sense of learning spaces and learning networks. The project reported here is very much part of this general exploratory approach.

- **Improved motivation.** The standout conclusion in the current literature is that m-learning is highly engaging for students (e.g., Backer, 2010; Jones & Issroff, 2007; Kukulska-Hulme & de los Arcos, 2011; Pachler, Bachmair & Cook, 2010). Factors which may contribute to the enhanced level of student motivation include greater student ownership of learning processes; personalisation of learning environments; seamless learning across different
contexts; wider communication and networking; and the intrinsic interest of engaging with peers as well as with multimedia learning experiences.

- **Improved learning outcomes.** Some evidence of improved student learning outcomes with the use of mobile handheld technologies has begun to emerge in a handful of quantitative studies (e.g., Cristol & Gimbert, 2011; Enriquez, 2010; Ernst & Harrison, 2011; Hwang, Chen & Chen, 2011). These have been conducted using different devices in different subject areas at different levels, not to mention employing different pedagogical approaches, which makes it challenging to draw general lessons at this stage. However, it seems safe to conclude that m-learning does at least have the potential to improve outcomes on traditional assessments.

Of course, the speed of technological development, combined with the speed of technology adoption by educational institutions, means that the ground of m-learning is constantly shifting. In many ways, teachers and students are acting as ‘co-learners and pioneers in the classroom’ (Gawelek, Spataro, & Komarny, 2011, p. 32). To some extent, strategies for how best to use mobile devices are still being developed on the fly by teachers and researchers, but as seen in the account of the literature above, and as revealed in this project, some consensus on key insights is beginning to emerge.

### 2.2 ICTs and teacher learning

The best-known model internationally for developing teachers’ use of ICTs is Mishra and Koehler’s (2006) TPACK framework, which shows teachers’ integrated *Technological, Pedagogical and Content Knowledge* (see overleaf). This framework assists educators to think about how technological knowledge might complement their existing pedagogical and content knowledge in such a way as to foster innovative classroom practices and improve student learning outcomes. Where any of the three forms of knowledge intersect, integrated knowledge is created. Where all three forms of knowledge overlap and are integrated, technological, pedagogical and content knowledge – or TPACK – is generated. This model has been used to inform the present study, supporting parts of the data analysis in both phases, as well as underpinning some of the guidance offered to teachers in Phase 2.

One premise underlying this framework is that teachers need to be reflective and flexible, considering how changing technologies might impact on students’ learning. They should also consider the pedagogical theories underlying the learning activities in which students engage. For example, many of the educational apps available for mobile handheld devices offer little more than content transmission or behaviourist drill and practice exercises, although the content and drills may be presented in multimodal ways. In some contexts, teachers may consider such apps to be a useful supplement to their classroom teaching, but it is desirable for them to build a critical awareness of the variety of possible uses of these new technologies – including more creative uses – as they make connections between their technological, pedagogical and content knowledge (TPACK).
2.3 ICTs and literacy learning

Since the mid-nineties, a large amount of research has been conducted on the use of ICTs for the teaching and learning of literacy/literacies, digital literacy/literacies, and (foreign) languages (with the last of these areas often referred to as CALL, or ‘Computer-Assisted Language Learning’). Yet there is very little literature on how to use m-technologies, especially recent devices like the iPad, to teach literacy (though there is now a growing literature on MALL, or ‘Mobile-Assisted Language Learning’).

While the general literature on the use of ICTs in literacy and language learning can be leveraged for ideas on how to use mobile handheld technologies for similar purposes, there are, as noted above, some significant differences between m-learning and e-learning. It is clear, then, that there is a need for far more research, not just on m-learning in general, but specifically on the integration of mobile handheld technologies into the teaching of literacy.

A selection of key literature on the teaching and learning of literacy using the two main mobile devices covered in this study – iPod Touches and iPads – is summarised below.

▼ iPods/iPod Touches and literacy learning. Apple’s iPod is a digital media player which can play both audio and video. The iPod Touch, which evolved from the iPod, can perform a much wider range of tasks, including accessing the internet, downloading apps, sending text messages and
making FaceTime calls. Although it lacks the ability to make phone calls, it shares a great deal of its functionality with the iPhone.

As such, the iPod Touch can provide a wide range of app-driven multimedia learning experiences, open up communication and publishing channels, and allow seamless, networked learning across formal and informal learning spaces. Students can personalise their devices and their use of apps to some degree, though, as noted in Section 2.2 above, many of the available apps – including literacy apps – are underpinned by a content transmission or behaviourist paradigm and permit little customisation or creativity on the part of students.

While much of the available research focuses on the more functionally limited iPod, rather than the iPod Touch, it is apparent that both devices can be used in a variety of ways to improve literacy learning. For example, Bomar (2006) reports anecdotally on the use of audio books on iPods by seventh grade US students, which increased their comprehension and vocabulary skills as well as boosting their motivation and confidence. Borgia (2009) reports on the successful use of iPods by fifth grade US students, who listened to podcasts to improve their comprehension of a novel’s vocabulary. In New South Wales, Australia, Kervin and Mantei (2010) report on the development of important literacy skills by fourth grade Australian students, who used iPods to create, develop, and evaluate a class radio show. In one study of the iPod Touch, which took place across the state border in Victoria, Murray and Sloan (2009) report on the device’s use in primary schools to enhance a range of literacy skills, resulting in improvement of students’ reading skills in one school, and the whole suite of macroskills – reading, writing, speaking and listening – in another.

**iPads and (literacy) learning.** In a few short years, Apple’s iPad has become the best-known tablet in the world. The iPad 1 was released in 2010, the iPad 2 in 2011, and the iPad 3 in 2012. With a larger screen size and a considerable range of educational apps and e-books available, it offers advantages over the iPod and even the iPod Touch. This is especially true of the iPad 2 (with its added cameras and the availability of key Apple software in app format, notably GarageBand and iMovie) and iPad 3 (which improved on the iPad 2 without altering its basic functionality). iPads, then, offer the possibility of expanding on iPod and iPod Touch pedagogies.

Because of the relative newness of these devices, most published work about iPads in education has been descriptive or anecdotal. Only a small number of more rigorous explorations have been carried out to date, and little information is available about iPads’ role specifically in the learning of literacy.

A trial of iPads at Trinity College at the University of Melbourne found they were ‘effective, durable, reliable and achieve[d] their educational aims of going further, faster and with more fun’ (Jennings et al., 2010, p. 4). The college decided to roll them out to all students in the wake of the trial, but it was made clear that they were a supplement to rather than a replacement for desktop or laptop computers. A study of iPad 1 apps used in education found that most involved either content...
transmission or behaviourist drills, and that they did not sit well with contemporary pedagogical approaches (Murray and Olcese, 2011), although another study of the iPad 1 found evidence that the device, used appropriately, could integrate well into a social constructivist approach (Cochrane, Narayan & Oldfield, 2011). Further studies are needed to reach more definite conclusions, including, in particular, studies of the iPad 2 and 3.

**A BYOD/BYOT model.** For educational institutions, it is very expensive to continually upgrade the hardware provided to students. Some educators and researchers are beginning to recommend a different model of mobile technology integration which, it is argued, is more financially sustainable as well as more pedagogically satisfactory, since it promotes personalisation of learning and its seamless spread across different spaces. It has two slight variations.

In the first, known as a BYOD (Bring Your Own Device) model, students are asked to purchase and bring to class a specific device, or one of a small range of devices, selected by the institution. In the second, known as a BYOT (Bring Your Own Technology) model, students can bring any device they choose. On current indications, it seems that many early adopters of mobile technologies are considering heading in this direction. We might expect, then, that in the coming decade the broader social trend towards increased private ownership of mobile devices, and even of multiple mobile devices, will intersect ever more strongly with the educational trend towards the use of mobile devices to support learning.

### 2.4 Issues in m-learning

While mobile handheld technologies like iPods, iPod Touches and iPads have real educational promise, there are a number of actual and potential issues to consider.

**Hardware.** Mobile devices, like digital technologies in general, were not designed for education and need to be repurposed for learning. Certain physical features, like small screen sizes on some devices, may be problematic. Design features, however, are even more problematic. Some educators suggest that because mobile handheld devices were designed primarily for consumption rather than creation of content, their educational value may be largely limited to content transmission and behaviourist exercises.

Of course, different devices have different affordances, which may be an issue with BYOD and, more particularly, BYOT models. Such models may also raise equity issues, given that not all devices will be equally accessible to students from varying socioeconomic backgrounds. What is more, educators must take care not to dampen students’ enthusiasm and detract from the appeal of the devices by eroding students’ sense of ownership of their personal technologies.

**Software.** The limitations of apps which are underpinned by content transmission or behaviourist pedagogical approaches compound the limitations which some educators perceive in the hardware. However, more creative apps are now beginning to appear, and more should become available as further research is conducted on m-learning.

**Supporting students.** Technical support is an issue for both students and teachers, though an increasing number of educational institutions are explicitly drawing on the expertise of their more
tech-savvy students, designating them as technology advisors to whom both peers and teachers can turn for help.

Students may arrive at school not only with different technologies but with different levels of digital literacy/literacies, based on past exposure to mobile and other devices. Getting all students up to speed on digital literacy/literacies will require pedagogical intervention. What is more, most students – even those who are more technologically accomplished – are likely to need support in developing strategies for protecting their digital safety, digital privacy and digital reputation, and for developing good digital citizenship skills.

**Supporting teachers.** In addition to needing technical support from time to time, teachers need pedagogical support on how to integrate mobile devices into their own TPACK framework; how to critically evaluate m-learning hardware and software; how to embed mobile technologies within appropriate teaching and learning strategies; how to facilitate and capture students’ m-learning processes; how to assess students’ traditional literacy skills through mobile technologies; and how to assess students’ developing digital literacy skills. Keeping up to date with changing technologies and pedagogical strategies will require teachers to join communities of practice where they can share ideas with other educators.

This research project aimed to address teachers’ needs by drawing lessons from current classroom practices, and developing a series of key considerations and associated recommendations on best practices.
3. Methodology

3.1 Research strategy

The research was conducted in two phases. The first generated a broad overview of current practices, and initial insights into best practices. The second consisted of more in-depth exploration, and the development of effective practices in selected case study schools. All of the research fell under a qualitative paradigm which, as noted in Section 2.1 above, is appropriate for exploring the parameters of a new field of study.

**Phase 1.** To begin with, UWA researchers interviewed school staff – ranging from principals to teachers – about the use of mobile handheld technologies at all levels of schooling, from early childhood and primary through to secondary, with a major focus on literacy. The aim was to generate a set of principles or considerations underpinning the educational use of mobile tools and to produce initial recommendations on best practices. It was discovered that all the schools surveyed were using iPads, with a smaller number using iPod Touches. Thus these two devices, but particularly iPads, became the focal point of the project.

Using semi-structured interviews, the investigators obtained data on the following main research questions in this phase:

- **How are teachers currently employing mobile handheld technologies to teach literacy across the curriculum?**

- **What factors enable and inhibit the use of mobile handheld technologies to teach literacy?**

**Phase 2.** In the following phase, the focus narrowed from a wide survey of schools to selected case study schools. The researchers built up a more detailed picture of how mobile technologies
were being used, mainly but not exclusively in literacy teaching. This involved both teachers who already had some experience with these tools, as well as teachers who were introducing them for the first time. As in Phase 1, semi-structured interviews were conducted, but in Phase 2 they were complemented, importantly, by lesson observations and follow-up discussions with teachers. The investigators sought to answer the following main research questions:

- How do teachers, especially those who are new to this area, use mobile handheld technologies to teach literacy?
- According to these teachers, what works when using mobile handheld technologies to teach literacy?
- What factors inhibit the use of mobile handheld technologies to teach literacy, and how do teachers respond to these factors?
- What are the similarities and differences in the use of mobile handheld technologies to teach literacy across the cases examined?

Significantly, this was a professional learning and sharing phase, in which researchers and teachers (especially those teachers who were working with mobile devices for the first time) collaborated closely, forming a community of practice (Wenger, 2000).

The approach employed in Phase 2 with the teachers who were just beginning to use mobile technologies is known as formative experiment methodology (Ivey & Broaddus, 2007; Oakley, 2003; Reinking & Bradley, 2008). This is a kind of design experiment, where specific pedagogical targets are selected and teachers trial and modify techniques (in this case using iPod Touches and/or iPads) in order to reach the nominated pedagogical targets. The cases studied thus become ‘designed’ as opposed to ‘naturalistic’ cases (Reigeluth & Frick, 1999) because of the input and intervention of the researchers. This is a useful strategy for exploratory work, such as when implementing new technologies. Although the formative experimental approach is very similar to action research, it differs in that it involves outside researchers, which helps practitioners through the provision of ideas and a different kind of expertise. It also typically entails a higher degree of documentation of what happens in the formative experiment by all co-researchers. Finally, it can be easily combined with a community of practice model of professional learning.

The community of practice formed by researchers and teachers was supported by the aforementioned MLearnWA wiki (see Appendix 1), created towards the end of Phase 1. Here, all teachers using mobile handheld technologies in Western Australian independent schools were invited to join the researchers in sharing and discussing mobile devices and, more particularly, related pedagogical strategies. It was hoped that an emphasis on pedagogical strategies would assist teachers in bringing together their technological, pedagogical and content knowledge – in short, their TPACK, as discussed in Section 2.2 above – in meaningful and productive ways. As noted in Section 1.1 above, the wiki has now been opened to the wider teaching community.
3.2 Selection of participants

Phase 1 was open to all 165 Western Australian independent schools which are members of AISWA. Staff from AISWA were instrumental in identifying schools which were already experimenting with mobile handheld technologies and whose principals and staff were willing to participate. In the end, this phase drew on interviews with key staff, including principals, vice principals, technology coordinators and teachers, from 10 schools.

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<thead>
<tr>
<th>School</th>
<th>School context</th>
<th>Location</th>
</tr>
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<tbody>
<tr>
<td>A</td>
<td>Ocean Beach School</td>
<td>Metropolitan Perth</td>
</tr>
<tr>
<td>B</td>
<td>South Regional College</td>
<td>Regional WA</td>
</tr>
<tr>
<td>C</td>
<td>Swan River Ladies’ College</td>
<td>Metropolitan Perth</td>
</tr>
<tr>
<td>D</td>
<td>Central Girls’ College</td>
<td>Metropolitan Perth</td>
</tr>
<tr>
<td>E</td>
<td>Boys’ Western College</td>
<td>Metropolitan Perth</td>
</tr>
<tr>
<td>F</td>
<td>Lyall Grammar</td>
<td>Metropolitan Perth</td>
</tr>
<tr>
<td>G</td>
<td>St Frances’ School</td>
<td>Metropolitan Perth</td>
</tr>
<tr>
<td>H</td>
<td>Southern River Academy</td>
<td>Metropolitan Perth</td>
</tr>
<tr>
<td>I</td>
<td>Hills College</td>
<td>Outer Perth</td>
</tr>
<tr>
<td>J</td>
<td>St Martin’s School</td>
<td>Metropolitan Perth</td>
</tr>
</tbody>
</table>

Note: All school names are pseudonyms.

Six schools were selected for participation in Phase 2. The schools were inclusive of a range of locations and socioeconomic contexts. A number of teachers at each of the schools were identified by school principals to participate in interviews, observations and discussions.

Three schools – Schools D, G and J – had participated in Phase 1. Three new schools – Schools K, L and M – were also included. The latter three were all at the point of introducing iPads into their teaching, and it was in these schools that researchers were able to offer the most guidance and support to teachers, as they followed a formative experiment methodology.

<table>
<thead>
<tr>
<th>School</th>
<th>School context</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>D</td>
<td>Central Girls’ College</td>
<td>Metropolitan Perth</td>
</tr>
<tr>
<td>G</td>
<td>St Frances’ School</td>
<td>Metropolitan Perth</td>
</tr>
<tr>
<td>J</td>
<td>St Martin’s School</td>
<td>Metropolitan Perth</td>
</tr>
<tr>
<td>K</td>
<td>City College</td>
<td>Metropolitan Perth</td>
</tr>
<tr>
<td>L</td>
<td>New Heights</td>
<td>Metropolitan Perth</td>
</tr>
<tr>
<td>M</td>
<td>Desert Lake School</td>
<td>Remote WA</td>
</tr>
</tbody>
</table>

Note: All school names are pseudonyms.
Four cases are presented in detail in this report. As stated, School D, Central Girls’ College, and School G, St Frances’ School, were originally included in Phase 1, and their teachers had developed some expertise in using mobile handheld technologies for the teaching of literacy and other subjects prior to the study. School L, New Heights, and School M, Desert Lake School, were loaned sets of iPads by AISWA and were introducing these particular devices into their teaching for the first time. The remaining two case studies are not covered in detail in this report, though their data is included in the summary table in Section 5.5 below, and they contributed to the refinement of the considerations initially established in Phase 1.

### 3.3 Data collection & analysis

In Phase 1, semi-structured interviews were the chief means of data collection. The researchers sought to answer the Phase 1 research questions listed in Section 3.1 above by structuring interviews around the following set of guiding questions, which were posed directly to interviewees:

- How do you use mobile handheld technologies, particularly for teaching literacy?
- Why do you use them this way?
- What benefits to the students’ learning have you observed?
- What problems, if any, have you encountered?
- What professional development do you think is needed by the teachers at your school?
- Would you be interested in helping develop/deliver some professional development?

The questions were designed to encourage the participants to reflect on and share their positive and negative experiences of using mobile handheld devices in the teaching of literacy, as well as more broadly. The final question was designed to initiate a discussion about the second set of PD workshops delivered towards the end of Phase 1, and the founding of a community of practice and the setting up of an appropriate digital platform to underpin it (see Section 1.1 above for more details). Wherever practical, interviews took place face to face, though a telephone interview was used for the regional school (School B, South Regional College).

Interview notes, including transcriptions of key passages, were checked for accuracy by interviewees. They were then coded by researchers to draw out key considerations, linked to recommendations about best practices. The resulting nine considerations and associated recommendations were used to inform the researchers’ advice given to participating teachers in Phase 2, and to initiate discussions in the community of practice. These considerations and recommendations are reported in Section 4 below.

In Phase 2, case studies were conducted in three of the Phase 1 schools, as well as three additional schools which had recently introduced mobile handheld technologies, as indicated above. With a looser structure than those in Phase 1, the semi-structured interviews were not based on a single
common set of guiding questions, though they generally aimed to obtain answers to the Phase 2 research questions listed in Section 3.1 above. These interviews were complemented by more general discussions with teachers, many of them conducted shortly after class observations. Interview notes, including transcriptions of key passages, and detailed observation notes were sent to participants for checking before being coded by researchers.

Given the formative experiment methodology employed in this phase, ongoing collection and analysis of data was necessary to inform the next teaching steps and modifications of pedagogy (Reinking & Bradley, 2008). For example, participating teachers collected a considerable amount of informal assessment data from their students to enable them to judge the success of innovative practices.

For each case, a ‘case description’ was developed (Yin, 1994) by the researchers. Within-case analysis was carried out according to theory developed throughout the project, using existing knowledge from the literature and insights gained throughout the research journey. Four cases are described in Sections 5.1 to 5.4 below. Cross-case analysis was subsequently carried out in order to identify similarities and differences between cases and to enable the detection of important common patterns, as reported in Section 5.5.
4. Nine considerations for mobile technology use

This section presents an overview of the educational uses of mobile handheld technologies in the schools studied. The overview is framed by nine considerations for mobile technology use, which are associated with nine dimensions of practice that were identified as pivotal. The considerations are presented as binaries; for example, the fifth consideration reads: “Consider consumption vs production”. However, this does not mean that the considerations necessarily require either/or choices. Most considerations in fact allow educators to adopt a position at any point along a continuum which runs between the binary poles. Indeed, educators may move backwards and forwards along such a continuum, depending on changing educational contexts. In some cases it is even possible to adopt binary positions simultaneously, as was frequently observed with the first consideration: “Consider analogue vs digital tools”. The positions teachers adopt in relation to these considerations – consciously or not – have a great impact on the kinds of teaching and learning with mobile technologies which occur in their classrooms.

The data suggested that the nine considerations were broadly related to technology, pedagogy and/or organisation. Teachers quite often viewed them as relating to one of these areas in particular, so the nine considerations have been categorised as being primarily technological, pedagogical or organisational. It should be noted, though, that these three categories should not be seen as discrete. There is a good deal of overlap between them, as there is between a number of the considerations themselves.

Alongside each of the nine considerations, we present recommendations to help teachers think through the relevant issues and make careful responses to them, with the ultimate goal of improving teaching and learning outcomes. Some of the considerations are associated with only one or two recommendations, while more complex considerations may be accompanied by six or seven recommendations.

The considerations and recommendations were largely derived from the analysis of Phase 1 interviews, but were complemented by insights that continued to emerge and crystallise during Phase 2. Although the project focused primarily on literacy learning, the considerations may be applied in all learning areas. The considerations and recommendations are explored in detail in the current section, and listed in summary form in Appendix 2.

### Table 4.1 iPad Usage in Phase 1 & Phase 2 Schools

<table>
<thead>
<tr>
<th>Class Set</th>
<th>Early Childhood (Years K-2)</th>
<th>Primary School (Years 3-6)</th>
<th>Middle School (Years 7-9)</th>
<th>Upper School (Years 10-12)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:1 Model</td>
<td>A B C D E F G H I K M</td>
<td>A B C D E F G H I K M</td>
<td>B C D E F G H I K M</td>
<td>B C D E F G H I K M</td>
</tr>
</tbody>
</table>

Current, proposed & experimental iPad usage models by schools (A-M) across levels at the start of Phase 2. Note that the experimental usage involved class sets loaned to schools by AISWA.
It quickly became apparent from the interviews that the iPad was the device of choice for teachers individually as well as for schools as a whole. iPads had already been introduced, or were about to be introduced, in all of the Phase 1 and Phase 2 schools (including the two Phase 2 schools which were loaned sets of iPads by AISWA). Most schools were using the iPad 2, although a few still had the iPad 1 available; the AISWA sets consisted exclusively of iPad 2 devices. Teachers’ views on the iPad 2 supported the published literature in many ways, with interviewees finding it easy to use, quick to boot up, and intuitive for students (and, notably, staff as well). As one participant observed, students ‘took to it straight away ... we underestimated that’ (School I). The table above indicates the levels and models of iPad usage across the 13 schools from Phase 1 and Phase 2.

iPod Touches were less commonly used, featuring in only four of the 10 Phase 1 schools, and one of the three new Phase 2 schools. However, even in those schools, iPod Touches were generally losing ground to iPads and were perceived by many teachers as somewhat ‘redundant’ (School C) and less ‘useable’ (School D) than iPads.

There was little mention of other devices. One interviewee indicated that Toshiba tablets had been used at his school but were being superseded by iPads. Another expressed a personal preference for Android devices, but this was not reflected in the school’s policy. One school gave students a choice between iPads and MacBooks; two schools allowed the use of iPhones in the classroom under the direction of the teacher; and one permitted any personal devices in addition to the school-provided devices, which in practice meant mainly iPhones and iPods. As described below, these are all versions of a BYOD/BYOT policy. Other schools permitted smartphones but only for personal use.

Teachers flagged up a number of issues connected with the technology, some of which mirror those described in the literature covered in Section 2.4 above. Their concerns included the following:

- **hardware issues** such as small screen sizes, notably on iPod Touches;
- **software issues** such as the challenges of syncing apps;
- **network issues** such as slow speeds, especially outside the metropolitan area;
- **IT issues** such as restrictive institutional policies;
- **ethical issues** such as the potential for student misuse of the technologies (though none of the schools reported any serious incidents to date, perhaps as a result of pre-emptively setting up tight acceptable use policies).

In coding the interview data, it became apparent that teachers’ reflections on how best to use iPads and, to a lesser extent, iPod Touches revolved around a series of nine considerations, as noted above. Combining insights from Phase 1 and Phase 2, these considerations are presented below. Naturally, there are some points of overlap and intersection between them, but they represent key themes in teachers’ experiences of using mobile handheld technologies in the classroom – mostly, although not exclusively, in the context of teaching literacy. The recommendations derived from these considerations informed researchers’ interactions with staff at the case study schools, particularly the three new schools, and on the MLearnWA wiki in Phase 2.
4.1 Technological considerations

The first set of considerations derived from the data concern the place of mobile handheld devices in the classroom and choices about which kinds of technologies to use.

1. Consider analogue vs digital tools.

Several interviewees spoke of the need to balance the use of old technologies like pens, paper and books with the use of digital tools. Two participants spoke of the need to ensure that young children develop fine motor skills through writing or drawing in traditional ways (Schools C & F), though one felt letter tracing apps could help in this (School M). Observations conducted in Phase 2 suggested that many teachers are finding ways to blend old and new technologies, using the latter to supplement rather than replace the former. This could involve early childhood students using physical counters as support when engaging with maths apps, for example, or middle school students hand-drawing maps based on those in e-textbooks.

Recommendation 1A: Use blends of analogue and digital technologies to achieve varying educational aims.

2. Consider free vs proprietary tools.

In Phase 1, teachers at six of the 10 schools reported that they were spending a great deal of time exploring appropriate apps to use with their students, especially in connection with the new Australian Curriculum. It was notable, however, that this concern began to tail off towards the end of Phase 2, as many teachers settled on collections of apps they had found to be useful.

In most schools, a combination of free and paid, proprietary apps was being used, although teachers indicated that this had cost implications, especially since there are

Figure 4.1 Combining digital & analogue
Photo by Michelle Striepe, 2012. Used by permission.

Figure 4.2 Browsers give access to web tools
Photo by Sean MacEntee under CC BY 2.0 Licence from www.flickr.com/photos/smemon/6972714864/in/photostream/
currently no educational site licences available for apps purchased from Apple’s iTunes App Store. Some teachers preferred to make use of free web 2.0 services by having students access and use websites and web-based tools, rather than working solely with apps. This gave students wider exposure to new technologies as well as helping ensure that they were not limited to tools pre-vetted by a single company. It should be noted, however, that Apple’s iOS, used on its mobile devices, does not support Adobe Flash, meaning that numerous Flash-based educational websites – including quiz-based and other interactive sites – could not be used.

- **Recommendation 2A**: Explore both free and paid apps, seeking a pedagogically and financially effective combination.
- **Recommendation 2B**: Ensure that students use web-based services as well as native mobile apps to increase their exposure to a range of digital tools.
- **Recommendation 2C**: Establish a common database of useful apps and web services to be shared among a community of teachers.

### 3. Consider technology vs pedagogy.

Participants strongly stressed that pedagogy (in association with content and students’ needs) rather than technology must be the driver in the classroom. As one participant put it:

> The iPad is the strawberry sauce that you pop on top [of the ice cream]. It gives a bit of extra flavour. It is not the be all and end all of teaching in the classroom, you still need good quality teaching [and] teachers in the classroom to facilitate the use of the iPad. [The teachers need] to have a key understanding of which applications and which part[s] of the applications relate to the outcomes you want ... it is not just the technology for technology’s sake, because it is shiny and new, because other schools are doing it. [It is about] how are the schools using it and what are the benefits. (School B)

While it was clear that students found the use of new technologies engaging – their faces ‘light up’ when the iPads are brought out, said one interviewee (School B) – teachers repeatedly emphasised that mobile devices should not be used primarily to entertain or distract students. As one teacher explained, ‘We do not use technology as a babysitting device’ (School F). Instead, schools were investigating how to ‘fully integrat[e]’ (School D) these devices into an ecology of learning.

On the other hand, it became clear in several Phase 2 schools that the engagement factor could play an important role, particularly although not only in contexts where there were behaviour management issues. By helping to keep more students on task for longer, the technology could indirectly facilitate the teacher’s focus on pedagogy and content, and thereby promote student learning. It could also reduce the incidence of students disturbing or distracting each other, and thus freed up the teacher to help those who needed extra support.

Several teachers also noted the benefits of iPads and apps for students with special needs, such as those who require early intervention; those with visual impairments; and those with reading difficulties and disabilities (Schools C, D & G). For example, students with visual impairments can resize and reformat text, and where appropriate they may also be able to use voice recognition and
text-to-speech apps. Such features of the hardware and software can be very advantageous in supporting students’ individual needs and thereby improving their learning.

It was apparent to many teachers in both Phase 1 and Phase 2 schools that mobile handheld devices can provide a good means for students to learn not just through but about technology. They thus help fulfil the requirements of the new Australian Curriculum which, like similar curriculum documents being released by governments around the world, highlights the inclusion of ICTs in student learning. As seen in Section 1.2 above, the Australian Curriculum specifically stipulates a focus on applying social and ethical protocols and practices when using ICTs; investigating with ICTs; creating with ICTs; communicating with ICTs; and managing and operating ICTs.

 ✓ **Recommendation 3A**: Place pedagogy and content ahead of technology, ensuring that the selected technologies support the intended learning outcomes.
 ✓ **Recommendation 3B**: Integrate the use of mobile technologies into the wider learning ecology, so that they are not seen primarily as entertainment devices.
 ✓ **Recommendation 3C**: Capitalise on the engagement potential of mobile technologies to keep students on task – especially, although not exclusively, in contexts where there are behaviour management issues – thereby facilitating pedagogical aims and supporting student learning outcomes.
 ✓ **Recommendation 3D**: Capitalise on the benefits of mobile technologies, including relevant apps, to support students with special needs.
 ✓ **Recommendation 3E**: Use mobile technologies as a springboard for teaching students how to manage technology and use it appropriately for a range of purposes.

### 4.2 Pedagogical considerations

The second set of considerations derived from the data concern the pedagogical strategies supported by mobile handheld technologies.

#### 4. Consider traditional vs contemporary pedagogical approaches.

In the m-learning literature, as noted in Section 2.3 above, there is some debate about whether devices like iPads sit better with more traditional teacher-centred pedagogical approaches (like content transmission or behaviourist approaches) or more contemporary student-centred pedagogical approaches (like social constructivism and problem-based or inquiry-based paradigms). The teachers interviewed suggested that they could be used either way depending, for example, on whether students were directed to apps underpinned by older or newer educational approaches (see Consideration 5 below), or whether teachers encouraged students to exploit their devices both inside and outside the classroom (see Consideration 8 below).

At least two interviewees suggested that, used appropriately, mobile devices can support the shift from a sage-on-the-stage pedagogical model to a more collaborative, student-centred model (Schools A & F). In this way, new technologies have the potential not only to enhance but to transform pedagogy, moving learning in a more social constructivist direction (Puente’dura, 2011).
However, at least one interviewee felt that the progressive potential of mobile devices to support communication, networking and creativity is somewhat at odds with the traditional forms of assessment that still dominate schools, particularly at upper levels (School A).

- **Recommendation 4A**: Consider whether, how and when mobile handheld technologies should be used to support traditional or contemporary pedagogical approaches.
- **Recommendation 4B**: Consider how mobile handheld technologies can be used to transform learning, moving it (further) in a social constructivist direction, rather than merely enhancing traditional or existing tasks.

### 5. Consider consumption vs production.

The concerns in the m-learning literature over the pedagogically limited nature of many mobile apps were reflected strongly in teachers’ comments. Many apps, they felt, involved mainly information transmission or behaviourist reinforcement of learning.

Some considered that such apps have a place in education, for example when students are learning letter formation or spelling at early childhood and primary levels. The value of such apps was reinforced by two schools that had conducted small-scale empirical studies – one focusing on French vocabulary retention (School B), the other focusing on mental maths skills (School D) – and concluded that the use of pedagogically traditional (if interactive and multimedia) apps led to improved learning outcomes on traditional assessments.

Teachers emphasised, however, that pedagogically traditional apps should not be used to the exclusion of creative tasks and/or tasks that encourage higher-order thinking. Several teachers noted that ‘generic’ apps (production-oriented apps that are not subject-specific) like GarageBand and iMovie, which became available with the iPad 2, allow students to be creative as well as sharing their work with peers and parents (Schools A, D, G & M). As one participant put it: ‘Initially, we saw [the iPad] as a content viewing device; it is turning into a creating device’ (School A). Some teachers reported using more structured digital storytelling apps, like Comic Life, Puppet Pals and others, for similar purposes at early childhood and primary levels (Schools D & L).

- **Recommendation 5A**: Use content transmission or behaviourist apps, where appropriate, to reinforce learning, but not to the exclusion of more production-oriented or creative activities.
- **Recommendation 5B**: Explore the use of generic apps to promote student creativity and higher-order thinking.
6. Consider teachers as learners vs teachers as experts.

Some schools reported high levels of teacher enthusiasm when it came to learning about and using mobile handheld devices. As one interviewee said of the teachers at her school:

They’ve been so enthusiastic about it. Lots of teachers that you wouldn’t necessarily think would be on board with technology [have] really got on board with it. (School D)

Nevertheless, other schools reported a distinct lack of enthusiasm, at least among some teachers: ‘the staff is the biggest blocker’, stated one interviewee. It was clear that individual school leaders and key teachers were often instrumental in spreading enthusiasm and garnering wider staff support for the use of mobile technologies, providing inspiration in how to use them, and supporting their use in practical ways.

There is little doubt that educators who are beginning to use new technologies in the classroom have to become learners as well as teachers with expertise to share. Not only must they acquire technological knowledge, they must learn to integrate it with their existing content knowledge, and their existing and developing pedagogical knowledge, which together make up their own personal TPACK. Moreover, teachers need plenty of time to become acquainted with new hardware and software before using it with students.

It was clear from the interviews that many teachers felt both technologically and pedagogically uncertain in this new territory, and keenly experienced a sense of lacking knowledge, skills, support and time. It became apparent that, above all, a shift of mindset is necessary, with the most successful teachers being willing to invest their time and engage in experimentation, while regarding themselves as technological co-learners with their students.

- Recommendation 6A: Identify key leaders and teachers who will share enthusiasm for the use of mobile handheld devices, act as role models, and offer support to other staff.
- Recommendation 6B: Emphasise pedagogy ahead of technology, reminding teachers that technology complements – and does not in any way make redundant – their existing content and pedagogical knowledge, though it may require further development of pedagogical knowledge as they seek strategies for effectively integrating mobile devices into their classrooms.
- Recommendation 6C: Give teachers access to hardware and software with plenty of lead-in time before they start to use it with students.
- Recommendation 6D: Provide teachers with bracketed time for professional development, both formal and informal.
- Recommendation 6E: Offer targeted and contextualised professional development, if practical, with 1:1 support being supplied at the point of need.
- Recommendation 6F: Remind teachers that they do not necessarily have to be technological experts from the start, but can learn with and from students about new technologies.
- Recommendation 6G: Encourage teachers to join, and share ideas in, a sustainable community of practice.
4.3 Organisational considerations

The third set of considerations derived from the data concern organisational or managerial aspects of working with mobile handheld technologies, including their role within the dynamics of learning ecologies. Differences between school year levels become more salient in this cluster of themes.

7. Consider collaborative use vs personalised use.

Collaborative use of shared mobile handheld devices was widely seen as suitable at early childhood and primary levels. By interacting around iPads or iPod Touches in pairs or small groups, students could develop skills of sharing and teamwork (Schools D, H, I & M). Yet, as one teacher pointed out, using iPads in this way runs counter to their design:

[W]e are doing something that is alien to the device ... we have tried to make it behave like a laptop in a trolley when it really should be a student-owned device.
(School B)

At middle and upper school levels, there was more of a trend towards individual ownership and use of mobile handheld devices, although learning tasks were sometimes collaborative. In various schools, a version of a BYOD/BYOT model was already in place or was put into place during the course of this project. One school required parents to purchase iPads, while another advised them to do so but allowed students and parents to purchase a MacBook if they preferred. In two schools, students were permitted to use their own iPhones instead of, or in addition to, their regular classroom devices at higher levels. In another institution, students were allowed to bring and use any personal devices they wished in addition to the devices provided by the school. As noted in Section 2.3, a BYOD/BYOT model is not only financially more sustainable for educational institutions (although it may place a burden on students and parents) but has the pedagogical advantage of allowing students greater customisation of their devices and, hence, more personalisation of their learning environments. In sum, by the end of our project in mid-2012, five of the 13 schools studied had already begun to move in this direction.

Regardless of where on the personal or collaborative spectrum devices are situated, students will inevitably upload and/or create some personal information on mobile devices, and they will inevitably share their own and interact with others’ personal information. To avoid potential issues in this area, many schools were proactively establishing policies for acceptable use, teaching students about digital safety, digital privacy and digital reputation, and encouraging them to develop digital citizenship skills. Several schools, notably those with a BYOD or BYOT model, had conducted or were planning to conduct information evenings for parents, helping them to understand both the technology and the potential dangers which exist around it, thus enabling them to participate more closely in their children’s education and offer adult guidance where appropriate.

✓ **Recommendation 7A:** At early childhood and primary levels, explore mobile handheld devices as shared tools for collaborative tasks (though individual tasks are still possible).
✓ **Recommendation 7B:** At middle and upper school levels, consider a 1:1 model of mobile handheld technology use (both for individual tasks, and for collaborative tasks where the collaboration occurs online).
✓ **Recommendation 7C**: In the medium to long term, consider a BYOD or BYOT model, encouraging students to personalise their devices and their learning environments.

✓ **Recommendation 7D**: Whether using class sets or personal mobile devices, put in place an acceptable use policy, teach students about digital safety, digital privacy and digital reputation, and help them to develop digital citizenship skills.

✓ **Recommendation 7E**: Involve parents in their children’s education by holding information sessions about mobile technologies and their dangers, especially but not exclusively when a BYOD/BYOT model is employed.

### 8. Consider formal vs informal learning spaces.

In line with the idea of ‘seamless learning’ expressed in the m-learning literature, covered in Section 2.1 above, a number of teachers were encouraging students to use mobile handheld technologies across a series of formal and informal learning spaces. In early childhood and primary settings, this meant allowing children to carry their devices to working spaces outside the classroom, such as hallways, common rooms or even playgrounds. As one teacher noted: ‘Being so mobile, you are not restricted to being in your classroom or at desks’ (School I). In middle and upper school settings, where there was a trend towards a 1:1 model, this meant encouraging students to use their devices to continue in-class learning in out-of-class settings, notably at home. This gave students access to a broader range of physical learning spaces, linked together by virtual learning spaces accessed through internet connections on their mobile devices.

One school had drawn consequences for the design of its physical learning spaces, and was establishing flexible classrooms with no fixed desks to foster collaboration and communication between students. Such arrangements were in fact already in place in several schools with well-established laptop programmes. Some schools were placing emphasis on the networking possible in virtual spaces, and had set up regular channels of communication between staff and students (School A) or between staff, students and parents (School E).

✓ **Recommendation 8A**: At early childhood and primary levels, encourage students to use mobile handheld technologies outside regular classroom spaces.

✓ **Recommendation 8B**: At middle and upper school levels, encourage students to explore ‘seamless learning’ by integrating their learning across formal and informal spaces, including school and home.

✓ **Recommendation 8C**: Capitalise on the networking which is possible between staff, students and parents in virtual spaces accessed through mobile handheld devices.
9. Consider lower vs higher year levels.

There was a view among many teachers that iPads and similar devices are best suited to early childhood and primary levels. Two reasons stood out above all others. Firstly, teachers observed that at lower year levels there is greater freedom to institute play-based learning and more time for collaborative, student-centred work without the pressure of traditional forms of assessment (Schools H & I). Many teachers indicated that middle school, which is not dominated by preparation for final university entrance exams, also allows some latitude for experimentation with mobile devices.

Secondly, teachers felt that as students advanced through the school levels, they would need more generative devices (such as laptops) instead of, or in addition to, devices like iPads, which may be less suited to producing the kinds of extended texts and other artefacts demanded of students at higher levels. Many schools have chosen to retain laptops instead of employing mobile handheld devices at higher levels. A number of teachers suggested that older students might use mobile technologies as a supplement to, rather than a replacement for, laptop or desktop computers. Indeed, more teachers appeared to be arriving at this view as they experimented with different technologies over the course of this project, including in Phase 2. Interestingly, one interviewee suggested that iPads are better seen as a replacement for textbooks (thanks to the still small but growing range of e-textbooks available) than computers (School D). In some schools, teachers had begun, or were about to begin, creating their own e-textbooks using iBooks Author.

- **Recommendation 9A**: At early childhood, primary and middle school levels, encourage directed-play and creative approaches to using mobile handheld technologies.
- **Recommendation 9B**: At middle and upper school levels, consider mobile handheld devices as a complement to, rather than a replacement for, laptop and desktop computers.
- **Recommendation 9C**: Consider e-textbooks, including those designed by teachers, as a replacement for hard copy textbooks.

4.4 Roundup

The three clusters of considerations which emerged in Phase 1 underpinned the researchers’ interactions with teachers and schools in the Phase 2 case studies. In particular, the recommendations that were developed in connection with the considerations were used to inform the professional development and support offered to teachers in the three new case study schools.
At the same time, the case studies provided data which allowed some further refinement of the considerations. In this way, Phase 1 and Phase 2 of the project were mutually reinforcing.
5. Case studies

Developed in Phase 2, the case studies were informed by the considerations and recommendations generated in Phase 1, as well as by ongoing interactions with schools. Four case studies are reported one by one in Sections 5.1 to 5.4 below. Common themes are identified in the cross-case analysis in Section 5.5.
5.1 Case Study: Central Girls’ School (CGS)

Central Girls’ School (CGS)\(^1\) figured as School D in our study, and was involved in both Phase 1 and Phase 2. It is a well-established Perth metropolitan school for girls, founded in the early 1900s. It has a holistic focus on students’ intellectual, social, emotional and spiritual development, tied to its cultural heritage and religious affiliation. The school’s 1100 students from Pre-Kindergarten to Year 12 are served by 230 teaching and administrative staff.

5.1.1 Overview of ICT usage at CGS

CGS has a long history of innovative use of ICTs for educational purposes. It was one of the first schools in Western Australia to initiate a laptop programme in the early 1990s. A few years later, the school began another initiative to integrate ICTs within its middle school, with the aim of personalising students’ education. This focus on integrating ICTs has continued to the present, with the recent adoption of iPads at all school levels.

CGS and its staff benefit from having an assigned team that oversees the integration of ICTs into the classroom, which includes providing professional development for teachers. The school employs Information Learning Technology (ILT) Coaches at different levels, in addition to ILT staff who help with the maintenance and distribution of ICT equipment, and support staff in using ICTs in their teaching. As the research at CGS was focused on the primary school, this section mainly describes the role of the ILT Coach, Lesley,\(^1\) in that part of the school.

Lesley has taken on many different projects and responsibilities in order to support teachers’ use of the iPads since their adoption by the school in 2011. Initially, much of her time was devoted to researching different apps. Over time, she has put together a list of ‘solid apps’; that is, core apps for teachers to use in their classrooms [\(\text{Recommendation 2C}\)]. This list includes many generic apps such as Book Creator and Puppet Pals. She believes that such generic apps are more useful to teachers as they are not subject-specific and can be used flexibly across all areas of the curriculum, often to involve students in the production of digital texts [\(\text{Recommendation 5B}\)].

Lesley spent a lot of time attending planning meetings in the various year groups to learn what content would be covered in each school term. She then used her knowledge of the iPad’s capabilities, and available apps, to make recommendations to teachers as to which apps might be integrated into their lessons. She continues to offer ongoing ‘shoulder to shoulder’ support to help teachers integrate the new technology into their practice [\(\text{Recommendation 6E}\)].

At the start of the 2012 school year, a set of early childhood level ‘core apps’ was placed on all the Pre-primary, Year 1 and Year 2 iPads, which could be added to or altered as necessary (see Table 5.1.1). Lesley has been careful not to ‘bombard’ teachers with too many apps; she is very aware that many of them are still learning how to use iPads.

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\(^1\) All names, both of schools and teachers, are pseudonyms.
As the 2012 school year has progressed, Lesley’s role has evolved. Having established a core set of apps, and with teachers now doing some of their own app research and sharing their findings with each other, Lesley spends less time researching. This has enabled her to reflect on what the school might do with the iPads in the future, as well as to support the teachers in sharing their experiences [Recommendation 6G]. In addition, Lesley has continued to spend time helping teachers understand how to integrate iPads and apps meaningfully into teaching and learning [Recommendation 6B].

5.1.2 Use of iPads at CGS

Following experimentation with the iPad 1 in 2011, the iPad 2 was more widely rolled out in 2012. Pre-Kindergarten (with three-year old students) through to Year 1 classes were each given a set of six iPads. As the Year 2 cohort was larger and the teacher demonstrated a keen interest in integrating iPads throughout the curriculum, this class was allocated 12 iPads.

As an example of how the devices are employed, the Year 1 teacher, Rowena, uses them as a station activity during her maths sessions. In these sessions, a particular app is selected in order to recap or reinforce taught concepts [Recommendations 4A & 5A]. For example, students have used the app Measure to practise their measurement skills. Rowena includes such activities because she believes they enable students to demonstrate or represent their understanding ‘in a different way’.

The Year 1 class has also used iPads in science. Here, children recorded the growth of a plant by taking pictures and making videos, before integrating them into the productive app, Book Creator, where they could add oral commentary to explain what the pictures or videos were showing [Recommendations 4B & 5B]. As Rowena explains, this became ‘a diary’ for the students’ learning. She is now planning to introduce the app, Explain Everything, as another means for students to articulate and record their understandings.

In the middle school, three classes of Year 8 students were given a set of 60 iPads to share. The classes were chosen because the teachers had shown an interest in using iPads and were ‘IT-savvy’. Before the iPads were distributed to students, teachers had their own iPads for five weeks in order to develop their understanding of how they worked and to acquire confidence in using them [Recommendation 6C]. It was intended that in the middle school the iPads would be used as ‘companion devices’ to laptops [Recommendation 9B].

In the upper school, a small set of iPads has been used in two different Language Other Than English (LOTE) classes. The distribution of iPads to these particular classes was determined by teacher interest; the teacher had experienced success in trialling the iPads in 2011 and, as there were some older iPad 1 devices available in 2012, she ‘snatched them up’.
5.1.3 Use of iPads for teaching literacy at CGS

It is evident from observations and interviews that teachers at CGS have taken advantage of the devices’ creative capabilities to support their students’ literacy development.

This has included the use of apps such as *ABC Tracer*, *Word Wall* and *Word Wizard*, which are underpinned by traditional pedagogies but which teachers feel nevertheless have a place in the classroom for reinforcement of learning [Recommendation 5A]. Such apps have been complemented by more creative apps used for digital storytelling and similar purposes [Recommendation 5B].

One example of the latter was a collaborative and creative Year 2 learning activity that focused on narratives [Recommendation 9A]. The teacher began by explaining the elements of narratives using the interactive whiteboard. After this, she explained and modelled how the children would create oral narratives using the *Story Wheel* app. Students were instructed to spin the wheel five times to reveal different pictures, which would then be incorporated into their stories. The first picture was used to establish the setting; the second, third, and fourth pictures were to describe the events; and the last picture was for the conclusion. Students were asked to work in pairs [Recommendation 7A]. They were invited to choose from a variety of learning spaces in which to compose their stories, with some deciding to remain at their desks, some opting for beanbags in different parts of the classroom, and others working on sofas or at tables in communal areas outside the classroom [Recommendation 8A]. After they had created their stories, they shared them by emailing them to the Year 1 class. The use of iPads to create e-books is a learning activity that is regularly implemented at CGS; for instance, the Year 2 class made a book for Pancake Day and the Pre-Kindergarten class worked with a Year 5 buddy class to create a fairy tale book.

In addition to iPads being used in classrooms to support literacy, the school’s library has embraced these mobile technologies. The library has a small set of six iPads, which are being used to showcase a set of e-books created by Year 5 students. These e-books are historical narratives geared towards lower primary children. During their lunch breaks, students are able to go to the library and read the e-books using the *iBooks* app. The iPads have proven to be popular with students and the library is interested in exploring the purchase of commercially produced e-books in order to better understand the costs, to find out how best to manage e-books and, above all, to trial how much they are used.

5.1.4 Successes at CGS

At CGS, iPads are widely viewed as tools with considerable potential to assist student learning. For Rowena, it is important that the use of any app can be connected to a specific learning objective [Recommendation 3A]. Lesley is also adamant that the iPads should not be used for playing games just for fun, but rather as learning tools [Recommendation 3B]. Rowena agrees:

[The children] know it is a tool ... it is not something that they go and play on. They understand that it is like a pencil, it’s something they need to use and it’s a tool that helps us with our learning.
At the same time, it is apparent to participating teachers that use of iPads has increased students’ engagement in learning tasks; they have described students as being ‘more focused’ [Recommendation 3C]. The introduction of iPads has been well received by students, as Lesley’s comments illustrate: ‘The girls are definitely engaged and enjoying it a lot. The teachers are really enjoying it too’. This kind of student engagement, if channelled appropriately, can ultimately benefit teachers’ pedagogical aims and students’ learning outcomes, as indicated in Rowena’s comment:

They have really enjoyed doing something different ... It is fun ... the apps are very child-friendly. They are having fun but they are learning at the same time ... They are doing what they need to do and recapping what we have done in class.

In order to ensure the students understand that iPads should be seen as learning tools, Rowena has created an iPad Reflection Book for each student. After children have interacted with an app, they fill out a page in their reflection book (see Figure 5.1.1). Rowena believes that the reflection book has had an impact on students’ learning as well as informing her teaching. Firstly, the book enables her to see whether the students like an app, and it helps her understand which aspects of the app students have problems with or do not find interesting. She uses this information to decide whether the app should be kept, or removed from the iPads. Secondly, the iPad Reflection Book has helped students themselves to ‘understand why we are using the apps, so it is not just about getting on there and playing. It is a tool for learning and to help them with their understanding’ [Recommendation 3B].

The teachers at CGS report that iPads have also assisted students with special learning needs [Recommendation 3D]. In one case, a CGS student with a visual impairment was able to take an iPad home in order to complete her homework on the device. As Lesley pointed out, this improved the process of learning for the student, as well as making it more enjoyable to complete the homework! Moreover, because all her classmates use iPads at different times of the day, the student did not feel especially ‘different’ from the others in her class. Teachers are interested in exploring further how iPads might be used to support students with a range of special needs.

5.1.5 Challenges at CGS

Lesley and Rowena commented that there have been few technological issues, with Lesley describing the implementation of the iPads as running ‘quite smoothly’. She credits the school’s ILT team with quickly dealing with any issues that arose. Moreover, the ILT team has been proactive in ensuring that teachers know how to perform key tasks, such as syncing apps, uploading photos and videos, and sharing student work. In respect of sharing work, the ILT team has decided that, rather
than having work printed out from iPads, it should be uploaded onto the school wiki or shared through other means, such as email or iBooks.

One particular challenge noted by teachers was the difficulty of finding apps that relate to the Australian context. For example, many of the available phonics apps come from the USA, and may embody a different approach to phonics – not to mention the obvious differences in pronunciation, intonation and accent. Teachers agreed on the value of sharing a list of useful apps, especially those which are relevant to the Australian Curriculum and/or the Western Australian context, on a platform such as the MLearnWA wiki [ Recommendation 2C].

But the greatest challenge seems to have been dealing with staff members’ perceptions of iPads. While many staff have been enthusiastic about the iPads (see the quote in Section 4.2 above), others have been somewhat ‘nervous’ about using them. Lesley suggests that staff hesitancy may be partly due to a sense that students have much more experience with these kinds of devices, meaning that teachers and students must be, at the very least, co-learners about the new technology [ Recommendation 6F]. Even more significantly, some teachers are unsure about how the use of the iPads might require them to alter their practices, and how the devices might or might not fit in with their current philosophy of teaching; they thus require guidance in integrating their existing pedagogical and content knowledge with new technological knowledge [ Recommendation 6B]. At early childhood level in particular, teachers have been keen to ensure that digital technologies don’t swamp more established, hands-on activities; it is of course necessary to find a balance between these [ Recommendation 1A]. Some of these issues, and other related topics, are neatly captured in Lesley’s comment about the need for close support of teachers as they work with the new devices:

A lot of kids have them at home now and [some teachers] think, ‘Why give something they could do at home?’ Particularly in the [early years, some teachers] are a bit resistant to them. I think it is because they have so many things in the classroom; they want [the children] to build those basic skills with the manipulative. They don’t want the technology to take over ... but I think it also has to do with their IT skills and how comfortable they are with it, so I think they just need more support.

This approach appears to have worked to some extent, with many teachers gradually becoming more interested in using iPads as they experience how easy they are to use, especially with close support available [ Recommendation 6E]. However, some teachers still require further convincing:

It is very hard to help people get from that point of ‘it is just games’ to be able to see that it is not just games – there is so much more to it. You just have to be imaginative about how you use it.

5.1.6 Roundup of CGS

The CGS approach to integrating iPads across all curriculum areas and different age levels demonstrates how these devices can be used to support a wide range of learning needs. Although the participating teachers would like to see more apps that are specifically geared to the Australian context, they have had considerable success in using apps based on traditional pedagogical
principles to consolidate literacy skills and understandings, complemented by generic apps used in creative ways for purposes such as representing knowledge and constructing digital stories.

It is evident that many of the successes experienced at CGS are attributable to the expertise and research of the ILT Coaches, targeted and sustained support from the ILT team, and the growing interest of the teaching staff. In this context, CGS plans to continue extending and refining its teachers’ and students’ use of iPads, in conjunction with their use of other ICTs.
5.2 Case Study: St Frances’ School (SFS)

St Frances’ School (SFS)\(^2\) figured as School G in our study and, like Central Girls’ School (School D), was involved in both Phase 1 and Phase 2. It is a large co-educational school affiliated with the Christian faith. Located in the northern suburbs of Perth, it was established in the early 1980s as a secondary school. Over the past three decades, SFS has expanded to serve students in years K-12. It has primary, middle and upper school areas on its main campus, with an off-campus early childhood centre nearby. The school serves a diverse community of students and strives to offer a range of programmes in order to meet their academic, social, and emotional needs. In total, the school has approximately 1450 enrolled students and around 220 staff.

5.2.1 Overview of ICT usage at SFS

SFS has adopted an innovative approach towards the use of ICTs in education, as evidenced by the school’s recent decision to implement a parent-funded BYOD programme (see Section 2.3 above) in the middle years.

At the beginning of Phase 1, SFS was trialling the use of tablets, laptops and iPod Touches in their classrooms. However, the leadership team – consisting of the principal and two teachers with knowledge of and interest in mobile technologies – had concerns with adopting these devices on a more permanent basis. In particular, they were disappointed by the tablets, due to their screen quality; the difficulty of displaying their screens through classroom data projectors; and their cost. The iPad 1, released the previous year, was then introduced into the mix of devices under consideration because of its reported educational advantages. As they reflected on which device(s) to adopt, the leadership team considered the following key questions:

- **Which device would make it easiest for students to interact with the technology?**
- **Which device would ensure that the focus was on the relationships between students, their classmates and teachers, and not on the technology?**

As pointed out by Scott,\(^2\) the Director of iEducation and a member of the leadership team, the technology needed to be ‘inconspicuous’. After due consideration, the iPad emerged as the device of choice. The school’s leadership team saw it as a ‘game changer’ and ‘easy to use’, and hoped that its portability, long battery life, and intuitive touch screen technology would encourage students to engage in anytime, anywhere learning [Recommendation 8B].

It was decided to launch the iPad programme on a small scale. With the support of the school council, the school requested the parents of students in two middle school cohorts, Years 7 and 8, to purchase the 32GB iPad 2. However, parents and students were given the option to buy a MacBook

\(^2\) All names, both of schools and teachers, are pseudonyms.
laptop as an alternative, thus introducing some flexibility into this BYOD programme. In practice, most opted to buy an iPad 2, and some chose the 64GB rather than the 32GB model.

The school took many steps to ensure as smooth a start to the programme as possible. The leadership team designed an acceptable use policy [ Recommendation 7D] and ran information evenings and workshops to educate the community of parents about the programme and how it would work [ Recommendation 7E]. In addition to providing members of the leadership team and selected teachers with a device so they could develop ‘a certain degree of comfort in using it’ [ Recommendation 6C], the school ran a number of professional development sessions to help staff develop a working knowledge of the device and gain an understanding of possible issues, such as students attempting to access social networking sites during class time [ Recommendation 6D].

The start of the 2012 school year saw the iPad programme implemented in Years 7 and 8. It was envisioned that once the programme was underway, the students in other year groups would be able to bring in their own mobile devices, but this was made optional rather than required. The move to a 1:1 system was a ‘challenging’ process, as Scott explained:

We are in a very risky situation and we are being watched by the whole education community because we are writing our own story. We have no one to go to, to compare. We are quite unique because of our size and we have a fantastic, proactive, supportive principal who has [given us] free rein, but we are in a very high risk situation. But I guess we just see that [it] is all about the big picture, and that is what is driving us. That is what we see and it is so important that this big picture is in the mind of our staff or we are all going to go down. It is important that it is a combined team effort.

One successful strategy for helping staff to understand the big picture and implement the plan as a team effort was the formation of the iMentors group. This group of staff supports teachers by offering PD in the use of iPads and laptops as well as particular software and apps. It is envisioned that the support offered by the iMentors will gradually move away from one-off group sessions and towards more contextualised, ongoing support for teaching within the classroom [ Recommendation 6E].

5.2.2 Use of iPads at SFS

iPads are now being employed on a daily basis in Years 7 and 8 at SFS. On one level, the devices serve to enhance traditional pedagogy, with teachers encouraging students to use them to access, record or recall information [ Recommendation 4A]. Students regularly use their iPads to access e-textbooks [ Recommendation 9C] as well as teacher-created PowerPoint presentations and other documents, and to record notes by using the ActionNotes app or by creating mind maps with a range of relevant apps. In one society and environment class, for example, students were studying primary and secondary sources. They were placed into groups, each with a document to analyse. Students used their iPads to access, open, and study their documents in order to identify them as primary or secondary sources, then connected their iPads to the classroom projector so they could share their conclusions and justify them to the class.
Some teachers are using the devices in a more transformational way [Recommendation 4B]. One society and environment teacher, Chris, who described himself as a ‘technology-focused person’, made it a priority to explore how the technology could open up new pedagogical possibilities. In a class on Ancient Rome, for example, he replaced the previous year’s task of creating a mock Roman newspaper with an activity which exploited the iPad’s capabilities. Together with a team of staff, he altered the activity so students could work in groups to create newscasts using the iMovie app. Not only did this introduce a strong multimedia element into the exercise, it also placed greater emphasis on student collaboration. As Chris indicated, the new format made a big improvement to student participation and enjoyment. Last year, the kids did it ... it was part of a normal assessment, they were OK with it, they kind of enjoyed it. This year, the kids seem to love it.

Such engagement can ultimately promote pedagogy by keeping students focused on the task at hand [Recommendation 3C].

At SFS, iPads are frequently used in conjunction with other devices, especially in group work where different students may have different technologies at their disposal [Recommendation 9B]. For a majority of students, the digital and the analogue go hand in hand: students were frequently observed using the iPads to view a source or type a text, while also referring to a printed handout or using a pen and paper to make notes [Recommendation 1A]. Teachers specifically encouraged students to move outside the classroom to use their iPads, and to use them both in school and out of school [Recommendation 8B].

5.2.3 Use of iPads for teaching literacy at SFS

SFS has a specific programme to develop literacy and numeracy, and to fit ICTs into these curriculum areas. Chris’s class on Ancient Rome, described above, shows how iPads can be used to support literacy across the curriculum, but the iPads were also used in dedicated literacy classes.

An English teacher, Sharon, used the iPads for the study of two novels. In one case, students used iPads to read the novel, while exploiting the capacity of the devices to allow them to quickly check the meaning of difficult words. In Sharon’s opinion, this helped students regulate their own learning; they were finding the answers themselves rather than bringing their questions to her. In the other case, students were studying characterisation. After working in pairs or groups of three to create an artefact about a chosen character, they used their iPads in creative ways to inform others about the character. The end products varied widely: they included Keynote presentations; visual
representations, such as ‘Wanted’ posters, created using apps like *Skitch* or *Pages*; and even a digital voice recording created with the music app, *GarageBand*. Again, the accent was on multimedia literacy, student collaboration, and a social constructivist educational paradigm [Recommendation 4B].

In a different activity, Sharon exploited the iPads’ recording capabilities to help students build oral language and presentation skills. Students were asked to memorise a poem, prepare a speech, or read from a book. As she explained, the students were asked to ‘take out their iPads and video each other doing their speeches, watch it back and critique themselves’. She found this approach worthwhile for a number of reasons:

> Previously it would have been a huge drama to get the cameras and all that sort of thing. Now I am able to say, ‘Take your iPads out, go outside and find a spot underneath a tree and do your filming’.

In addition to the ease of organising such an activity, and the opportunity for students to explore different learning spaces [Recommendation 8B], Sharon is convinced there were considerable learning benefits. The video activity, she said, enabled the students to get a better picture of and ultimately improve ‘their ability to speak ... their eye contact, their body language, that shuffling around which [they] often don’t realise they are doing’.

### 5.2.4 Successes at SFS

It is clear that the staff at SFS believe iPads can contribute to student learning in a number of key ways. As Julie, one of the iMentors, put it: ‘[The iPad] enhances learning not only on an auditory and visual level [but] it [also] makes it fun for the kids; they want to do it’. Chris, who taught the class on Ancient Rome, picked up on the way the students’ engagement with the iPads can improve their focus [Recommendation 3C], alongside other benefits:

> The students are a lot more focused on completing tasks when it is an iPad-focused task ... in the previous schools I have worked at there might be issues in getting access to the computers and log-on problems [but with the iPads] the students have instant access. I can challenge them to find a picture of the Emperor of China. Kids can have that within, say, 30-40 seconds, so that has allowed them to have a visual reference to things we are learning in class.

In addition to echoing the common theme of increased motivation, Sharon noted that iPads have been beneficial for particular types of students. For instance, she reported that they have helped ‘strong students’ to become ‘more creative’: ‘They have a bit more freedom in how they present things’. At the other end of the spectrum, she believes that iPads have helped students who have difficulty with handwriting: they ‘are loving [the iPads] because they know [their writing] is much neater and easier to revise’.
5.2.5 Challenges at SFS

The issues reported at SFS fell into three main categories: issues with the technology; the management and organisation of the technology, in particular managing and organising students’ use of the technology; and staff reactions to the technology.

At the start of Phase 2 of the study, participants experienced significant issues with the school network, as it could not support the number of people and devices using it simultaneously. As the network was being upgraded during the study, these problems appeared to recede. An ongoing issue relates to purchasing and accessing e-textbooks, described by one teacher as a ‘complicated process’ involving the use of special access codes and the creation of special accounts, resulting in too many steps for teachers, parents, and students. Consequently, it is anticipated by the leadership team that in the future fewer electronic books will be purchased, with teachers being encouraged to create their own e-books for the iPad using iBooks Author [▶ Recommendation 9C].

Managing students’ use of the iPads has been time-consuming. One unanticipated problem was the use of the Messages app which is bundled with all new iPads, and allows users to text/email and send photos to each other without going through a personal or school email account. Thus, despite the fact that some institutions prefer iPads precisely because they are not iPhones, newer iPads can effectively be used for text messaging. In one case, a student used Messages to send a text with an attached photo of another student during class time, which was interpreted and treated by the school as a form of bullying. In another case, a student messaged her parents during class, which resulted in the parents immediately emailing the teacher. SFS has dealt with the issues around Messages by: refining the school policy on the use of mobile devices, reminding students about appropriate use of the devices, and instructing students not to open the app in class [▶ Recommendation 7D]; and, where necessary, issuing penalties.

Helping students organise their work on the iPads has also proven to be time-consuming. Students regularly reported that they could not find their work on their iPads, and claimed that they had emailed work when, perhaps, they had not. As a result, one of the teachers participating in the study has spent a considerable amount of time with students to help them to establish a filing system. This is not something she had anticipated needing to do, but it may be a necessary part of teaching students how to manage new technologies [▶ Recommendation 3E].

Before the school’s 1:1 programme began, it was anticipated that staff would need to be ‘technology-savvy’ and would have to be prepared to spend time integrating the devices with the curriculum. Because it was felt that staff willingness would be important in making a smooth transition to using mobile devices, there was no desire to ‘push’ teachers into using them before they were ready to do so. While there was a general feeling of excitement among those teachers who were involved at the start of the iPads programme, it quickly turned to frustration for some, with suggestions that it might be preferable to go back to using laptops or computers. The main causes were the aforementioned issues with the network, e-textbooks, and the Messages app, as well as issues with sharing files and getting them off the iPads. As one participant put it, ‘the iPads are being used now and then but not as they should be or how we want them to be used’. Nevertheless, as these issues are addressed, it is anticipated that staff objections will decrease.
5.2.6 Roundup of SFS

It is clear that SFS’s vision of using mobile devices to enhance teaching and learning is being realised. In spite of technological issues with the network and e-books, management and organisational issues with Messages and student filing, and some teacher hesitancy, the adoption of the 1:1 model in Years 7 and 8 has resulted in benefits to teaching and learning. Many staff in Years 7 and 8 now incorporate iPads into their daily lesson plans. As in other case study schools, teachers are using the devices and relevant apps to support and even enhance more pedagogically traditional activities some of the time, and at other times they are exploiting the devices’ capabilities to radically transform classroom tasks and learning activities.

Like the other schools which have successfully introduced mobile learning, SFS has relied heavily on the vision of its leaders, the availability of a support team, and the motivation of key staff. The successes experienced to date augur well for the future.
5.3 Case Study: New Heights (NH)

New Heights (NH)\(^3\) figured as School L in our study, which it joined in Phase 2. It is a small school in metropolitan Perth that provides alternative education for ‘at risk’ and disengaged young people between the ages of 15 and 19. It has an enrolment of between 25 and 30 students and is one of several schools in a network run by a not-for-profit Western Australian organisation which offers a range of community development programmes for young people. Their educational provision includes Year 11 and 12 Western Australian Certificate of Education (WACE) programmes and Technical and Further Education (TAFE) courses. The organisation focuses on raising students’ self-esteem, believing that this is key to their success in the WACE exams. Normally taken by the general population in Year 12, these exams are typically taken by NH students one or two years later. Whilst ‘changing individual lives’ is the essence of the official school motto, ‘better late than never’ seems equally appropriate for this unconventional learning centre where students decide for themselves when, or even whether, to attend. For as long as they do, staff members are on hand to support and teach, but there is a strong commitment to autonomous student learning.

Located in a suburban light industrial zone, NH looks more like a small business unit than a school from the outside. Inside, there is a main classroom and several smaller rooms. Students are often seen working at tables in the main classroom, or sitting informally around smaller coffee tables in rooms which are more like lounges than conventional classrooms.

5.3.1 Overview of ICT usage at NH

Many of the NH students come from low socioeconomic status (SES) backgrounds, but they all possess iPhones, other smartphones and/or iPods. It appears that mobile technologies have become an essential everyday need for these young adults, regardless of SES. In keeping with the school’s emphasis on individual student responsibility, these devices are permitted. The use of personalised playlists as a backing track to learning is common, for example.

NH owns 15 laptops and whilst this is not technically a 1:1 model, students enjoy easy and frequent access to these devices. The laptops are recognised as making a significant contribution to student engagement and learning. An applied information technology learning unit has been specially designed for students, with an emphasis on consolidating essential ICT skills: the use of basic word processing, PowerPoint and Excel software is included in the unit, along with various multimedia packages for music, animation, photography and graphic design. Nevertheless, the school laptops do not go home with students and are not, in that sense, personalised mobile learning devices.

A key figure in the teaching and support of ICTs at NH is a recent science graduate in his early twenties. Rory\(^3\) is teaching at the school as he completes studies for a formal teaching qualification. From the first of two initial visits it was clear that he is the most ICT-savvy member of staff. As a near peer to students too, at the beginning of the trial it seemed likely that he would play a significant

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\(^3\) All names, both of schools and teachers, are pseudonyms.
role in the introduction of iPads. The school laptops are all MacBooks, so both Rory and the students were already familiar with Apple systems, settings and software (e.g., iTunes, iMovie and GarageBand) as well as with the Microsoft Office applications installed on the devices. It was obvious from early conversations that some of the students were already sophisticated ICT users. Whilst Rory was responsible for the initial introduction of iPads to the students, the researchers were not able to interview him again later in the project.

In contrast to Rory, the school principal, Gary, made no claims to more than basic ICT skills. One other teacher, Michelle, also participated in the research study. She had limited ICT skills at the outset of the project, but in terms of professional development represented the most significant growth. She was able to apply solid teaching skills to the matching of tasks to apps in highly effective ways. Between them, these three staff members covered most of the school curriculum.

For 9 weeks of Term 1, 2012, AISWA loaned a set of 13 iPads to NH for Phase 2 of the present study. This number was sufficient to institute a 1:1 model for all students who elected to participate in the study [Recommendation 7B]. This mimicked a BYOD model [Recommendation 7C], even though the devices were not in fact student-owned. Thirty-three apps had already been downloaded to these iPads on the basis of observations in Phase 1 of the study; 17 were free and 16 were paid [Recommendation 2A] (all are listed on the MLearnWA wiki, described in Appendix 1).

5.3.2 Use of iPads at NH

An initial visit focused on discussions between the researchers and staff about potential iPad usage and the brief demonstration of a range of apps. The MLearnWA wiki was also presented by the researchers, and school staff were invited to join.

The first observation and professional discussion visit to the school was made just one week after the delivery of the iPads. Several students had not returned necessary permission slips and were thus unable to be loaned an iPad immediately, highlighting issues of safekeeping and parental vs student vs school responsibility for personalised learning technologies [Recommendations 7D & 7E]. Students at NH were encouraged to explore the apps supplied with the devices, but they also had the freedom to download additional apps, in keeping with the school’s emphasis on student autonomy. This autonomy was evident in engagement with the iPads unrelated to assigned learning tasks but focused on recreational gaming apps. For example, one student, Cara, was observed playing a Temple Run pursuit game, ‘because I can, and it’s addictive’. Other students reported
playing games like Pet Shop Story, Tap Fish and Fashion Story. Although students were not interviewed in the project, their voices were given prominence in interviews with staff, as one might expect with such small numbers of teenage students. These voices are reflected in the data reported below.

Throughout the study, students were observed working both individually and collaboratively on a range of tasks and with a range of apps. It was not unusual to see several mobile devices on students’ desks: iPods that provided individual backing tracks for learning; mobile phones; digital cameras; and laptops. The early sense of novelty, where students were clearly playing with their new toys and were not focused on explicit learning, was in most cases quickly replaced by students’ busy exploration of a range of apps. Students were guided towards and discovered focused iPad uses that supported their learning, often in conjunction with other devices or hardcopy resources [Recommendation 1A]. For example, it was very common to see iPads on desks alongside laptops, both being used simultaneously [Recommendation 9B].

5.3.3 Use of iPads for teaching literacy at NH

In contrast to generally high levels of ICT competency, many of the students at NH have low levels of literacy skills for their age. Attempts to support student learning in preparation for the Year 12 examinations foreground ‘literacy across the curriculum’, with an introductory English programme that leads to the teaching of Stage 1 English, more normally taught in mainstream Years 11 and 12.

During initial discussions, NH staff indicated an interest in using iPads for the teaching of discrete skills for literacy; for a more general, topic-based approach to literacy; and for integrated approaches across the curriculum. Teachers could see possibilities for the explicit scaffolding of key learning strategies that might improve literacy and writing skills, particularly at the level of comprehension and spelling. Teachers also saw the iPads as having potential as platforms for multimedia project tasks — say, around a particular theme. As in other schools which were exploring the use of iPads in the teaching and learning of literacy, it became clear that it was necessary, and useful, to take a multimodal view of literacy.
In spite of our assumption that Rory would be the leading figure in teaching with the iPads, it transpired that Michelle dedicated a great deal of time to exploring and implementing a range of teaching and learning strategies using these devices. She was especially keen to investigate the potential of the devices and to get students using them in purposeful ways. Michelle was responsible for the early adoption of a ‘sticky note’ function in the inbuilt iBooks app to assist student comprehension and, in addition, she made what she described as a ‘cheat sheet’ of apps for students to use with various learning activities (see Figure 5.3.2). It identified a repertoire of apps for students’ use for specific learning tasks across the curriculum, enabling them ‘to pick and work through’ a task strategically.

The apps on the list included: Book Creator, Comic Life, ComicStrip, Demibooks® Composer, Keynote, Pages, Puppet Pals, Sock Puppets and Total Recall. It is notable that this list, which contains both free and paid apps [Recommendation 2A], consists essentially of generic apps which lend themselves to student production of digital texts and artefacts [Recommendation 5B]. Michelle reported that the list had a significant impact on students’ targeting of apps for specific tasks. In planning, students were expected to identify an appropriate app; so, for example, Sock Puppets was identified as an app that could be used for conducting interviews while preserving anonymity because of its voice distortion feature. In one project, Michelle asked students to combine audio recordings made on the iPads with Keynote to explore questions of spirituality and faith with individuals from Christian, Hindu and Aboriginal backgrounds. In another project, the multimedia potential of the iPads enabled students to take photos and use them in the creation of digital comic books. A number of these projects involved a radical transformation of teaching and learning approaches, with the devices and apps enabling classroom tasks which would formerly have been much more difficult to undertake [Recommendation 4B].

Despite initial discussion about the use of iPads for the teaching of specific English skills, there was little evidence of this. One exception was the use of the e-book Raw by Scott Monk, which Michelle employed in a fairly traditional way to help students develop their vocabulary and comprehension skills. Vocabulary definition and pronunciation functions were seen as particularly useful, and the capacity to make notes and highlight was also used systematically. However, printed copies of the book were available alongside the digital texts [Recommendation 1A]. There is clearly a place for more traditional materials, and more traditional pedagogical approaches, alongside the digital materials and digital approaches which iPads introduce into the classroom; the key is finding the right balance [Recommendation 4A].

Whilst Gary claimed to have little prior ICT knowledge, he embraced the use of the iPads. His students were observed accessing YouTube through the Safari browser to help with the analysis of camera angles in an English viewing task [Recommendation 2B], and the Pages app was used for the write-up. Gary also reported using the iPads for their audio and video recording capabilities, for problem solving, investigation and exploration. Less innovative uses by students included note-taking verbatim from the web, because using the iPad was ‘easier than having a computer on the desk’. Students were also observed using the iPad for quick reference to dictionary sites. While there was nothing transformational about these latter uses of iPads, they were certainly convenient. What was perhaps most striking was the way that students moved effortlessly between analogue and digital information and communication channels, in the form of paper-based resources, the web and apps [Recommendations 1A & 2B].
5.3.4 Successes at NH

Gary saw the iPad project as ‘very successful’ and indeed described it as having a ‘100 per cent success rate’. Essentially, the iPads were ‘a terrific support for the computers and existing course work’, were received enthusiastically by staff and students, and resulted in far greater everyday integration of ICTs into teaching and learning.

Significantly, the principal saw the iPads as complementing existing technology rather than replacing it: ‘The iPads are taking the place of the computer for some things but together [they] are a multi force; there is a union of the computer and the iPad’ [Recommendation 9B]. He was clear, too, about the impact of the iPads’ mobility on student learning, allowing them to work across in-school and out-of-school settings [Recommendation 8B]:

The fact that they are portable, the fact that they can take them home and do stuff at home on them is a big bonus too. I am getting more homework and seeing more homework finished since they have been using these.

Similarly, the iPads were seen as positively impacting on general everyday behaviour among NH students:

[Students] are sitting here and they are not disrupting other kids from doing their work. They might not be doing schoolwork ... but it has cut right down on the amount of negative behaviour.

This corresponds to the observation made in other case study schools that iPads are very engaging for students. By extension, whether or not behaviour management is an issue in a given context, having the students more engaged through the technology may well keep more of them on task more of the time, thus producing benefits for their learning [Recommendation 3C]. Gary explained the link between iPads, motivation and achievement this way:

If the kids are interested, they will excel. That is the bottom line. Whatever it takes, if it’s technology or whatever. In this case, the iPad – it has really enhanced their learning ability. Even more so, their learning enthusiasm ... to get a task completed.

Certain schools in our study were identifiable as ‘early adopters’, normally as a result of individual ‘early leader’ initiatives, rather than systematic ones. Similarly, individual students were sometimes identifiable as key ‘early leaders’ in the classrooms, generally by virtue of prior experience outside of the school setting. Staff admitted that they enlisted student expertise to assist with downloads and other technical issues. Karl, a NH student, already had his own iPad before the research project commenced and he was immediately considered the ‘go to’ person by students and teachers alike [Recommendation 6F]. A keen amateur photographer, his favourite apps for personal use were iMovie, GarageBand and various photo storage and processing apps. He completed a range of ICT learning tasks on the iPad whilst others continued to use laptops; for instance, he created a Keynote recipe, a Keynote presentation for English, a comic for English using ComicLife, and a series of ‘true or false’ questions to improve his own and his peers’ comprehension. In many ways, Karl provided a role model for the use of the iPads, and the arrival of the set from AISWA clearly enhanced his own sense of efficacy as he became a critical asset for the students and staff alike.
5.3.5 Challenges at NH

Overall, staff at NH reported very few challenges. On the technological side, they noted that a lack of expertise, especially in purchasing and downloading apps, was frustrating and potentially wasteful. They felt that questions remained about the novelty impact of the devices on engagement and motivation, and about the long-term sustainability of the improved learning they observed. Like all of the case study schools, teachers commented on the importance of professional development and staff support. In this case, the limited PD available resulted in more limited iPad use, though it was clear that enthusiastic teachers were able to find ways to develop their own and their students’ skills with the mobile devices. Had the iPads been available for a longer period, the NH teachers might well have begun to develop some of the staff support structures seen at Central Girls’ School (School D) and St Frances’ School (School G).

5.3.6 Roundup of NH

The use of iPads at NH demonstrated how mobile technologies can have a strongly positive influence on the learning of students in a non-conventional school setting. The high level of ICT literacy amongst students meant that they were quick to personalise these technologies, not just for learning outcomes but for games and diversions too. iPads increased their autonomy, allowing them to work seamlessly across a range of learning spaces, and to effortlessly combine digital and analogue tools. Alongside pedagogically traditional uses – which nevertheless appeared to have some positive impact on learning – students readily adopted more creative options for completing assignments, especially with encouragement and scaffolding by enthusiastic staff.

In short, it is clear that the potential of iPads to enhance the education of disengaged young adult learners remains underexploited and underexplored, and the present case study serves to illustrate untapped capacity. It is to be hoped that there will be more opportunities for the introduction and sustained use of iPads in this and similar contexts in years to come.
5.4 Case Study: Desert Lake School (DLS)

Desert Lake School (DLS)\(^4\) figured as School M in our study, which it joined in Phase 2. It is a small community school in the Great Sandy Desert region of Western Australia. It has approximately 75 children enrolled, from Kindergarten to Year 10. The school’s aim is to equip Aboriginal (Martu)\(^5\) children for life, whether they choose to enter the wider community or remain in the small township. In school, children use their native language, Manyjilyjarra,\(^6\) as well as English. Non-Aboriginal teachers, along with Aboriginal Education Workers, provide two-way teaching (that is, in two languages). For students aged 14 and above, the school has a strong emphasis on Vocational Education and Training (VET). School policies state that it is important for the children to learn about their traditional culture, skills, language, stories and songs, as well as acquiring 21st century life skills.

The school is well-equipped, with several classrooms, a computer room, a language room, a VET room and a café, which is used for hospitality training. There is also a nearby community hall, which is used by the school for some activities.

5.4.1 Overview of ICT usage at DLS

ICTs are viewed as important in the school, since they enable students to connect with the outside world and see aspects of life that they have never experienced firsthand. In early 2009, the school became one of the first in Australia to participate in the One Laptop Per Child (OLPC) project (www.laptop.org.au), an international initiative providing laptops to children in developing areas. The laptops, which are still in use at the school, are sturdy, low-cost and low-power, with software designed for collaborative, motivational learning. Each laptop is capable of connecting to the internet wirelessly, has a video camera, microphone, word processing software, and music and drawing software.

In 2011, 27 computers were delivered to the school under the Australian National Secondary School Computer Fund. Thus, students and teachers at Desert Lake were no strangers to computers and technology when the iPads arrived in Term 2 of 2012. For the present study, AISWA provided a set of 13 iPads for a period of nine weeks during the 10-week school term. As at New Heights (School L), 33 apps suggested by the researchers were preloaded onto the iPads before they were sent to the school, although teachers were free to download additional apps if they wished. Seventeen of the apps were free and 16 were paid [\(\text{Recommendation 2A}\)] (all are listed on the MLearnWA wiki, described in Appendix 1). All of the school’s four classroom teachers, including Tom,\(^4\) the Deputy Principal, participated in the trial. Tom is responsible for all aspects of ICT support and administration at the school.

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\(^4\) All names, both of schools and teachers, are pseudonyms.

\(^5\) The Martu are Aboriginal people from the Western Desert region of Australia. For more information, see: ‘Martu people’, Wikipedia, en.wikipedia.org/wiki/Martu_people.

Prior to the iPad trial, the school used the OLPC laptops with wireless capability and built-in cameras to extend the learning spaces available to children. For example, children worked in the kitchen garden, in the school grounds and beyond, under teacher supervision. Thus, although laptops were not taken home by children, the concept of mobile learning was not unknown to the participants.

When the iPads arrived, Tom encouraged students and staff to simply ‘experiment’ or ‘play’ with the apps that had been preloaded by AISWA. As the staff became more familiar with the devices and the apps, they began to use particular apps for particular tasks. They also began to download additional free apps. At the end of the 9-week trial, the teachers were convinced that the iPads could improve learning outcomes, and they are currently investigating the possibility of obtaining a permanent set for the school. Tom intends to do this through approaching mining companies in the area for donations.

5.4.2 Use of iPads at DLS

It is helpful to bear in mind that DLS only had access to the iPads for nine weeks and that none of the staff members had used them prior to the trial. It was therefore necessary for teachers to learn alongside the students [Recommendation 6F], both about the general uses of iPads and also about how they might be implemented in the teaching and learning of specific subjects. Since the school had the iPads for a short duration only, the teachers’ main focus was on using them to promote literacy learning, both within the English learning area and across the curriculum. However, the iPads were also used in science, for example, to photograph plants in the school vegetable garden, and in maths.

Joshua is the primary and secondary maths teacher at DLS. Unsurprisingly, he used the iPads mainly during maths lessons. Joshua tended to have children sit at their desks, within the formal learning space of the classroom, as he believed that this was where they were ‘most comfortable’. He had not considered using apps that would take students out of their seats and out the classroom, such as those that utilise satellite positioning to facilitate measuring distances (e.g., Measure Map).

In terms of literacy, he suggested that students’ ‘language of maths’ was supported by the iPads (including vocabulary such as ‘before’ and ‘after’, as well as the language appropriate to describing patterns). Some of the maths apps he used incorporated ‘read aloud’ functions, which he thinks may have benefited students’ listening skills. According to Joshua, the ‘read aloud’ feature also appears to have supported the significant number of students with reading difficulties [Recommendation 3D]. He observed that students tended to talk to each other a lot about their discoveries on the iPads, encouraging them to practise oral language associated with sharing and explaining, as well as language that was more specific to maths.

5.4.3 Use of iPads for teaching literacy at DLS

Other teachers at DLS used the iPads to focus even more extensively on literacy. Terri, the early childhood teacher, employed a variety of apps throughout the trial to assist children in improving their knowledge of the alphabet – letter recognition, letter naming and letter writing. She also used
apps that focus on letter-sound associations and sight word recognition. She found word-making and letter recognition apps particularly useful, especially those with sound available to support children’s learning, for example where the letter name or sound is pronounced as the child simultaneously traces the letter with a finger. Terri is of the opinion that such apps (e.g., Alphabet Tracing) can assist in the development of children’s fine motor skills as well as their alphabet knowledge. Other apps and e-books she used, such as Phonics Silly Sentences 2 and The Cat in the Hat, focus on rhyming to assist the development of phonological awareness.

Terri did not try out any generic apps like writing or e-book creation apps. However, she found that even those apps which were essentially traditional ‘drill and skill’ exercises could be educationally effective [Recommendations 4A & 5A]. Not only that, she reported that such apps could enhance the educational process in that children would talk keenly about the content and learning activities, and there was often a difference in the quantity and quality of communication and sharing around iPad-based learning tasks. ‘There’s a lot of interaction,’ she noted. While the apps she employed were primarily designed for use by individuals, children often used them collaboratively [Recommendation 7A].

Notwithstanding the high levels of interaction around some of the apps, Terri observed that children sometimes preferred to move into a quiet space on their own: ‘Sometimes they can concentrate more ... just by themselves’. During the trial, she encouraged children to find their preferred spaces, and they would often go to an informal learning space, such as a beanbag, with the iPad [Recommendation 8A]. Terri felt that if they were given choices about where to sit, or even recline, individual children would naturally gravitate to the places where they could best concentrate. She reported that children tended to stay ‘more engaged’ and were able to work more independently if they were given some freedom of this kind. Thus, the children were able to use their iPads to some extent as personal devices and may perhaps have benefited from the ‘intimacy’ they afforded.

In terms of classroom dynamics and management, Terri noted that iPads could help children behave more appropriately in the classroom: ‘It’s a good and effective behaviour management tool ... once they are on the iPad, they are so engaged’ [Recommendation 3C]. This also had the benefit of freeing Terri up to work with children who needed one-on-one support.

Deena leads the teaching of literacy from K-10 at DLS. She reported that no ‘best’ or ‘favourite’ apps were identified; students tended to explore many different apps as opposed to having repeated experiences with only a few. Deena also indicated that the children influenced each other in their choice of apps, with their explorations of apps often being collaborative.

A student might find one particular app ... and then for a week or two every kid in the class will be playing that app. The kids will get tired of playing that app but, by then,
another kid will have discovered another one and then all of a sudden they will play with that. So, the apps they ... played with at the beginning of the term will not be ones they will be playing with now.

Deena learned a lot through observing children use apps independently and was pleasantly surprised at how intuitive the iPad is. This enabled her to move away from a traditional teacher-directed pedagogical approach [Recommendation 4B]:

One of the concerns I did have is that the apps wouldn’t be accessible to the students because of their low literacy levels. Teaching out here, there is little room for independent work for the students because they can’t read instructional sentences so everything has been teacher-directed ... Having the iPads ... that hasn't been teacher-directed. Somehow [the children] have figured out how to use them without those high levels of literacy.

Students in the middle and upper school at DLS engaged in creating multimodal e-books about their community, using a range of generic apps like Creative Book Builder [Recommendation 5B]. This necessitated careful planning, drafting and editing, as well as thinking about how elements such as written text, pictures and sound can work together. Amongst other things, students photographed areas of their town with their iPads and then wrote sentences and paragraphs to describe the pictures, which were meaningful and relevant to them. The books were shared through iBooks for other students to read, discuss and enjoy.

According to Deena, one app that did not appeal so much to the students at DLS was Pages. The upper school students, who were used to word processing fairly quickly and efficiently using a laptop, experienced some frustration when using the Pages app for a writing assignment. Issues included losing pictures, having trouble resizing photos, and doing text wrapping. Although this experience is not in line with that of students in some other case study schools, where the Pages app was used without too many problems, it may be that laptops and their conventional software should be retained as a complement to iPads, especially at higher levels [Recommendation 9B].

5.4.4 Successes at DLS

Overall, the teachers at DLS saw the iPad trial as highly successful. iPads served to reduce behaviour management issues and increase the amount of time spent on task, with the superior level of engagement resulting in enhanced learning opportunities [Recommendation 3C]. Some of the more pedagogically traditional apps helped students consolidate the skills they had been learning in class (for example, the alphabet, phonics, and sight words), while more generic apps allowed for greater student autonomy and creativity [Recommendations 5A & 5B]. Even with more traditional apps, however, it was noted that younger students’ interactions with each other were qualitatively different – involving much more sharing and discussing – when using iPads, suggesting their value as collaborative devices [Recommendation 7A].

It was clear that when teachers and students learned about iPads together, in a collaborative spirit, it could be ‘very empowering’ for students [Recommendation 6F]. In sum, these devices brought
many benefits even if, especially at higher levels, they were best used in combination with a range of other learning technologies [Recommendation 9B].

5.4.5 Challenges at DLS

Alongside the successes associated with using iPads during the 9-week trial, teachers at DLS noted a number of challenges.

As in other schools which lacked adequate, dedicated IT support, there were some technological issues. It was sometimes problematic to connect iPads to the school network. Accessing and sharing student work on iPads was not always easy, nor was printing directly from iPads – something that was not achieved during the DLS trial. Making sure that the devices were at a 30 degree angle, preferred by the teachers for ergonomic reasons, was difficult without suitable iPad covers. Students also needed to learn some new skills, such as finger tapping rather than using a mouse, or formatting documents in unfamiliar apps like Pages.

Echoing teachers in other schools, the DLS teachers explained that it was time-consuming to find suitable apps. They spent a considerable amount of time sourcing Australian apps, especially apps relevant to Aboriginal children, which was a particular issue in their context.

5.4.6 Roundup of DLS

DLS used iPads in all classrooms over a period of nine weeks, with teachers employing them according to the needs and capabilities of the students, both as consumption and production devices. Teachers reported that successes included enhanced engagement of students and, in some cases, changed classroom dynamics and interactions, which facilitated the implementation of more contemporary, student-centred pedagogical approaches. Teachers were also able to experiment with new learning spaces, such as informal spaces within the classroom, and other learning spaces within the wider community.

The teachers had to be learners as well as teachers during the trial because it was not possible to be an expert on all aspects of the technology and the available apps. Although the students and teachers encountered several challenges and frustrations during the trial period, the successes seem to have outweighed the problems – hence the fact that Tom and his staff are now seeking funding for a permanent set of iPads so that they can continue exploring the use of these devices to support teaching and learning.
5.5 Cross-Case Themes

The findings from Phase 2 of the project indicate that, even though the participating schools were at different points on their journeys in the implementation of mobile technologies to teach literacy, and had different models of ICT infrastructure and support, not to mention different student demographics, they shared many common experiences, which largely related to the nine considerations outlined in Section 4. All used iPads, in some cases alongside other mobile handheld devices, usually iPod Touches.

5.5.1 Technological, pedagogical & organisational considerations

All schools, and all teachers, made decisions pertaining to the nine considerations. These decisions were made on an ongoing basis as new teaching and learning activities involving mobile technologies were conceived and implemented. In many cases, this was a heuristic process of trying out possible options to reach pedagogical goals whilst taking account of technological, organisational and pedagogical considerations. Often, a good deal of exploration and ‘play’ with the devices and apps was necessary, by both staff and students. Whilst both technological and organisational considerations were important, the view among most teachers was that pedagogical (and content) considerations were paramount and should ultimately drive curricular innovation. At the same time, they recognised benefits linked directly to the technology itself, like increased levels of engagement and motivation, and the reorganisation of learning that it permitted. Although teachers were certainly willing to conduct their own explorations of how to use the technology to meet their students’ learning needs, many indicated that they would value access to research evidence and professional networks to help them make sound technological, pedagogical and organisational decisions. It is hoped that this report and the professional network based on the wiki, MLearnWA (see Appendix 1), will go some way towards providing such evidence and networking opportunities.

5.5.2 Leading and sharing innovation

It emerged that it was important to have leaders and key teachers in schools who had an interest in implementing mobile handheld technologies and providing necessary support to other teachers who were ready to take up the challenge to innovate. All of the Phase 2 schools had teachers with a keen interest in using mobile technologies to teach English and literacy across the curriculum, as well as other subjects, and it was often these teachers who spread their enthusiasm and extended their support to other teachers as well as to students. It should be noted that it was not necessary for teachers to be experts in using mobile technologies. Indeed, in some schools, teachers and other staff, including teacher librarians, successfully learnt alongside and from students. Having said this, quality professional learning was recognised as crucial to the refinement of practice, as was the notion of sharing. In some cases this took the form of professional sharing, where teachers and ICT professionals helped each other apply mobile technologies in meaningful and efficient ways, and in
other cases the sharing could be described as student-teacher or student-student sharing. The professional network developed around the MLearnWA wiki has already been, and can continue to be, used to facilitate both leadership and sharing in the area of mobile technologies in education.

5.5.3 Identifying and creating digital resources

Another key issue revolved around the identification of pedagogically and culturally appropriate apps for teaching literacy. Teachers commented that a shortage of Australian-produced apps was an issue, not least because of the difficulties they experienced in linking apps to the Australian Curriculum and the Early Years Learning Framework. In response to this difficulty, some schools formulated lists of carefully selected apps, many of which were generic in nature, as opposed to apps with a specific content or pedagogical focus. Apps with a specific skill-building focus, such as spelling, phonics or letter formation, seemed to be more popular in early childhood and junior primary classrooms. The use of generic apps, which were often repurposed for literacy teaching, tended to increase through the year levels. There was a clear shortage of apps that were directly appropriate to particular groups of children, such as the Aboriginal children at Desert Lake School (School M). Although this school did identify many apps that were quite useful, these were not tailored to the students’ needs.

Overall, teachers reported that they had spent many hours downloading and evaluating apps, only to find that many were inappropriate for their purposes. This scoping of apps was an expensive and time-consuming exercise and participating teachers were eager to have access to a database of quality apps, especially in light of the volume of new apps being produced and the impossibility of keeping up with them. It should be pointed out that teachers’ evaluations of apps did not usually employ rigorous systems such as checklists or rubrics; such tools need to be developed and widely disseminated to help teachers to judge quality and appropriateness. Checklists and rubrics can now be found on the blogs and wikis of some educators, but most appear to be somewhat ‘off the cuff’ and not yet based on research principles.

Although difficulties in sourcing suitable apps were common, participating teachers were beginning to realise that they could easily create e-books (both fiction and non-fiction) that were customised to their students’ needs. Software such as iBooks Author and generic apps such as My Story were
being used for this. This was not generally attempted by teachers who were new to using iPads, however. As described in the nine considerations, teachers also needed to make important decisions about how best to use digital resources alongside analogue ones.

5.5.4 Increasing student engagement and interaction

Teachers in a number of the schools were of the opinion that the use of mobile technologies enabled them to give students far greater choices, for example in terms of where to sit or work, which apps to use, and whether to use analogue or digital resources. This freedom of choice tended to lead to greater student engagement in, and ownership of, literacy learning and other tasks. Other teachers thought that factors intrinsic to the technology (such as the aesthetics of the devices, their touch screens, and visual and sound quality) led to greater engagement and, hence, fewer behaviour management issues. Teachers were also interested in the potential of iPads to help them provide differentiated learning experiences to cater for a range of needs, including special needs, as well as their potential to support collaborative learning and enriched student interactions, linked in many cases to oral language development. These are all areas that warrant further research.

5.5.5 Linking to the literacy curriculum

This is an area that participating teachers appeared to find challenging and time-consuming, perhaps because they were attempting to come to grips with the new Australian Curriculum and new mobile technologies simultaneously. When asked how they used iPads to teach English and literacy across the curriculum, many teachers gave general descriptions of how they used the devices to teach literacy in terms of reading, spelling, phonics and writing, but did not clearly relate their use to the strands of the Australian Curriculum – Language, Literature, and Literacy. It appears that this is an area that requires more research. The MLearnWA wiki was set up in part to encourage teachers to make links between apps, their possible uses, and the Australian Curriculum but, at the time of writing this report, few members of the wiki had actively contributed to this area.

Participating teachers tended to use apps underpinned by traditional pedagogical approaches to help children learn constrained literacy skills (Paris, 2005) such as letter identification and names, letter formation, letter sounds, phonological awareness, spelling, and sight words (see the MLearnWA wiki in Appendix 1 for details of such apps). More generic apps were used to create digital stories and digital non-fiction texts, and promoted students’ ability to write. In addition, students read e-books and webpages for a variety of purposes, but these primarily involved traditional comprehension strategies, aside from technological enhancements that allowed students to look up vocabulary definitions and add notes to e-books. There appears to be great scope for generic apps to be used to support comprehension in more targeted ways, such as through the provision of models of cognitive comprehension strategies; multimedia representations of understandings; or collaborative annotation and discussion of texts in multimodal apps such as VoiceThread. More research is clearly needed in this area.
5.5.6 Summary of successes and challenges in case study schools

The case study schools shared many successes and challenges, but there were some variations, which may be attributed to differences in: the availability of mobile handheld technologies (and the use of a shared or 1:1 model); levels of ICT support and expertise; teacher knowledge and attitudes; student knowledge and attitudes; student demographics; and curriculum targets.

The successes and challenges experienced by the four Phase 2 schools described in Sections 5.1 to 5.4 are briefly summarised in Table 5.5.1 below. The experiences of the other two Phase 2 schools, which have not been written up as full case studies in this report, are also included in the table. Note that this table provides only an overview of key points alongside illustrative examples; for full details of Schools D, G, L and M, see the preceding case studies.

Table 5.5.1. Summary of successes and challenges in Phase 2 schools

<table>
<thead>
<tr>
<th>Brief Description of School</th>
<th>Successes &amp; enabling factors</th>
<th>Challenges &amp; inhibiting factors</th>
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| Central Girls’ School (School D) | Large independent school for girls (K-12).  
  - Pre-Kindergarten & Year 1 classes: set of 6 iPads per class.  
  - Year 2: set of 12 iPads.  
  - Year 8: set of 60 iPads between three classes.  
  - Upper school LOTE: small set of iPad 1s between two classes. | Use of iPads improved student engagement.  
  - iPads helped students with diverse learning needs.  
  - Traditional apps were used for reinforcement of learning.  
  - More generic apps were used for creative tasks.  
  - Students created multimodal science diaries.  
  - Students created multimodal digital stories.  
  - Students kept a reflective journal, which helped the teacher assess usefulness of apps and strategies.  
  - ILT (Information Learning Technology) Coaches supported staff.  
  - List of ‘solid apps’ helped teachers.  
  - Smooth implementation was due to good ICT infrastructure, staff training and support. | Some teacher reluctance was encountered.  
  - Sourcing apps relevant to the Australian Curriculum was difficult.  
  - Some technological issues occurred but were quickly solved by ICT staff. |
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<tr>
<th>Brief Description of School</th>
<th>Successes &amp; enabling factors</th>
<th>Challenges &amp; inhibiting factors</th>
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<tbody>
<tr>
<td><strong>St Francis' School (School G)</strong></td>
<td>Large multi-campus co-educational independent school (K-12).</td>
<td>Use of iPads improved student engagement.</td>
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<td>- Years 7 &amp; 8: 1:1 BYOD model, with iPads recommended (but MacBooks permitted as an alternative).</td>
<td>- Traditional apps were used to enhance traditional pedagogy.</td>
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<td></td>
<td>Use of iPads improved student engagement.</td>
<td>- More generic apps were used for creative tasks.</td>
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<td>- Improved student productivity was noted.</td>
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<td>- Greater student autonomy was noted, with students relying less on the teacher.</td>
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<td></td>
<td>- Students created video newscasts.</td>
<td>- Students created multimodal character studies.</td>
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<td></td>
<td>- Students improved oral presentation skills.</td>
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<td></td>
<td>- iMentors supported teachers.</td>
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<td></td>
<td>- Teachers were encouraged to consider making customised e-books.</td>
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<tr>
<td><strong>St Martin's School (School J)</strong></td>
<td>Large co-educational independent school (K-12).</td>
<td>Use of iPads improved student engagement.</td>
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<td>- Years 7 &amp; 8: 1-year trial of 1:1 BYOD iPad model in two classes.</td>
<td>- iPads became ‘constant companions’ of students for researching at the point of need.</td>
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<td>Improved student productivity was noted.</td>
<td>- Students created videos for a bush ballads project.</td>
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<td></td>
<td>Greater student autonomy was noted, with students relying less on the teacher.</td>
<td>- Students sometimes listened to music as they worked (using earbuds).</td>
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<tr>
<td>Brief Description of School</td>
<td>Successes &amp; enabling factors</td>
<td>Challenges &amp; inhibiting factors</td>
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<tr>
<td>City College (School K)</td>
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| Large independent school for girls (K-12). | ▪ Students worked collaboratively, helping and learning from each other.  
▪ Students created e-books on iPads.  
▪ Students used mind mapping apps on iPads.  
▪ Students created digital stories on iPads. | ▪ Sharing a small set of iPads between several classes meant restricted access.  
▪ There were difficulties in managing and syncing the iPads.  
▪ There were network access difficulties.  
▪ There were difficulties getting work off iPads, with *Dropbox* being used as the solution. |
| Junior school (K-6): shared set of 27 iPod Touches. |                             |                                 |
|                             |                             |                                 |
| New Heights (School L)     |                             |                                 |
| Small co-educational independent school for ‘at risk’ and disengaged students aged 15-19. | ▪ Use of iPads improved student engagement.  
▪ Students stayed more on task.  
▪ Students’ prior ICT skills were advantageous.  
▪ Improved student creativity was noted.  
▪ Greater student autonomy was noted, with students relying less on the teacher.  
▪ ‘Cheat sheet’ of useful apps helped students choose appropriate apps.  
▪ Students created multimodal presentations and comics.  
▪ Students used an e-book alongside an analogue version.  
▪ Students sometimes listened to music as a backing track while they worked. | ▪ Limited staff PD meant more limited iPad use.  
▪ A lack of staff technological expertise caused some frustration.  
▪ The limited 9-week trial period meant more limited opportunities for exploration. |
<table>
<thead>
<tr>
<th>Brief Description of School</th>
<th>Successes &amp; enabling factors</th>
<th>Challenges &amp; inhibiting factors</th>
</tr>
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</table>
| Desert Lake School (School M) | Small remote independent school for Aboriginal students (K-10).  
- All students: set of 13 iPads, preloaded with 33 apps, provided by AISWA for 9-week trial. | Use of iPads improved student engagement.  
- Students stayed more on task.  
- Students interacted and collaborated around the iPads.  
- Traditional apps were used for reinforcement of learning.  
- More generic apps were used for creative tasks.  
- Students used apps to reinforce learning about letters and sounds.  
- Students created multimodal e-books. | Some technological issues occurred.  
- There were network access difficulties.  
- Sourcing relevant Australian apps, especially apps relevant to Aboriginal students, was difficult.  
- The limited 9-week trial period meant more limited opportunities for exploration. |
6. Conclusion

Through this study, it has been shown that the pedagogical applications of mobile handheld technologies – notably Apple’s iPad and iPod Touch – for teaching literacy, as well as other subjects, are many and varied. With the rapid development of mobile technologies and the proliferation of new apps, it is likely that this area of teaching and learning will be highly dynamic in the immediate future. Indeed, because the relationship between literacy and technology has always been reciprocal, there is likely to be further redefinition of what literacy actually is and what it is for. Due to the rate of change, it is important that teachers have access to ongoing professional learning and professional networking opportunities. It also seems important that they have access to valid and usable criteria by which to evaluate educational apps for a range of purposes.

Through interviews with staff at 10 schools in Phase 1 of the study, it was possible to identify nine considerations for mobile learning, which can be applied to literacy learning as well as other areas. Although presented as binary considerations, they often do not require either/or decisions, but offer teachers a range of choices along a continuum between the binary positions. The considerations were refined and elaborated throughout Phase 2 of the study, and are summarised in Appendix 2. Each of the considerations is accompanied by recommendations to guide the decision-making of teachers. It should be stressed that the considerations were developed as a result of studying early adopters of mobile technologies and, thus, they will no doubt need refinement as the use of mobile devices in schools becomes more sophisticated and research-based. They are designed to help ensure that early adopters consider a full range of choices when planning to use mobile technologies, and should not be construed as a finite set of principles.

Four in-depth case studies have been presented in this report. These show that mobile handheld technologies can be used to teach literacy from K-12 in a range of contexts. Despite the fact that the participating schools were different in many ways, they had a considerable number of common experiences when applying innovations using mobile technologies. These similarities are reflected in the nine considerations originally established in Phase 1. Some of the similarities, as well as the differences, are highlighted in Section 5.5 above.

This research did not attempt to measure the impact or efficacy of using mobile technologies for attaining specific pedagogical outcomes or goals. Rather, this was exploratory research intended to map out how early adopter schools and teachers have been using mobile handheld technologies in the teaching of literacy, what factors might need to be considered when doing so, and what recommendations on best practices might be made in light of teachers’ experiences to date.
There is considerable need for further research on many aspects of using mobile technologies in the teaching of literacy and other subjects. Further research is required, for example, on the impact of using specific apps, or categories of apps, to assist in the attainment of targeted pedagogical goals. There is also a need for research to measure the impact of mobile technologies on students’ learning of reading and writing of traditional texts and of digital, multimodal texts. In addition, there is scope for research on the use of a wider range of mobile technologies, as different kinds of devices become widespread and educational institutions move towards BYOD and BYOT models.
7. References

Selected key references are included in the lists below. The first, general list of references consulted for this project is followed by a second list focusing specifically on mobile handheld technologies and m-learning.

7.1 General references


### 7.2 M-learning references


molta.massey.ac.nz/massey/fms//Molta/Cochrane.pdf


mlearn.bnu.edu.cn/source/Conference_Proceedings.pdf

docs.google.com/viewer?a=v&pid=explorer&chrome=true&srclid=OB5lvGCuvwcgXZWZkYmEzNDTnMqO500NmRhLThYmItOTU5NmVhYWJINDA1&hl=en&pli=1


www.insidehighered.com/news/2010/12/22/college_students_test_drive_the_apple_ipad


Appendix 1: The MLearnWA Wiki

The MLearnWA wiki is a platform where practising teachers can share their experiences with and insights into m-learning, with a particular focus on materials, especially apps, that are relevant to the new Australian Curriculum and/or the Western Australian context.

It contains details of apps currently being used by teachers in Western Australian schools. It covers all those mentioned in the current report, including the 33 apps recommended by researchers and preloaded onto the AISWA iPads in Phase 2 of the project. The wiki is continuously updated as new apps become available.
The wiki is publicly viewable but can only be edited by members. For the duration of the original research project, it was open solely to AISWA teachers, but membership has now been expanded to include Western Australian teachers across all sectors. Educators who are resident outside Western Australia but would like to be part of this community are also welcome to join.

To request membership, please visit the wiki by scanning the QR code on the left using a mobile device, by clicking on the link mlearnwa.wikispaces.com in the electronic version of this document, or by typing the web address into your browser bar if you are reading a hard copy of this report.
Appendix 2: Considerations & recommendations

The boxes below contain a summary of the nine considerations, and associated recommendations, extracted from Section 4. Considerations and recommendations which are broadly technology-related are included in the first box; those which are broadly pedagogy-related are included in the second box; and those which are broadly organisation-related are included in the third box. However, there is considerable overlap between the three boxes, and between the considerations and recommendations contained within them. Please refer to Section 4 for full details and discussion.

<table>
<thead>
<tr>
<th>Technological Considerations &amp; Recommendations</th>
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<tbody>
<tr>
<td><strong>1. Consider analogue vs digital tools.</strong></td>
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<tr>
<td><strong>Recommendation 1A:</strong> Use blends of analogue and digital technologies to achieve varying educational aims.</td>
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<tr>
<td><strong>2. Consider free vs proprietary tools.</strong></td>
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<tr>
<td><strong>Recommendation 2A:</strong> Explore both free and paid apps, seeking a pedagogically and financially effective combination.</td>
</tr>
<tr>
<td><strong>Recommendation 2B:</strong> Ensure that students use web-based services as well as native mobile apps to increase their exposure to a range of digital tools.</td>
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<tr>
<td><strong>Recommendation 2C:</strong> Establish a common database of useful apps and web services to be shared among a community of teachers.</td>
</tr>
<tr>
<td><strong>3. Consider technology vs pedagogy.</strong></td>
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<tr>
<td><strong>Recommendation 3A:</strong> Place pedagogy and content ahead of technology, ensuring that the selected technologies support the intended learning outcomes.</td>
</tr>
<tr>
<td><strong>Recommendation 3B:</strong> Integrate the use of mobile technologies into the wider learning ecology, so that they are not seen primarily as entertainment devices.</td>
</tr>
<tr>
<td><strong>Recommendation 3C:</strong> Capitalise on the engagement potential of mobile technologies to keep students on task – especially, although not exclusively, in contexts where there are behaviour management issues – thereby facilitating pedagogical aims and supporting student learning outcomes.</td>
</tr>
<tr>
<td><strong>Recommendation 3D:</strong> Capitalise on the benefits of mobile technologies, including relevant apps, to support students with special needs.</td>
</tr>
<tr>
<td><strong>Recommendation 3E:</strong> Use mobile technologies as a springboard for teaching students how to manage technology and use it appropriately for a range of purposes.</td>
</tr>
</tbody>
</table>
### Pedagogical Considerations and Recommendations

| 4. Consider traditional vs contemporary pedagogical approaches. | **Recommendation 4A:** Consider whether, how and when mobile handheld technologies should be used to support traditional or contemporary pedagogical approaches.  
**Recommendation 4B:** Consider how mobile handheld technologies can be used to transform learning, moving it (further) in a social constructivist direction, rather than merely enhancing traditional or existing tasks. |
| --- | --- |
| 5. Consider consumption vs production. | **Recommendation 5A:** Use content transmission or behaviourist apps, where appropriate, to reinforce learning, but not to the exclusion of more production-oriented or creative activities.  
**Recommendation 5B:** Explore the use of generic apps to promote student creativity and higher-order thinking. |
| 6. Consider teachers as learners vs teachers as experts. | **Recommendation 6A:** Identify key leaders and teachers who will share enthusiasm for the use of mobile handheld devices, act as role models, and offer support to other staff.  
**Recommendation 6B:** Emphasise pedagogy ahead of technology, reminding teachers that technology complements – and does not in any way make redundant – their existing content and pedagogical knowledge, though it may require further development of pedagogical knowledge as they seek strategies for effectively integrating mobile devices into their classrooms.  
**Recommendation 6C:** Give teachers access to hardware and software with plenty of lead-in time before they start to use it with students.  
**Recommendation 6D:** Provide teachers with bracketed time for professional development, both formal and informal.  
**Recommendation 6E:** Offer targeted and contextualised professional development, if practical, with 1:1 support being supplied at the point of need.  
**Recommendation 6F:** Remind teachers that they do not necessarily have to be technological experts from the start, but can learn with and from students about new technologies.  
**Recommendation 6G:** Encourage teachers to join, and share ideas in, a sustainable community of practice. |

### Organisational Considerations and Recommendations

| 7. Consider collaborative use vs personalised use. | **Recommendation 7A:** At early childhood and primary levels, explore mobile handheld devices as shared tools for collaborative tasks (though individual tasks are still possible).  
**Recommendation 7B:** At middle and upper school levels, consider a 1:1 model of mobile handheld technology use (both for individual tasks, and for collaborative tasks where the collaboration occurs online).  
**Recommendation 7C:** In the medium to long term, consider a BYOD or BYOT model, encouraging students to personalise their devices and their learning environments. |
<table>
<thead>
<tr>
<th>Recommendation 7D:</th>
<th>Whether using class sets or personal mobile devices, put in place an acceptable use policy, teach students about digital safety, digital privacy and digital reputation, and help them to develop digital citizenship skills.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recommendation 7E:</td>
<td>Involve parents in their children’s education by holding information sessions about mobile technologies and their dangers, especially but not exclusively when a BYOD/BYOT model is employed.</td>
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<tr>
<td><strong>8. Consider formal vs informal learning spaces.</strong></td>
<td><strong>Recommendation 8A:</strong> At early childhood and primary levels, encourage students to use mobile handheld technologies outside regular classroom spaces. <strong>Recommendation 8B:</strong> At middle and upper school levels, encourage students to explore ‘seamless learning’ by integrating their learning across formal and informal spaces, including school and home. <strong>Recommendation 8C:</strong> Capitalise on the networking which is possible between staff, students and parents in virtual spaces accessed through mobile handheld devices.</td>
</tr>
<tr>
<td><strong>9. Consider lower vs higher year levels.</strong></td>
<td><strong>Recommendation 9A:</strong> At early childhood, primary and middle school levels, encourage directed-play and creative approaches to using mobile handheld technologies. <strong>Recommendation 9B:</strong> At middle and upper school levels, consider mobile handheld devices as a complement to, rather than a replacement for, laptop and desktop computers. <strong>Recommendation 9C:</strong> Consider e-textbooks, including those designed by teachers, as a replacement for hard copy textbooks.</td>
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