Mobile learning in early childhood education: A school-university partnership model

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Chapter 2 Literature Review

2.1 Introduction

The purpose of this research was to explore the implementation of mLearning in early childhood education (ECE) at two partner public schools in the metropolitan area of Perth, Western Australia. The school-university partnerships in this research were integral to the development of change in the use of mLearning. The study is informed by existing research. The literature identifies what is already known about mLearning in early childhood education and school-university partnerships. Table 2.1 presents the structure of the literature review.
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2.2 Conceptual framework

This literature review examines the literature in four sections: mLearning in early childhood education, the benefits of mLearning, the challenges of mLearning, and school–university partnerships. Section one, mLearning in early childhood education, defines mLearning and early childhood education in the context of this research. Following a definition of mLearning and similar terms used by researchers, there is an overview of children’s use of the Internet. Children’s Internet use is relevant as mLearning devices include smartphones and tablet computers that connect to the Internet and are increasingly used by young children. Section one concludes by considering mLearning in the particular context of early childhood education.

Section two reviews the literature on the benefits of mLearning in early childhood education. mLearning has been shown to increase engagement and support skills for the 21st century learner. The term 21st century learning is used around the world and includes the skills of digital literacy, collaboration, critical thinking, communication, and problem-solving. The benefits of mLearning in early childhood education are reviewed from three perspectives – namely, the classroom teacher, the PST (pre-service teacher), and the school community which includes parents.

Section three reviews the literature on the challenges to mLearning in early childhood education. Four areas are considered – classroom, community, school, and university. The final section of the literature review discusses school–university partnerships, which were examined using the theory of alliances framework (Iyer, 2003). The literature focuses on the purpose of and reasons behind partnerships in general and then school-university partnerships in particular. The benefits and challenges of school-university partnerships follow. These four
sections are important because together they inform the research questions that guided the study.

The four sections of this literature review influenced the focus of the research, which was to explore the implementation of mLearning partnerships in early childhood education at two public schools in the metropolitan area of Perth, Western Australia. Section one, mLearning in early childhood education, is important because it defines mLearning so that the reader is clear what the term means in this research. Sections two and three review the benefits and challenges to mLearning in early childhood education. A sustainable mLearning partnership will be affected by both benefits and challenges. The final section, partnerships, is important because school-university partnerships provide in-situ opportunities for new ideas, such as mLearning implementation to be trialled. A stable partnership provides the opportunity to explore the benefits and challenges of mLearning in early childhood education by connecting theories and ideas learnt in a University with practice in the classroom. The conceptual framework illustrates how the four sections underpin the research (Figure 2.1).

Figure 2.1. The four sections of the literature review.
2.3 Section one: mLearning in early childhood education

The first section of the literature review presents a definition of mLearning (mobile learning) along with how it contrasts with non-mobile learning. This section defines the early childhood phase of learning and reviews young children’s access to the Internet because young children mostly connect to the Internet using mLearning devices (Holloway, Green & Livingstone, 2013).

2.3.1 What is mLearning?

The term *mLearning* is a contraction of the words *mobile* and *learning*. The term has different meanings to different authors. For this research, *mLearning* means using a mobile tool for educational purposes. Researchers sometimes use different terms when referring to mLearning, such as technology, new technology, or educational technology. All these terms describe mobile devices that do and do not connect to the Internet. mLearning devices – for example, tablet computers and programmable robots such as Bee-Bots and robotic Lego – are light and, therefore, mobile, which means they can be used anywhere. Crompton (2013) defines mLearning as “learning across multiple contexts, through social and content interactions, using personal electronic devices” (p. 4). It has been reported that research on mLearning, particularly in early childhood education, is not extensive (Bittman, Rutherford, Brown, & Unsworth, 2011; Mazzoni, Nicolò, Sapio, & Isaias, 2015).

Fullan (2014) describes deep learning as a partnership between students and teachers enabling students to master the process of learning. For the 21st century learning is the process where students gain the competencies necessary to prepare them for a creative, connected and collaborative future. Technology can be used to create new knowledge in the real world. Access to digital technology enables learning to occur inside and outside of traditional school settings.
Meaningful learning with technology is learning using technology where the focus is on the learning and not on the technology. Meaningful learning occurs when students are willfully engaged in meaningful tasks which are active, constructive, intentional, authentic and cooperative (Jonassen, 2008). When students are able to inquire, experiment, design, communicate, collaborate, write, model and visualise using technology, their learning becomes meaningful. The characteristics of meaningful learning will be used as a focus when observing children in the classrooms throughout this research and are incorporated into the observation instruments. Technology may not teach students but meaningful learning occurs when technology is used in a meaningful manner.

The NMC Horizon Report: K–12 Edition is an annual publication from the US New Media Consortium that predicts trends in educational technology and offers a timeframe for technologies to become mainstream in schools. In the 2013 K–12 Edition, mLearning was placed on the near horizon, meaning it was almost mainstream for schools in the United States (New Media Consortium, 2013). The European edition of the 2014 Horizon Report placed mLearning two to three years away, indicating that the United States was leading Europe in mLearning (New Media Consortium, 2014). The 2015 Horizon Report placed the adoption of BYOD (bring your own device) on the near horizon and made no specific mention of mLearning (New Media Consortium, 2015), supporting the 2014 claim by Handal, Ritter, and Marcovitz (2014) that the term mLearning would disappear as it became an everyday pedagogy used in 21st century classrooms. If mLearning is to become an everyday tool, then how it will be used in early childhood education is worthy of investigation. This is the justification for this research.
2.3.2 mLearning.

mLearning uses tools that are mobile and, therefore, not confined to use in any specific location. Traditionally, technology in education has been segregated from the classroom, being mainly carried out in computer laboratories (Kiili, 2003); but the increased availability of mobile devices such as laptops and tablet computers is enabling children to use mobile devices within the classroom (Henderson & Yeow, 2012). The mobile nature of tablet computers in particular means they can be easily stored and accessed in classrooms and spontaneously integrated into the curriculum (Hutchison & Beschorner, 2015). Mobility enables students to use mLearning outside the classroom in informal learning environments, which have been found to promote interactions between students and engagement with learning (West, 2013). Boyce, Mishra, Halverson, and Thomas (2014) found that using iPads on nature excursions was a powerful way to increase students’ interest and foster curiosity in science. Male and Burden (2014) posited that mLearning would have an effect on education not seen since the introduction of the printing press because mLearning has the ability to transform and extend learning beyond the walls of the classroom.

A challenge associated with the portable nature of mLearning devices is that they can become lost or damaged when moved from location to location. A further challenge is providing on-going technical support. In schools, mLearning devices are often shared amongst classes. Without specific guidelines, devices quickly become cluttered with photographs and applications that can make them slow and ineffective. mLearning devices such as iPads and Bee-Bots also require charging, so if teachers do not return them to a charging station after use, they may become discharged for the next user (Moorefield-Lang & Meier, 2014).
2.3.3 Technology, new technologies, and educational technology.

Technology refers to the application of scientific knowledge in a practical setting (Collins, 2014). Technologies arise in response to an identified need and bring benefits to industry or commerce. Technologies developed for industry and commerce often end up being useful tools in education; for example, the printing press, the pencil, and television. New technologies such as smartphones and tablet computers are less than 25 years old and were not specifically designed for education, but they can serve as educational tools even if educators sometimes need to repurpose them for teaching (Traxler, 2014). Educational technology includes technologies that do not require the Internet, such as programmable robots as well as those that do require the Internet, such as tablet computers (Bartolini Bussi & Baccaglini-Frank, 2015).

2.3.4 Early childhood education (ECE).

In Australia, early childhood education includes the education of children aged between zero and eight years old. Children can start kindergarten (which is not compulsory) in the year they turn three or four. Cost free kindergartens are attached to public schools, and private kindergartens exist in childcare centres and fee-paying schools. The compulsory school-based years of early childhood education in Australia are pre-primary (PP), Year 1 and Year 2.

Play-based learning is central to early childhood education, for it is through play that children interact socially with peers and teachers to construct meaning and understanding (Cutter-Mackenzie & Edwards 2013; Froebel & Jarvis 2003). Lev Vygotsky (1978) laid the foundations of social constructivism when he proposed that cognitive development involves active internalisation and problem-solving processes that occur through mutual interaction between children, parents, and peers. mLearning devices can act as scaffolding tools for
children, in the zone of proximal development who need additional assistance to achieve a task. mLearning devices have emerged as well suited to social constructivism and student-centred learning (Cochrane & Bateman, 2010), as well as play-based learning (Ebbeck, Yim, & Lee, 2013). Government policies are shifting towards more child-centred pedagogies (Gallo, 2007).

The early childhood years of education are key developmental stages and critical to brain function (Menon, 2013). Early childhood educators need to balance the demands of an externally imposed content driven curriculum with the need to support developmentally appropriate learning styles for young children. Play stimulates the formation of new brain pathways in young children, so enhancing children’s cognitive abilities (Van Hoorn, Nourot, Scales, & Alward, 2014). Early childhood educators in the 21st century need to guide children in creative, open-ended play-based learning experiences in order to maximise learning opportunities (Nell, Drew & Bush, 2013).

2.3.5 Young children and mLearning.

mLearning tools such as tablet computers and Bee-Bots are well suited to the early childhood setting because of their user-friendly design (Hutchison, Beschorner, & Schmidt-Crawford, 2012). Bee-Bots are small and light and have a bright appearance designed to attract young children. The iPad is simple for young children to use because there is no mouse or keyboard required (Verenikina & Kervin, 2011). Tablet computers are so easy to use that it makes them a good choice for early childhood education because children can pick them up with little direction or modelling from adults (Holloway et al., 2013). It has been reported that young children are usually enthusiastic regarding the use of mLearning, are active learners, readily accept technology, and have fun using it (Pudaruth & Bahadoor, 2011). Children using tablets have been shown to solve technological problems and do not
have to wait for technical support that would be necessary when using other types of ICT such as desktop computers (Couse & Chen, 2010).

2.3.6 Young children and the Internet.

Access to the Internet is growing exponentially in society. The New Media Consortium (2013) predicted that the Internet would become mainstream in schools in the United States within a year. In June 2013, President Obama announced the ConnectED initiative, designed to enrich K–12 education for every student in America. Under ConnectED, 99% of American students will have access to fast broadband in schools by 2018 (The White House, 2015). In 2015, the Western Australian government pledged a $32.7 million to increase Internet speed in Australian schools and a further $20 million to primary schools for computer programs (Government of Western Australia, 2015). Internet access has become an integral part of living in the 21st century and has changed the way people communicate, socialise, bank, shop, access information, and learn. The prevalence of the Internet in the lives of young children means that they are spending more time exposed to media and technology (Hesterman, 2011a). The trend in the use of the Internet by children between the ages of five and eight has steadily increased from 38% in 2006 to 60% in 2009 (ABS, 2010). In 2015, the Australian Bureau of Statistics (ABS) reported that 79% of children aged between five and eight had access to the Internet at home, and each week engaged in ten hours of computer screen time, fifteen hours of television, and five hours riding a bicycle.

In 2014, Common Sense Media revealed that 75% of American children aged eight or under had access to the Internet. Children under nine routinely use the Internet to watch videos, play games, search for information, do homework, and socialise (Holloway et al., 2013). One-quarter of all Facebook users worldwide are under ten, which illustrates that
young children are using the Internet to access social media sites (Australian Government Department of Education and Training, 2013). Internet access from mobile devices overtook access from desktop computers in the middle of 2013 and Internet access using mobile devices is expected to exceed 90% by 2017 (Statista, 2014).

2.3.7 International context of mLearning

mLearning in schools is affected by access to the Internet and policies regarding science, technology, engineering and mathematics (STEM). Current government policies in New Zealand, the United States, and the United Kingdom acknowledge the importance of digital technology and access to the Internet in early childhood education (Neumann & Neumann, 2014). The international context of mLearning in schools is affected by broadband plans which enable Internet access in schools. Governments around the world have implemented a range of strategies to prepare students for the 21st century. A snapshot of initiatives in England, Hong Kong, Portugal, South Korea, Turkey and the USA are presented to illustrate mLearning initiatives in Europe, Asia and the USA. Similar initiatives are occurring in other countries and those presented in this chapter are not intended to be exclusive. The initiatives demonstrate that governments globally are looking for ways to improve education systems by incorporating digital technologies.

In England, the Department of Education has established outcomes for computing for all stages of education in its National Curriculum (Department of Education, 2013). In the early years, children are expected to understand algorithms, create and debug simple programs and use technology purposefully. In 1998, the Hong Kong government initiated a move to reform schools so that pedagogy became more student-centered by using ICT (The Government of Hong Kong Special Administrative Region, 2016). The aim was to have 25% of the curriculum supported by ICT within five years. The Portuguese government launched a
Technology Plan for Education in 2007 with the aim of placing Portugal amongst the top five most technologically advanced countries in Europe. As part of this plan, a laptop was provided to all primary school children (aged 6-10) free of charge or at very low cost. In 2011, the South Korean government invested US$2.1 billion in technology and infrastructure in schools, developed policies regarding technology integration and provided professional development for teachers. It was mandated in the National Curriculum that 10% of the time spent on each subject should include technology. The Turkish Ministry of National Education introduced state-of-the-art technologies into all Turkish public schools in 2010. Every Turkish classroom installed an interactive whiteboard (IWB), and every teacher and student received a tablet computer. In the USA, the first iPad trial took place in Chicago in 2010 with children in Years 1 and 2. The results from the first trial were used around the world for ongoing trials (Center for Digital Education, 2010). In 2013, the Obama government announced ConnectEd, a plan to provide high-speed Internet to all schools and provide training for teachers in the use of digital content (The White House, 2015).

These initiatives had mixed results but were useful for informing future initiatives. The Government of the United Kingdom reported that technology was used erratically in classrooms despite inclusion in the curriculum (Flewitt, Messer, & Kucirkova, 2014). Some teachers in Hong Kong replaced blackboards and overhead projectors with PowerPoint presentations in order to meet requirements to use technology. In doing so these teachers did not use technology purposely to enhance student learning (The Government of Hong Kong Speical Administrative Region, 2016). The laptop initiative in Portugal did not transform schools as the government had hoped, due to lack of preparation and little thought was given to how teachers should change their pedagogical approach (Pereira & Pereira, 2015). In Turkey, there were problems with the infrastructure such that the Internet was only accessible at school through a controlled portal (Akcaoglu, Gumus, Bellibas, & Boyer, 2014). The
issues faced in South Korea and the USA mirrored the problems in Hong Kong, England, Portugal and Turkey.

2.3.8 Australian context of mLearning

Australian Government policies exist indicating the value that Australia places on ICT integration in education. These policies include the Early Years Learning Framework (EYLF), the Digital Education Revolution (DER), the National Broadband Plan and the National Professional Standards for Teachers. In what follows, the Australian context is considered in six areas; namely EYLF, DER, National Broadband Plan, National Professional Standards for Teachers, ICT in the curriculum and digital literacy and science, technology, engineering and mathematics.

2.3.8.1 Early years learning framework (EYLF).

The EYLF (Australian Government Department of Education Employment and Workplace Relations [DEEWR], 2012) conceives of ICT as part of the multi-literacies environment that children will require for full participation in the 21st century. The EYLF recognises the importance of ICT in two of its five outcomes. Outcome four (children are confident and involved learners) and outcome five (children are effective communicators) have ICT embedded within them. An important aspect of outcome four is for children to resource learning through connecting with people, place, technologies and natural and processed materials. Essential components of outcome five are that children use ICT to access information, investigate ideas and represent their thinking and that children engage with a range of texts (digital and printed) and gain meaning from these texts.
2.3.8.2 Digital education revolution (DER).

Schools in Australia and elsewhere have started to invest in mLearning tools, but the initial focus was in secondary schools (McMahon, 2009) where the Australian government invested $2.1 billion in a DER in 2008 to promote ICT integration into the new Australian Curriculum (DEEWR, 2008). This money was primarily used to fund laptops for secondary schools, broadband connectivity and professional development for teachers. The DER raised the number of computers in Australian schools from approximately 200,000 to over 957,000 in four years. Money was also used to upgrade infrastructure and, as a result, the number of Australian schools with broadband connectivity rose from 47% in 2008 to 60% in 2012. Four years after the commencement of the DER program, many schools choose not to continue with one-on-one laptops programs favouring class sets of computers (Nielsen, Miller, & Hoban, 2014). The Digital Education Advisory Group (DEAG) was established by the Australian government in 2011 to build upon the DER (DEEWR, 2013, p. 5). The DEAG made eight recommendations which were:

- Moving towards a ‘bring your own device’ (BYOD) learning environment;
- Support for Australian Curriculum digital resources through the National Digital Learning Resources Network;
- Improved learning through interoperability;
- Strengthening partnerships in education;
- New approaches for learning by building teacher and leadership capacity;
- School learning and teaching plans which demonstrate learning for the 21st century;
- Embedding innovation in learning; and
- Strategies for building capacity in the whole community.

The recommendations illustrated the Australian government’s support for transforming learning to reflect the needs of the 21st century learner.
2.3.8.3 National professional standards for teachers.

The National Professional Standards for Teachers in Australia have ICT embedded in the standards (AITSL, 2012). There are no specific standards for early childhood teachers. The standards that refer to ICT are shown in Table 2.2.

Table 2.2 National Professional Standards which include ICT

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<th>Standard</th>
<th>Lead Teacher Standard</th>
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<td>Information and</td>
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<td>Technology (ICT)</td>
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<td></td>
<td>Lead and support</td>
<td>Implement teaching</td>
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<td></td>
<td>colleagues within the</td>
<td>strategies for using</td>
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<td></td>
<td>school to select and</td>
<td>ICT to expand curriculum</td>
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<td></td>
<td>use ICT with</td>
<td>learning opportunities</td>
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<tr>
<td></td>
<td>effective teaching</td>
<td>for students.</td>
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<td></td>
<td>strategies to expand</td>
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<td></td>
<td>learning opportunities</td>
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<td></td>
<td>and content</td>
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<td></td>
<td>knowledge for all</td>
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<tr>
<td></td>
<td>students.</td>
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<td>3.4</td>
<td>Select and use</td>
<td>Demonstrate knowledge of</td>
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<td></td>
<td>mLearning</td>
<td>a range of resources,</td>
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<td></td>
<td>resources</td>
<td>including ICT, that</td>
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<td></td>
<td></td>
<td>engage students in their</td>
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<td></td>
<td></td>
<td>learning.</td>
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<td>4.5</td>
<td>Use ICT safely,</td>
<td>Demonstrate an</td>
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<td>responsibly and</td>
<td>understanding of</td>
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<td>use of ICT in learning</td>
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These Professional Standards guide teacher education institutions in equipping graduates to employ ICT in teaching at the start of their educational career. The standards indicate that practising teachers have to embrace ICT, and lead teachers need to become exemplary role models in the implementation of ICT and selection and evaluation of ICT resources. In 2014 the Teacher Education Ministerial Advisory Group (TEMAG) reported that teacher education providers were not rigorously and consistently assessing PSTs against the professional standards and recommended that robust evidence of PSTs reaching the standards be collected by providers (TEMAG, 2014).
2.3.8.4 National broadband network

The National Broadband Network was an Australian government initiative established in 2012 with the aim of providing all Australian households and businesses with fast broadband by late 2016 (DEEWR, 2015a). It was recognised that without universal access to broadband, students and teachers could not optimize the use of digital learning resources. The Australian Bureau of Statistics (ABS) reported that in June 2015, 99% of Australian households had access to the Internet (ABS, 2015).

Other initiatives operate at the state level, for example, the Public Education Endowment Trust (PEET) seeks to improve the education of Western Australian children. Two of PEET’s foci areas, between 2011 and 2015, were technology and early childhood education. PEET recognised that there was a broad spectrum within and between schools in the adoption of the curriculum delivery to include new technologies. This broad spectrum was perhaps due to differing levels of expertise and local decision-making regarding the allocation of mLearning resources.

2.3.8.5 ICT in the curriculum.

By embedding ICT competence into the general capabilities of the Australian Curriculum (ACARA, 2013) children at all stages are given the opportunity to use ICT effectively to investigate, create, and communicate across all learning areas. The National Statements of Learning for ICT, together with their professional elaborations for Years 3, 5, 7 and 9, view ICT as an integral tool in the learning process (Curriculum Corporation, 2006). In addition to having ICT integrated throughout the curriculum, digital technologies became part of the Technologies curriculum in 2015. From 2015 children in pre-primary (PP) were expected to develop an understanding of the characteristics of digital systems, procedures and computational thinking (School Curriculum and Standards Authority, 2015).
The National Digital Learning Resources Network is a collection of more than 20,000 digital learning resources that link directly to the Australian Curriculum. Teachers can access resources through an online portal called Scootle. The Australian government Department of Education supports Scootle, which is managed by Education Services Australia on behalf of all Education Ministers. Scootle contains digital teaching resources for the early years, primary and secondary teachers. Curriculum content is categorized by year level, and underpinned by the Australian Curriculum. Scootle enables teachers to belong to a digital professional learning network, to connect, reflect, collaborate and share information. Teachers can create personalized learning pathways for students using Scootle. Although there is evidence that teachers are accessing Scootle and integrating digital technologies into the classroom, referencing Scootle has not been mandated.

2.3.8.6 Digital literacy and science, technology, engineering and mathematics.

In 2015, the Western Australian Curriculum included digital technologies within the Technologies learning area for all students from pre-primary to Year 8. Teachers will be required to report on students’ progress in digital technologies from 2018. Students are required to have knowledge and understanding of digital technologies and use digital technologies to define, design, implement, evaluate and collaborate (School Curriculum and Standards Authority, 2015). The Australian government released a National Innovation and Science agenda in 2015 with the aim of increasing student participation in digital literacy and science, technology, engineering and mathematics. As part of this initiative, the government pledged to invest in promoting science, technology, engineering and mathematics skills to children aged three to five. The initiatives commenced in July 2016 (Australian Government Department of Education and Training, 2015a) so it is too early for an evaluation to have been undertaken.
The EYLF, National Professional Standards for Teachers, Australian Curriculum, Western Australian Curriculum, and National Statements of Learning for ICT are key National documents that teachers must use to plan their teaching and learning programs. All these documents explicitly refer to the value and importance of ICT integration within the curriculum so that children are ready for 21st century engagement. Figure 2.2 illustrates the Australian timeline for recent technology initiatives.

**Figure 2.2.** The Australian timeline for technology implementation in schools. The timeline spans from 2008-2018.
2.3.8.7 Western Australian context.

In Western Australia, schools fall into three groups: Catholic, Department of Education (public), and Independent. Catholic and Independent schools in Western Australia are non-government schools and charge fees. Figure 2.3 illustrates the percentage of students attending each school category.

Figure 2.3. Percentage of students attending K-12 schools by sector in Western Australia. Census February 2015 (Government of Western Australia, 2015).

Catholic and Independent schools have more financial autonomy than Department of Education schools and are more likely to be well resourced with technology (Independent Schools Council of Australia, 2016). In 2009, the Australian government launched the Independent Public School (IPS) initiative to give Department of Education schools more flexibility and responsibility. The IPS initiative aimed to build strong communities, give schools greater local decision-making powers and increase the engagement of parents, community groups, business and industry in the life and operation of schools. At the time of the research more than 65% of Department of Education schools had achieved the IPS status.
(DEEWR, 2016). IPS schools can recruit their staff and have a greater responsibility for administrating the school, including financial management.

2.3.8.8 mLearning tools in Western Australian schools.

In each year of the study, to obtain a snapshot of mLearning tool availability and regularity of use in Western Australian schools all the participating PSTs were surveyed (Appendix C) when undertaking a professional experience in a Western Australian school. The purpose was to contextualize the Western Australian school environment. Figure 2.4 illustrates the technologies available in professional experience schools attended by the PSTs. Figure 2.5 shows frequency of technology used in the early childhood classrooms, and Figure 2.6 illustrates how classrooms used the mLearning tools. An Interactive White Board (IWB) was available in 71% of classrooms whereas iPads/tablets were only available in 44% of classrooms. The IWB was included in the surveys for comparison but was not classed as an mLearning tool.

*Figure 2.4. The technology that was available in professional experience schools. The figure shows the technology available in the Western Australian schools that the PSTs attended for professional experience.*
Figure 2.5. The frequency of mLearning use in classrooms at professional experience schools. The figure shows the frequency of technology use in professional experience classrooms.

![Bar chart showing frequency of mLearning use in classrooms](image)

Figure 2.6. mLearning use in the classroom. The figure reflects PSTs’ statements about how children used mLearning in professional experience classrooms.

![Bar chart showing how mLearning is used by children in classrooms](image)

Figure 2.5 indicates that the use of mLearning in early childhood classrooms was quite small and in 23% of the classrooms mLearning was not used at all. The PSTs reported (Figure 2.6) that mLearning was used in teacher-centred (64%) more than in student-centred
ways (50%) which was the method that PSTs were encouraged to use in ICT units undertaken at the University.

2.3.9 Section one summary.

This section of the literature review defined mLearning and other terms used in current research, which are sometimes interchanged with the word mLearning. The review defined the early childhood phase of learning and reviewed children’s access to the Internet, which is likely to involve an mLearning device such as a tablet computer or smartphone. Despite the rapid emergence of mLearning in schools, there is a lack of published research on the efficacy of mLearning in early childhood education (Holloway et al., 2013; Lafton, 2012). This study seeks to add to the body of knowledge of mLearning in early childhood education.

2.4 Section two: Benefits of mLearning in early childhood education

This second section of the literature review includes a review of 21st century learning skills which are well aligned with the use of mLearning devices. The section follows with the benefits of mLearning for young children from the perspective of the classroom teacher, PST, and school community.

2.4.1 Learning in the 21st century.

The term 21st century learning is used around the world and according to Noss (2012), includes the skills of collaboration, communication, digital literacy, creativity, critical thinking, and problem-solving. These skills have been shown to be aligned to mLearning, for example, Male and Burden (2014) found that children interacted with a mobile device in a social and collaborative manner, unlike working on a desktop computer in isolation. In an American study using tablet computers with young children, Geist (2012) found that
mLearning increased collaboration amongst children and did not isolate children from their peers. Henderson and Yeow (2012) found that tablets provided quick and easy access to information and enabled collaboration amongst primary-aged children. In an Australian study of young children aged between four and nine, Mc Ardle and Prowse (2010) found that children were able to use technology to develop effective ways to communicate, and demonstrate understanding. Swan, van’t Hooft, Kratcoski, and Unger (2005), in a study of uses and effects of mLearning devices such as tablet computers in classrooms, found that elementary children were motivated to collaborate and communicate more when using mLearning technologies. Children have been shown to communicate with each other more when using robots than when doing puzzles, illustrating that using mLearning is not socially isolating but rather encourages collaboration and communication (Kazakoff & Bers, 2014).

Research has shown that mLearning can be used to develop creativity and imaginative play in young children by making the learning more personal and removing the boundaries imposed by traditional resources (Alper, 2013; Lock, 2015). Bird and Edwards (2015) found that children use mLearning technologies as tools initially in an exploratory manner and when they have mastered the tools they use the tools innovatively to create new play scripts. Hutchison et al. (2012) found that using the iPad to teach literacy rather than a printed worksheet allowed for more creativity because children could express themselves in multiple ways including, audio, video, drawings, text, and photographs. Pegrum et al. (2013) posited that teachers value creative apps that allow young children to tell stories. Geist (2012) found that developmentally appropriate apps encouraged creative problem-solving in young children using a tablet computer. According to Geist, teachers found that many educational apps had closed (unchangeable) content and said that children preferred open apps where they could create their own content. In a similar vein, Flewitt et al. (2014) found that children
engaged more and had richer learning experiences when they could create original content using mLearning tools.

The preceding points illustrate that the quality of the exposure to mLearning and the pedagogical input of the teacher have the potential to affect the learning outcomes for children. Developmentally appropriate use of mLearning under the guidance of a trained educator can enhance children’s learning. However, inappropriate use, such as when mLearning is used as a tack on activity or time filler may be detrimental to children’s learning (Wood et al., 2012). Teachers and educators of young children need to consider new pedagogies when using mLearning with young children so that exposure is high quality and pedagogy scaffolds children’s learning.

2.4.2 Benefits for the classroom teacher.

The following themes are reviewed with regard to exploring the benefits of mLearning for classroom teachers: teaching using tablet computers, teaching new literacy, teaching using programmable robots, and the positive impact of mLearning on young children’s learning. Tablet computers such as iPads and Android versions are tools that have the potential to redefine teaching and learning. Since their release in 2010, iPads have gained momentum as tools for teaching (McCombs & Liu, 2011).

Teachers have access to a wide range of apps to support children’s learning. The number of educational apps stood at 75,000 in Apple’s App Store in June 2016 (Apple, 2016). These apps are largely unregulated and untested as educational apps and therefore present a challenge to teachers searching for educational apps to use in the classroom (Hirsh-Pasek et al., 2015). The Victorian Department of Education had 240 apps listed as educational on its website in 2016 (State Government of Victoria, 2016). Apps vary in quality
and educational potential. A description of some of the types of apps – namely, screencasting, drawing, creating and visualisation – is presented below.

Screencasting apps – such as Explain Everything and Show Me – enable teachers to see how children solve problems. Such apps allow children to draw or write on an iPad and speak about what they have written. Children can write using a stylus or finger and can highlight work and insert graphics. Screencasting apps encourage children to reflect on their thinking and edit their work, leading to improved outcomes for children (Soto & Hargis, 2014). Screencasting apps are useful for children to use and as teacher tools because they are used to explain things. When a child explains something, they tend to reflect on and solidify their own knowledge. Screencasting enables children to communicate their understanding using video, text and pictures.

Drawing apps, such as Doodle Buddy, provide children with tools to create visual images including inserting photographs. Children have a choice of colours and drawing tools (crayons, brushes, chalk, glitter, and so on). Teachers appreciate that the children can be very creative with Doodle Buddy (Hutchison et al., 2012). A study by Couse and Chen (2010) into the use of tablet computers as drawing tools in early childhood reported several positive outcomes and concluded that children’s drawings were as expected or exceeded expectations. Couse and Chen (2010) also reported that children quickly developed the skills necessary to use a stylus for drawing after some adult instruction and peer modeling. Despite the technical issues that invariably arose, the children did not display any frustration. Most of the children preferred drawing on the tablet computer to using a paintbrush and showed high levels of engagement. Their reasons for preferring the tablet included its vivid colours and the fact that the ink never ran out. Visualising apps, such as Popplet, enable children to use pictures to convey meaning.
Contemporary literacy goes beyond the printed text. New literacies include the use of multi-modal forms of communication such as printed text, oral language, visual, auditory, gestural, tactile, and special means (Gardiner & Cumming-Potvin, 2015). Changes to print formats are relatively slow compared with changes in multimedia (Schneider, 2015). Such rapid changes can be challenging to PSTs, who are learning to teach with technology. Tablets are said to offer innovative opportunities for teaching new literacies incorporating communication, collaboration, and independent learning, which leads to positive learning outcomes (Flewitt et al., 2014). Literacy apps can assist with reading (e-books), sequencing (Popplet), drawing (Doodle Buddy), retelling (Strip Designer), cause and effect (Sundry Notes), and main idea and details (Cluster). Good apps encourage learning and revision of stories as well as provide an opportunity to create pictures and convey meaning (Østerud, Smørdal, & Sandvik, 2012). Teachers need to distinguish good apps which encourage learning, from poor apps, when choosing mLearning resources to support learning (Hutchison, Nadolny, & Estapa, 2016). Table 2.3 highlights some characteristics of apps that encourage quality learning and those that do not.

<table>
<thead>
<tr>
<th>Characteristics of apps that encourage learning</th>
<th>Characteristics of apps that do not encourage learning</th>
</tr>
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<tbody>
<tr>
<td>User can create content</td>
<td>Closed unchangeable content</td>
</tr>
<tr>
<td>Provides opportunity to extend the learning</td>
<td>Direct substitution for a traditional resource</td>
</tr>
<tr>
<td>Allows sharing of knowledge and collaboration</td>
<td>Distracting features such as sound and unnecessary animations</td>
</tr>
<tr>
<td>Encourages user to reflect on learning</td>
<td>Rote learning</td>
</tr>
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</table>

With regard to e-books, the teacher can control what is on an e-book’s bookshelf, and children can choose books in a virtual library using skills similar to those used in an ordinary
library (Korat & Shamir, 2012). The advantages of e-books are that the size and style of the font are flexible and the meanings of words can be quickly looked up. Children can also use virtual sticky notes to make notes, highlights, and reflections, which they are not observed doing when using printed books (Hutchison et al., 2012). Further, e-books support multimedia features that allow children to read or listen to a story, which is particularly useful for struggling readers (Schugar, Smith, & Schugar, 2013). Larson (2015) found that struggling readers preferred reading on a tablet because it gave them privacy so peers would not be able to see what they were reading, especially if they were reading a simpler text than their peers. Animations can also be embedded making the reading experience richer than the traditional print-based experience (Neumann & Neumann, 2014). Hutchison and Beschorner (2015) investigated how tablets could be used to support and transform literacy instruction and found that tablets helped readers to create multi-modal responses to reading by providing new ways to communicate, the opportunity to work collaboratively and the ability to edit work efficiently. Cahill and McGill-Franzen (2013) found that reluctant kindergarten readers increased their interest in reading when reading picture books on tablets, and children showed increased word recognition, fluency, and comprehension.

Traditional literacy is print-based involving reading and writing on pages. New technologies have added extra dimensions to literacy so that communication is not only linked to the written word but includes multimedia such as video, audio, and images as well as the printed word (Kazakoff, Sullivan, & Bers, 2013). As a result of these emerging technologies, being literate in the 21st century also means being digitally literate. Digital literacy is a term used in education and refers to literacy learning using digital tools. Neumann and Neumann (2014) found that tablet computers used under the guidance of a parent or teacher enhanced children’s emergent literacy skills, provided there was appropriate scaffolding. The process of making learning visual is important in expanding children’s
cognitive capabilities (Alper, 2013). Luke (2000) argued that the hypertext environment of digital literacy enabled children to treat multi-modal information simultaneously in a far more demanding manner than the linear method used when engaging with just printed materials. Managing the iPad with young children has been reported as easier than might be expected, with outcomes in literacy improvement for at-risk readers being demonstrated (Getting & Swainey, 2012).

Programmable robotic toys such as Bee-Bots are concrete and, for this reason, provide hands-on experience for young children to engage with mLearning. Bee-Bots are a good choice for young children as they can stimulate problem-solving and creative role-playing activities (Janka, 2008). Teachers use Bee-Bots widely in the United Kingdom, possibly because the British curricula recommend the use of programmable toys to support learning and Bee-Bots were found to be useful across the curriculum including for literacy, numeracy, science, history, and geography (Janka, 2008). In an Australian study using Bee-Bots, Highfield (2010) showed that children successfully used Bee-Bots in the early childhood setting for mathematics and problem-solving by programming simple commands. Highfield (2010) claimed that the Bee-Bot was an ideal choice as a programmable robot because of its robust nature and highly visual interface that promoted group work. An Italian study with Year 1 children found that the Bee-Bot was a rich tool for teaching geometry, for example by programming the Bee-Bots to move in different directions or at different angles (Bartolini Bussi & Baccaglini-Frank, 2015).

Sequencing is an important component of early mathematics and literacy education, making it a common theme in early childhood classrooms. The use of symbolic commands to control actions in an appropriate sequence in computer programming makes computer programming an excellent sequencing activity. Computer programming requires creative planning, hypothesis testing and the use of specific language, and so provides a foundation
for digital literacy (Kazakoff et al., 2013). Programmable robots have been shown to improve outcomes in science, technology, computing, engineering, and mathematics (Kazakoff, Sullivan, & Bers, 2013). Kazakoff and Bers (2014) found that young children (between four and seven) showed improvements in sequencing skills as a result of learning to program a robot.

For teachers to consider implementing mLearning into their teaching, the benefits to children’s learning must be proven (Baran, 2014). mLearning has been shown by researchers to have a positive impact on student learning and to increase levels of engagement, active participation, and motivation in young children (Boyce et al., 2014; Ciampa, 2014; Chiong, Ree, Takeuchi, & Erickson, 2012). A literature review of the mLearning research conducted between 2007 and 2012 in K–12 schools by Liu et al. (2014), identified 63 studies that were either comparative (21%) or non-comparative in nature (79%). Comparative studies compared an experimental and control group, with the experimental group using mLearning and the comparative groups not using mLearning. Nine of the 13 comparative studies found positive learning gains associated with mLearning, and three showed neutral outcomes compared with traditional learning. Examples of the positive gains included children outperforming comparison children in mathematics, listening and speaking, and learning and retention rates in science. Jeong and Kim (2016) found positive gains including social interactions between children, increased language learning, and increased enthusiasm and engagement in learning.

Other researchers found evidence of positive learning outcomes for children using mLearning tools. Kiger, Herro, and Prunty (2012) for example, found evidence of positive outcomes for children’s learning using an mLearning intervention with the iPod Touch in a third-grade mathematics class over a nine-week period. The authors found that children involved in the intervention outperformed comparison children. Usual practices were coupled
with mobile devices in a cost-efficient manner with improvement in student outcomes. Gomez et al. (2013), in a study with kindergarten children, found that mLearning used as a tool under the guidance of a teacher led to increased outcomes in oral language, logical-mathematical, and social skills. These studies provide teachers with evidence of the beneficial use of mLearning in education but also show that teachers need support to develop their own pedagogical literacy in how to use mLearning to maximise the benefits to children’s learning.

2.4.3 Benefits for the PST.

mLearning interventions provide PSTs with real-world experience using mLearning in early childhood education. Such experience is beneficial to PSTs because research has shown that PSTs are underprepared to use mLearning in their teaching. Gill, Dalgarno, and Carlson (2015) found that the PSTs were inadequately prepared to use ICT in teaching and learning in the course of their degree program. The study revealed that PSTs’ use of ICT increased when it became an assessment requirement. The inclusion of opportunities for PSTs to reflect on the personal or observed use of ICT within teacher education courses led to improved capacity to use ICT in education (Gill et al., 2015). Teacher education institutions typically use stand-alone ICT units, which demonstrate basic skills and do not allow PSTs to practise and reflect on what they have learned (C. Clark et al., 2015). Some teacher education programs include technology within curriculum areas, but this often occurs in a show-and-have-a-go format without explicit instructions as to how mLearning resources can be used for student-centred learning (C. Clark et al., 2015). A key factor in determining how well equipped PSTs felt to use ICT in their first year of teaching was found to be the expertise and modeling provided by university tutors (C. Clark et al., 2015; Haydn, 2014). Haydn posits that funds should be directed towards training university tutors to use mLearning resources. Research has shown that PSTs use technology in ways demonstrated by university tutors, due to a busy schedule with little time to explore technologies themselves. However, many
university tutors lack the skills required to model effective use of educational technology (C. Clark et al., 2015). Jeong and Kim (2016) claim that PST education needs full integration of technology into curricula so that PSTs are prepared for service. mLearning interventions are beneficial in assisting PSTs to integrate mLearning in future classrooms because they provide opportunities for PSTs to engage in real practice in a supported environment under the guidance of university tutors.

PSTs need opportunities to use technology for educational purposes in the classroom. Young people are often described as digital natives who are experts using technology (Palfrey, & Gasser, 2013). Although young people grow up surrounded by technology, they do not tend to use technology for educational purposes. Schneider (2015) posits that PSTs are not digital natives (educational technology experts) but educational technology learners who need explicit instruction in teaching using technology. Research by Schneider found that PSTs are technology consumers growing up digitally active with computers and phones, but need guidance to move towards being technology creators and instructors. Schneider likened learning to teach with technology to learning a second language. The opportunity for PSTs to gain practice in using mLearning in a real-world setting was beneficial to them because of the additional teaching practice it provided.

An Australian initiative is the Teaching Teachers for the Future project, which was established by the Australian government in 2011 to enable PSTs to become proficient in the use of ICT in education (Education Services Australia, 2011). The project created resource packages at three levels for the early, middle, and senior PSTs, with all 39 Australian teacher education institutions being involved in this project. Anecdotal evidence in Australia suggests that PSTs are increasingly using digital technologies in professional experience and university presentations. PSTs’ learning of pedagogy to match the technology suggests they are more likely to use these skills with confidence in the classroom setting (Bate, 2010; C.
Campbell & Macnish, 2010). Resources provided by the Teaching Teachers for the Future project were beneficial to PSTs because of the classroom ideas and activities that included ICT.

A study with PSTs who were required to use iPods to create authentic learning tasks for early childhood students found that PSTs were initially unsure of the place of mLearning. However, the task gave them the opportunity to gain a critical understanding of the place of mLearning (Olney, Herrington, & Verenikina, 2008). Such studies indicate that explicit mLearning at the pre-service stage of teacher training increases the likelihood of effective use of mLearning in early childhood classrooms.

2.4.4 Benefits for the school community.

Young children are using mobile devices when parents hand over their mobile phone or tablet computer to pacify their child, entertain them, or promote learning. Many parents believe that mobile devices are educational tools and so seek out educational apps to support their child’s learning (Goodwin & Highfield, 2012). Accordingly, parents often seek advice and guidance from their child’s teacher or school about the best apps to purchase. Even when the teacher is a digital native, using mobile technologies to support children’s learning is a whole new skill set, and some teachers struggle to provide appropriate advice (Elliott-Hall, 2013).

The mLearning partnerships in this research were potentially beneficial to parents and carers because they provided information about the use of ICT in education, enabling parents and carers to make more informed decisions. In terms of more informed decisions, for example, parents unwittingly create digital footprints for their children when they upload photographs, videos and ultrasound scans of them as babies, when they are too young to understand or give consent. Holloway et al. (2013) recommended that guidelines be
developed for parents and carers of young children to assist with young children’s engagement with digital technologies and the Internet. Such guidelines would also guide parents about the impact of creating digital footprints for their children.

2.4.5 Section two summary.

Section two examined the benefits of mLearning for early childhood classrooms, PSTs, and school communities, which includes parents. Given the literature on the benefits of mLearning in early childhood education, the fact that the uptake of mLearning in early childhood education has been variable, and that research shows that PSTs are ill-prepared to integrate mLearning into their teaching, research question one evolved as a focus of the research: What are the benefits and challenges of mLearning implementation in early childhood education for schools and the University?

2.5 Section three: Challenges to mLearning in early childhood education

A review of the literature identified four key challenges to mLearning in early childhood education: classroom challenges, community challenges, school challenges, and university challenges. Unless addressed, these challenges can inhibit children’s learning. Classroom challenges included factors that inhibited teachers from using mLearning effectively, namely, the vast number of apps available; selection of developmentally appropriate mLearning resources in the classroom; teacher philosophy; and teacher knowledge. A discussion of these factors follows.

2.5.1 Classroom challenges.

As at January 2017, there were more that 2.8 million Android and 2.2 million Apple apps available (Statista, 2017). The number of educational Apple apps in Apple’s App Store in January 2017 represented about 8.5% of the apps available on the market (Statista, 2017).
This number is overwhelming to teachers, making selection time-consuming because teachers need to consider curriculum goals, as well as the individual needs and learning styles of their students (Powell, 2014). At the same time, there has been little systematic study on the education potential and value of apps (Goodwin & Highfield, 2012). Hirsh-Pasek et al. (2015) created a set of principles to assist educators with the selection and evaluation of educational apps for children aged zero to eight years in response to the growing number of apps targeting young children. Hirsh-Pasek et al. (2015) posits that educational apps need to consider that children learn best in the 21st century by active engagement in meaningful, creative, and socially interactive tasks. In the context of apps, active learning means that the app provides a platform for seeking new information, or encourages children’s engagement with the app’s content. A poorly designed app requiring a child to participate in an action that does not encourage cogitation is unlikely to encourage active engagement. Researchers such as Goodwin and Highfield (2012) and Hirsh-Pasek et al. (2015) provide assistance in the form of selection criteria and rubrics to overcome the challenge of app selection for teachers.

The positive impact of mLearning on student learning depends on devices being appropriately used (Keengwe & Onchwari, 2009; McKenney & Voogt, 2012; Organisation for Economic Co-Operation and Development [OECD], 2015). With the correct guidance, mLearning can be harnessed for learning and development; without appropriate guidance, the risk is that use can be inappropriate or detrimental (NAEYC, 2012). In 2012, the NAEYC stated that early childhood teachers should be able to integrate developmentally appropriate technology into their classroom.

F. Simon, Nemeth, and McManis (2013) suggested that 35% of teachers were not using technology because of concerns about developmentalappropriateness. Many teachers and parents were possibly unfamiliar with the joint position statement issued by the NAEYC and the Fred Rodgers Centre about children’s technology use needing to be, aligned with
developmentally appropriate materials (NAEYC, 2012). The NAEYC have revised guidelines and no longer include the recommendation that screen time is limited to a specific amount of time and instead advise that not all screen time is the same because it is more important that technology is used intentionally and appropriately to support learning and development (NAEYC, 2015). The NAEYC guides teachers and families to select media with children’s developmental needs in mind, and to help children develop a healthy and balanced relationship with digital media as they grow up in a world where screens and digital media are the norm (NAEYC, 2015). Educators and researchers are looking for ways to bridge the gap between what teachers ought to be doing and what they are doing in the classroom in relation to the effective integration of mLearning. Organisations such as NAEYC provide much-needed support for teachers to overcome this challenge.

There are educationally valuable television programs, websites, and other digital media, and there are those that have less, if any, educational value. Educators with limited technology skills and digital literacy are at risk of making inappropriate choices and using technology with young children in ways that have a negative impact on learning (NAEYC, 2012). Without proper training, teachers may use technology in a manner that is not appropriate educationally.

The personal philosophy of some teachers has been found to be a challenge to mLearning. Keengwe and Onchwari (2009) found that technology conflicted with some kindergarten teachers’ traditional philosophies regarding early childhood education. Shin (2014) found that teachers’ pedagogical beliefs affected their ability to integrate technology into the curriculum. According to Shin, teachers with student-orientated constructivist beliefs about education were more likely to adopt new technologies because they could use them within the paradigm of their existing beliefs. Male and Burden (2014) found that adopting new technologies and student-centred learning protocols was too risky for some teachers
because their own performance was measured in terms of student achievement. Although early childhood teachers thought it was important to integrate technology into classroom practices, many felt that they were not adequately prepared to do so (Fenty & Anderson, 2014).

To change teachers’ beliefs regarding technology integration in early childhood, teachers need time to plan activities using new tools as well as first-hand experience of successful technology integration (Keengwe & Onchwari, 2009). Early childhood teachers who have not experienced the creative and play-based aspects of technology may, understandably, oppose mLearning. They are unlikely to understand the value of mLearning or the place it has in a play-based early childhood curriculum. Jeong and Kim (2016) found that kindergarten teachers who could see the usefulness of mLearning were more likely to use it in their classes. Teachers with a negative philosophy towards mLearning will focus on literacy as a paper-based activity, thus denying children access to multiliteracies (Marsh, 2004). F. Simon et al. (2013), in a survey of 485 early childhood teachers and administrators in America, found that the main reasons teachers gave for not using mLearning were concerns about developmentally appropriate use (34%), program philosophy (18%), funding (60%), and not seeing the value in mLearning (16%).

The changing role of the teacher was predicted as a factor affecting the use of educational technologies in K–12 classrooms (New Media Consortium, 2014). Teachers ought to be open to new philosophies and be prepared to embrace new pedagogies to match new technologies. Educating teachers to teach in the 21st century classroom is a challenge that requires a philosophical shift towards constructivism, and in many cases, may mean letting go of old ways (Lock, 2015). An unbalanced digital diet like an unbalanced nutritional diet can lead to health problems. In the case of an unbalanced digital diet (excessive screen time), the body and mind can suffer because of lack of physical activity or over stimulation of
the senses. Good teachers will be aware of a proper balance in a child’s educational diet. Early childhood teachers and parents would be wise to work together to guide and supervise children when using mLearning tools in the classroom and at home (A. Simon et al., 2014).

Teachers have cited the potential distraction caused by introducing technology into the classroom as a reason for avoiding technology. Research by Boyce et al. and Thomas (2014), with children using tablets on nature walks, found that initially children took many photographs (129 per pair) with lots of silly antics and camera options. On subsequent walks, children took fewer photographs (37 per pair) and recorded more field notes, indicating that the novelty was short-lived, and the students were rarely distracted when using the iPad as a resource. Unless steps are taken to address concerns, teachers who prevaricate when it comes to mLearning initiatives may themselves become the greatest obstacle to success with mLearning in the classroom.

McKenney and Voogt (2012) highlighted that teachers often struggle to find the right pedagogy for new technologies. Koehler and Mishra (2009) argued that teachers require a particular style of pedagogy when using technology to teach specific curriculum outcomes, and they refer to this as TPACK (technological, pedagogical, and content knowledge). Although the TPACK framework has gained much attention in the literature recently, difficulties have been recorded in applying it in the classroom (Bate & Maor, 2010). TPACK instruments have been used to measure technology integration in specific learning areas in schools (Handal, C. Campbell, Cavanagh, Petocz & Kelly, 2012). Teachers are not making the connection between ICT and improved learning outcomes for their students and often their technological and content knowledge banks remain separate from each other.

Effective teaching requires new pedagogies when teachers use mLearning (Beetham & Sharpe, 2013). Effective teaching, according to Pamuk, Ergun, Cakir, Yilmaz and Ayas (2013), requires the teacher to have:
• in-depth content knowledge (CK) and the ability to share that knowledge;
• pedagogical knowledge (PK), using items such as analogies, examples, illustrations, assessments and classroom management (Shulman, 1986).

Integrating technology into teaching and learning becomes a multifaceted process including a third knowledge base: technological knowledge. Matching pedagogy and technology are necessary for mLearning to be effective in the classroom. It is important that the technology supports the curriculum but is not the driver, so students are learning content not technology. The technology is a tool to aid the learning process.

Despite the evidence that mLearning can enhance literacy instruction, the reality is that mLearning is not used to this advantage (Hutchison & Beschorner, 2015). Australian research using tablets in literacy education in 2010 revealed that there were gaps between teachers’ visions for classroom use of ICT and actual practical use in the classroom (Lynch & Redpath, 2012). The Lynch and Redpath (2012) study illustrated the challenges that occur when traditional literacy practices meet teachers trying to transform learning by integrating technology. Although the curricula in many countries incorporates the use of technology, teachers received contradictory information about the role of technology in early literacy.

In summary, classroom challenges often prevent teachers from using mLearning effectively. Teachers require time to research suitable educational apps, and the increasing number available is overwhelming to some teachers (Education World, 2012). Many teachers lack technological knowledge, and a negative philosophy towards mLearning in early childhood education may inhibit teachers from developing the necessary technological knowledge to use mLearning in a meaningful fashion.
2.5.2 Community challenges.

Most of the literature on technology and young children concerns the harmful aspects, such as excessive screen time and how parents and educators can protect young children from these aspects (He, Irwin, Bouck, Tucker, & Pollett, 2005). Society today is understandably cautious about the harmful effects of new technologies on young children in the same way that early social commentators were cautious about the impact on children of sitting in dark movie theatres (Luke, 2000). The main concerns identified in the literature are excessive screen time, musculoskeletal discomfort, and cyber safety.

The primary concerns raised in the literature about excessive screen time are the associated health risks due to the sedentary nature of screen time and the associated lack of outdoor physical play. Concerns about the effects of screen time (television viewing) on health and family life were first published in 1949 (Martin, 2011). The amount of time spent watching television has remained stable, but the recent arrival of mobile devices has led to an increase in the quantity of screen time (Martin, 2011). In a Western Australian study of the impact of excessive screen use on children’s health and wellbeing, Martin posits that children who are excessively using screens encounter more physical, mental, educational, and behavioural issues than children who are not exposed to excessive screen time. Martin’s report concentrates on medical research associated with lack of physical activity in children and health-related issues including, obesity, diabetes, and mental illness. These health issues are associated with screen time because screen time is a passive activity. Possible adverse outcomes of excess screen time in early childhood are irregular sleep patterns, behavioural issues, focus and attention problems, decreased academic performance and adverse impact on socialisation and language development (NAEYC, 2012). Other researchers posit that language acquisition of young children is not affected by any particular dose of media, and delayed language acquisition is associated with parents not being involved with their
children’s use of media, and so not providing developmentally appropriate guidance (Bittman et al., 2011).

Screen time for children under two was totally discouraged by the American Academy of Paediatrics (Brown et al., 2011) and the White House Task Force on Childhood Obesity (Barnes, 2010). It was discouraged because interactions between adults and young children are essential to early brain development and cognitive, social, emotional, physical, and linguistic development (NEAYC, 2012). It was considered that such interactions ought not to be high jacked by screen time. In 2015, the American Academy of Paediatrics released an updated media policy, which encouraged parents to engage with media alongside their children (Brown, Shifrin, & Hill, 2015).

Concerns exist about screen time and the associated food and beverage advertising (NAEYC, 2012). The Campaign for a Commercial-Free Childhood (CCFC) is an organisation founded in 2000 whose mission is to limit the exposure of children to commercialism and access to child-targeted marketing (CCFC, 2012). CCFC aims to reduce screen time and ensure that young children have space for active and creative play with others and are connected to nature. It is worth noting that in the United States alone, $15 billion is spent each year on marketing directly to children younger than twelve. In 1980 Quebec banned advertising to children under 13 (Alliance for Childhood, 2004). In Taiwan, there is a law that imposes fines on parents who allow children excessive screen time (Dolasia, 2015). Screen exposure to advertising vis-a-vis educational resources are not comparable, and the negative concerns surrounding advertising have in some cases, according to one researcher, obscured the learning potential of mLearning tools (de Lange, 2014).

An illustration of the role of marketing is the Baby Einstein story. When Baby Einstein products came onto the market in 1998, with claims of creating a Baby Einstein by
parking a baby in front of their DVD, world sales skyrocketed. The Baby Einstein Company became a multimillion-dollar franchise. The founder Julie Aigner-Clark was named entrepreneur of the year and the franchise was purchased by Disney. One in three U.S. households were reported to have at least one Baby Einstein product. Subsequent research from the University of Washington reported that television viewing for children under two years of age should be limited and was detrimental to language development. The study reported that there were no associated benefits for young children watching television, and recommended minimising viewing (Zimmerman, Christakis, & Meltzoff, 2007). The CCFC raised a complaint with the U.S. Federal Trade Commission against the Baby Einstein company citing false advertising, based on the American Academy of Pediatrics recommendation. The complaint was subsequently dismissed but the Baby Einstein Company offered a full refund for all products as a gesture of goodwill (Zimmerman et al., 2007).

Despite the increasing use of tablet computers in schools, there have been minimal changes in associated elements such as furniture and consideration given to ergonomics. A literature review of possible musculoskeletal discomfort associated with children’s use of laptop and tablet computers by Binboga and Korhan (2014) pointed out that children’s learning should not be at the expense of musculoskeletal health. Binboga and Korhan (2014) found that children have the potential to develop an awkward posture resulting in musculoskeletal problems. There are currently no guidelines for ergonomic designs most suited to using tablet computers, as a recent search suggested. An electronic string search of several online databases was conducted, which included EBSCOhost, Educational Resources Information Center (ERIC), and PsychINFO. A cut-off date of 2010 was established using the following descriptors: musculoskeletal, children, tablets, tablet computers, and iPads. The search failed to reveal any results associated with the use of tablets by young children, which leads to the conclusion that it is an area requiring further research.
Children today are more restricted than children in the past. In a world where stranger danger is a concern, a child is likely to be spending more time inside and less time in the local park or playing on the street (Veitch et al., 2011). Children are conducting some of their social life digitally (Pegrum, 2009). The current media hysteria (Kitzinger, 2000) surrounding cyber predation distracts from the more important issue that, in most cases (95%), it is a family member or acquaintance who is the predator and not an online stranger (Pegrum, 2009). Children have access to pornography, racism, violence, and other online hate sites on the Internet. Filters can help reduce children’s access, but education has a role to play, and it is perhaps better for children to be taught explicitly by teachers and parents how to be safe. Parents, carers, and educators need to figure out the real dangers so that they can prepare young children to make informed and well-balanced decisions to help with all aspects of their lives, both educationally and socially (Pegrum, 2009).

Much of the discussion about children and their use of technology centres on caution about excessive use and the fact that there are limited benefits if children are merely babysat by an mLearning tool rather than using it for a more socially constructive teacher-initiated purpose. Adverse reports concerning children and media have been developed using a medical perspective and have subsequently been taken out of context in policies about technology in early childhood education (F. Simon et al., 2013). The American Academy of Paediatrics’ recommendation regarding screen time in 2011 was not explicit about how or why a child was using technology and have subsequently been revised. Passive use of technology is considered an inappropriate replacement for active play and engagement with others. It is important to consider how children spend time with technology when determining what is adequate and appropriate (NAEYC, 2012). Inherent reluctance to allow young children to use technology is a view that exists in the general population because some people believe that the technology deprives young children of physical freedom and intellectual
innocence (J. Hill, 2011). There is a fear that the technology will turn young children into ‘zombies’ with limited social and emotional development (The Telegraph, 2012). Fear of the unknown may be driven by a generational gap issue. The generation gap between young children and teachers can result in natural opposition to new technologies because these are new and different (Geist, 2012). This fear does not exist to the same degree about television, simply because television is an old, accepted technology but potentially offering less educational value (Luparenko, 2014). Parents need to be informed about mLearning so that they understand the difference between recreational and education use of mLearning resources.

In summary, community challenges are associated with fear about cyber safety and the effects of excessive screen time on children. There are also medical concerns regarding the associated health problems with the sedentary nature of using screens excessively. Community challenges have a good chance of being overcome if educators and researchers can show how mLearning may be beneficial to children’s learning (Australian Government Department of Education, Employment and Workplace Relations, 2013).

2.5.3 School challenges.

The literature revealed three key school challenges relating to professional development, leadership, and technical support. A paradigm shift in education due to the presence of mLearning has created new learning opportunities that reach beyond the walls of the traditional classroom. However, teachers need professional development to design rich learning experiences for the 21st century learner (C. Clark et al., 2015). Although there are educators, such as Kathy Schrock, who specialise in educating teachers about technology integration, the reality is that many teachers are lagging behind in technology integration in the classroom (Smirnova & Bordonaro, 2014). In classrooms where technology is available,
teachers tend to be using technology in conventional ways rather than to transform teaching and learning (Flewitt et al., 2014). In a study of 485 early childhood teachers and administrators in the USA, it was found that 25% said that they had received no professional development about using technology in education (F. Simon et al., 2013).

Schools are purchasing new technologies, but many teachers have been unable to use the technologies in ways that enhance students’ understanding. Hutchison and Beschorner, (2015), for example, found that 57% of teachers wanted professional development with access to examples of how to integrate technology into literacy. Teachers are seeking professional development so that they can deliver mLearning with an awareness of the limitations and benefits of tools to be used within the context and ability of the learner (Parsons, Ryu, & Cranshaw, 2007).

Professional development and training for early childhood practising and PSTs needs to be distinct from the professional development provided to primary and secondary teachers (A. Campbell & Scotellaro, 2009). In Australia, teacher professional development typically uses the one size fits all model where teachers passively receive information (Gardiner & Cumming-Potvin, 2015). To address this, professional learning needs to be targeted to the specific needs of young children so that practising early childhood teachers and PSTs can gain the confidence and expertise necessary to provide developmentally appropriate, quality-laden learning experiences for young children. It has been shown that generalised professional development in mLearning for all primary school teachers in a school creates frustration, as much of the content can be irrelevant to early childhood teachers (Ash, 2010).

Some researchers have pointed out that teachers are reluctant to use new technologies because of their fear of the unknown and lack of confidence, knowledge, or ability to integrate technology into the classroom culture (Arthur, Beecher, & Downes, 2001; Mumtaz, 2000). McKenney and Voogt (2012) reported on a study where teachers, provided with
scaffolding, actively engaged in designing technology-rich learning experiences for their classrooms. While this process required time, it facilitated teachers’ learning and resulted in more effective classroom implementation. The children in this study also exhibited significant gains in literacy and numeracy.

Teachers are responsible for guiding children through the hazards and potential dangers associated with mLearning (NAEYC, 2012). With technology integration encompassed in a child’s life, teachers need professional development to help progress the young child (Pegrum, 2009). With insufficient training, teachers are likely to adopt only trivial aspects of new technologies without experiencing the broader benefits. While integrating digital technologies may be a priority for many teachers, there are many more teachers who struggle to find a way to integrate new literacies with traditional methods (Hutchison et al., 2012). Likewise, there are teachers who are unaware of the range of different curriculum-based learning activities that can be completed using mLearning (Harris & Hofer, 2011).

In 2005, New Zealand introduced a framework for the development of ICT in early childhood settings (Ministry of Education, 2005). The idea was to expend funds on professional development for teachers rather than on the technology. The framework was used to show that professional development should be about purpose and pedagogy rather than software training or learning ICT skills. Teachers are time-poor, so keeping up-to-date with new technologies, plan technology-rich lessons, or research websites and suitable apps becomes problematic (Novak, 2009). If teachers are given the time and professional development, they are more likely to integrate mLearning effectively (Ministry of Education, 2005).

Without school leadership that is supportive of mLearning, access to teacher professional development, mLearning resources, and technical support will present a
challenge to mLearning integration in schools (Liu, Rirzhaupt & Cavanaugh, 2013).

Technology integration needs to be a whole-of-school initiative, starting with the school Principal leading by example (Foote, 2012; Heikka & Waniganayake, 2011). The school Principal is said to be the most significant factor affecting technology integration in schools (C. Clark et al., 2015). Competing pressures in schools and the need to perform well in standardised tests can make it difficult for schools to try new approaches (Gardiner & Cumming-Potvin, 2015). Transformational leadership, which consists of leadership where leaders and colleagues share a collaborative relationship resulting in an elevation of mutual goals, is required to create the atmosphere needed for integration of new technologies (Clarke & Zagarell, 2012). A non-teaching school principal will not be able to lead by example only with regard to curriculum integration, but can nevertheless integrate technology into their role as an administrator and leader for teacher evaluation, time management, professional development, and productivity (Winslow, Dickerson, Lee, & Geer, 2012). In doing so, principals can advance their technological leadership per se. Technological leaders are critical players in facilitating hardware and software purchases, guiding pedagogical choices and technological knowledge of teachers and managing the funds to buy assets. Professional development for principals is as important as it is for teachers so that they can fulfill their role as a technology leader (Clarke & Zagarell, 2012). Few school principals have an early childhood background and may have similar concerns to teachers about the use of mLearning and, as a result, may not see early childhood education as a priority in allocating ICT resources (Henry & Barnett, 2004).

Technological leaders need to find ways to upskill and encourage staff. In the early years of education, opportunities to explore new literacies using mLearning and other technologies may be overshadowed by government directives to raise standards in literacy and numeracy (Akcaoglu et al., 2014). A multiliteracies pedagogy invites new ways of
reading but is dependent on the school culture, teacher pedagogies, and mLearning resources, as directed by the school’s technological leadership. Technological leaders can encourage teachers to review their use of traditional methods and be open to social constructivist principles. Winslow et al. (2012), in a Canadian study that deployed tablets to school principals, found that the tablets augmented the abilities of principals to demonstrate technological leadership.

Limited changes only can occur in schools without the drive of the Principal (McGarr & Kearney, 2009). Lack of expertise and the ability to guide teachers makes it difficult for a Principal to monitor, evaluate, and maintain the momentum required for mLearning integration. Implementation of new learning technologies in a school context requires the support of all participants. It is, for this reason, important that school leaders plan for technology implementation (Boyle, 2001). Without a well-supported vision of mLearning integration, there will be a minimal effect on changing teachers’ practice and the use of technology with students (Clausen, Britten, & Ring, 2008).

Funding is an inhibitor of the use of mLearning in early childhood education, but leaders may be able to overcome this obstacle if they are prepared to be creative when sourcing funding (F. Simon et al., 2013). Many classrooms ban smartphones, but they are a readily available source of technology that offer teachers the freedom to explore, document, and communicate, and they provide extraordinary educational opportunities (Pinner, 2016). Allowing teachers to use smartphones in the classroom for educational purposes is a creative way to access mLearning devices that are readily available. Smartphones, although not without their pitfalls, provide an opportunity for educators to enhance the learning opportunities for young children, so educational leaders might be wise to manage rather than ban such technologies (F. Simon et al., 2013). Research in America has also shown that
smartphones can potentially improve methods of assessment and communication in early childhood classrooms (Parnell & Barlett, 2012).

mLearning offers enhanced learning opportunities for children but without informed leadership, misuse can occur (F. Simon et al., 2013). Ineffective technological leadership is a barrier to technology integration in schools (Dunaney, 2001). School principals are usually responsible for the technological leadership in schools and as such ought to accept responsibility for making technology an integral tool in all grades (Keengwe & Onchwari, 2009). Technological leadership means that school principals manage hardware and software requirements, and the ongoing professional development and support for teachers. Technological leaders might support the efforts of teachers who are innovative with technology and encourage them to become technology mentors to their colleagues, with compensation being given for mentor time (Keengwe & Onchwari, 2009). The selection of hardware and software requires the collaboration of teachers and school leaders so that purchases are developmentally appropriate and aligned with curriculum goals (Powell, 2014). In doing so, principals are engaging in shared leadership.

McGuire (2008), a school Principal in California, discovered that by sharing power and authority with parents, teachers and students, the energy focused towards school improvement increased exponentially. McGuire worked as a fellow learner with teachers to collaboratively and objectively look at the instructional content of classes. As a result of McGuire’s approach, the level of student achievement and engagement increased. By relinquishing power and authority and becoming part of the leadership team, real advancement occurred, which proliferated throughout the school community.

Technical support in addition to professional development is critical to the successful implementation of a new technology. Such support ought to be supplied by someone non-judgemental, with knowledge of both curriculum and technology (Ash, 2010). Teachers
report that barriers to using technology in the classroom are a lack of mLearning resources, difficulties with using software, Internet filtering, and bandwidth (C. Clark et al., 2015). When mLearning devices fail, they may be abandoned by teachers or not used for extended periods until someone has the time, money and/or knowledge to fix them. In a small primary school, or in a rural school, it may be the role of the Deputy Principal or Principal to provide technical support; however, it would be one of their many roles, and they may not necessarily have the expertise required (Keane, 2008).

Male and Burden (2014) found that over-restrictive firewalls excluded teachers and students from many useful resources. YouTube, for example, houses many valuable resources as well as inappropriate resources. Restricting access to social media and YouTube does not help children manage such resources or give them the opportunity to build responsibility. With regard to bullying, for example, there is much continuity between online and offline bullying (Thomas, Connor, & Scott, 2015). It has been found that children who are most at risk online are also those most at risk offline (Chadwick, 2014). Simply restricting online access might not be the best way to address the question of bullying behaviour. Teaching children to be good, responsible citizens must include the online as well as the offline environment (Shepherd & Woods, 2011).

A study of how ICT was used by early childhood teachers to help teach multiliteracies found that key barriers were unreliable equipment and access to technical support (Hesterman, 2011b). While in some schools there was sufficient technical support and broken resources were repaired; in others, time was consumed and frustration occurred due to the unreliable nature of the technology and lack of technical support. A plan for managing organisational and logistic issues – including recharging, repairs, protection, and deployment of applications – is necessary to ensure that the learning potential of mobile technologies is efficiently harnessed (Henderson & Yeow, 2012).
Lack of technical support contributes to the current technological divide between those schools that have access to mLearning resources and those that do not. The technological divide is a challenge that needs to be addressed in order to give all students the best opportunities for success (Clarke & Zagarell, 2012). Although the cost of devices is decreasing, schools are increasingly favouring the BYOD model because school budgets can make bulk purchasing of mLearning tools unaffordable (DEEWR, 2015b). The BYOD model was on the near horizon, in the 2014 Horizon Report (New Media Consortium, 2014). The BYOD model of technology integration means that schools do not need to purchase hardware; however, managing the BYOD model presents challenges because schools still need to manage the technical support necessary for the devices. The BYOD model also has the potential of presenting a challenge to families who are required to purchase devices.

Challenges associated with the BYOD model are the cost of the Wi-fi infrastructure, the need to support a range of devices, and access to applications. It has been reported that in European schools, only 25% of children under nine years old have access to digitally resourced schools that have high levels of well-maintained equipment such as desktop and laptop computers, IWBs, digital cameras, data projectors, and fast broadband (Wastiau et al., 2013). Many teachers who are not integrating technology into teaching say that it is a lack of mLearning resources, time, and leadership that is preventing uptake (Flewitt et al., 2014). Teachers with less experience and confidence were found to be more reluctant to use technology than their more experienced and confident peers.

Technical support is an issue that teachers and schools face when using technology. At one end of the spectrum, schools may have a full-time technical support person, and at the other end, there may be a part-time support person with limited expertise (Clarke & Zagarell, 2012). Successful studies using mLearning integration have used the technological support of a mentor or coach who has a vital role in successful implementation (Foote, 2012). Physical
barriers to technology integration such as mLearning resources, connectivity, and storage can cause frustration in teachers, who can then become barriers themselves (C. Clark et al., 2015).

In summary, the school challenges to mLearning in early childhood education stemmed from a lack of teacher knowledge and professional development, support of the leadership, and a paucity of technical support. These challenges resulted in an inability of many teachers to use mLearning in developmentally appropriate ways in the classroom. Potentially at least, school leaders may have the ability to overcome these challenges. The personal technology-related philosophies of school leaders were important factors in progressing mLearning implementation in schools.

2.5.4 University challenges.

The literature revealed three main university challenges to mLearning integration. These challenges were traditional philosophies of academics, traditional facilities and resources, and traditional pedagogies of academics. It has been reported that universities are conservative institutions regarding teaching with direct instruction being the dominant teaching style (McCarthy & Anderson, 2000). The use of technology in teacher education programs requires academics to change pedagogies to reflect more learner-centred approaches (Kehrwald & McCallum, 2015). Researchers have found that the main barriers to technology implementation in teacher education universities were the attitudes and pedagogical beliefs of the academic staff (Bakir, 2015). Training PSTs to integrate technology in the classroom requires explicit modeling at the pre-service stage of training through professional experience and modelling in units of study undertaken. Explicit modelling requires academic tutors to have the necessary skills, knowledge, and self-efficacy, which is often not the case (Bakir, 2015). PSTs are said to lack understanding about
student-centred learning with technology, and view PowerPoint and use of IWBs as integrating technology. Use of PowerPoint and IWBs are examples of teacher-centred learning and often do not extend the learning opportunities for students. The reason for PSTs lack of understanding about technology integration is possibly because of the modelling received from university tutors, which has been non-existent or teacher-centred (C. Clark et al., 2015).

Teacher education institutions with traditional learning facilities such as desks in rows, computer laboratories, and a screen at the front of the room do not provide PSTs with the opportunity to work in flexible, student-centred learning spaces like those in modern schools (Thompson, 2015). Modern schools include open learning spaces, natural light, numerous spaces for individual and group work, developmentally appropriate pods, and spaces for technology. Teacher education institutions lacking flexible furniture, facilities for PSTs to collaborate using technology, and the opportunity to use a variety of devices in classrooms are not able to create and model innovative and modern teaching and learning. Teacher education institutions are under pressure to provide learning spaces that mirror spaces in modern schools (Thompson, 2015).

One tablet per child is becoming common in K–12 schools, yet few teacher education institutions offer a similar environment. Mourlam and Montgomery (2015) found that when PSTs were given an iPad for a whole year with the support of a technology coach, many PSTs changed their beliefs about technology integration and reinvented their teaching approach. The context of the study was to immerse the PSTs in the use of the tablets and included more than 50 hours of professional experience. While some PSTs continued to use the tablets for low-level learning experiences, the majority changed their teaching style to reflect a student-centred approach.
Teacher education institutions around the world are looking for ways to integrate technology into PST education (Tondeur et al., 2012). Rosen and Jaruszewicz (2009) proposed a framework to guide early childhood teacher educators to extend developmentally appropriate practices to include the use of technology. They defined the term developmentally appropriate technology use (DATU) as use that respects the unique developmental needs of a child, and that capitalises on a child’s natural desire to solve problems and construct knowledge collaboratively. DATU occurs when teachers integrate CK and pedagogy to develop technology-rich opportunities for young children to learn.

Bakir (2015) found that the support of the entire staff, including a supportive dean with strategic vision, administrative support, technology support, funding, mentoring, leadership, and access to technology had a positive impact on technology implementation in universities. Universities that have successfully integrated technology into teacher education programs have done so by making technology integration systemically occur across entire degrees instead of offering stand-alone technology units (Metcalfe & Metcalfe, 2015). In the United States, 85% of teacher education institutions offer stand-alone technology units. Such units typically provide PSTs with the opportunity to learn how to create technology-rich lessons and develop basic computer skills. Stand-alone technology units have been shown not to facilitate PSTs with the integration of technology in a meaningful way (Bakir, 2015). The knowledge that PSTs gain from such units diminishes with time due to a lack of connection with other units.

2.5.5 Section three summary.

This section of the review examined the challenges to mLearning in early childhood education at the classroom, school, community, and university levels. At the classroom level, the challenges were the large number of tools to choose from, selecting developmentally
appropriate tools suitable to early childhood, teacher knowledge, and teacher philosophy. The community challenges posited excessive screen time, health issues relating to sedentary activities, and cyber safety. School challenges identified in the literature included professional development, leadership, and technical support. The university challenges identified were academics having limited experience of mLearning, and not adequately preparing PSTs to use mLearning in contemporary classrooms. Given the literature on the challenges and the fact that uptake of mLearning in early childhood education is varied, research question one evolved as a focus of the research: What are the benefits and challenges for schools and the University of adopting mLearning in ECE?

2.6 Section four: School–university partnerships

This section of the review defines and examines partnerships in general and school-university partnerships specifically. There are benefits and challenges to partnerships, and this section reviews these as they apply to both school and university partners.

2.6.1 Partnerships.

A partnership is an alliance or a collaborative relationship between two individuals or organisations such as businesses, schools, and governments in which partners agree to collaborate for mutually rewarding benefits (Radinsky, Bouillion, Lento, & Gomez, 2001). Such benefits could be to increase the likelihood of achieving missions, for monetary or knowledge gain, or for personal or professional satisfaction. An amalgam of minds and resources within partnerships is more likely to achieve success than partners working in isolation (English, 2013). The theory of alliances was the framework used to examine the school-university partnerships in this study (Iyer, 2003). Partnerships normally require stakeholders to collaborate with a shared purpose, accomplished through hard work, open communication, trust, and mutual respect. Close collaboration allows the overcoming of
inequalities and differential powers (Parker, Templin, & Setiawan, 2012). Open communication facilitates goodwill, alleviates dissatisfaction, allows a partnership to grow, and creates a culture of respectful conversations that help to generate respectful relationships (English, 2013).

The theory of alliances (Iyer, 2003) provides a useful lens in which to conceptualise relationships between schools and universities. Certainly in the current study, where the schools and University are relatively small in size and resource-scarce, there was an impetus to share resources and expertise. By forming alliances, organisations are thus able to compensate for deficiencies. In the current study, the schools lacked mLearning resources and technological knowledge and the University lacked authentic opportunities for pre-service teachers to teach children using mLearning. Alliances require governance characteristics such as strategic objectives, a time frame, rules about participation and ways to communicate. In addition to partnership characteristics, it is important to consider partner characteristics such as size, location, workforce profile, advertising profile and organisational memory (Iyer, 2003). During this research, the partner characteristics were important because small schools meant few resources and the location had to be close enough to the University for pre-service teachers to reach within the constraints of other commitments at the University. The small size of the schools also meant that they served as promotional stepping stones for principals so the workforce profile was unstable. Advertising profiles became an important characteristic of the partner schools when they acquired independent public school status because few schools have university partnerships. Despite the high turnover of school leaders throughout this research there were participants who remained throughout, and provided organisational memory which assisted the partnerships transition to subsequent years.
Partnerships between training organisations and industry are common around the world and have the potential to produce economic growth. One of the earliest examples of a training partnership was the opening of McDonald’s Hamburger University in 1961 in which McDonald’s has invested $40 million to improve the service industry, focusing on leadership development and business growth. The overall goals of business and training organisations (such as universities) are historically quite different – making money, versus producing employable graduates, education, and research. Progressive government cuts to public university funding has forced universities to generate their own funding using business models (Jarvis, 2013). According to many researchers (English, 2013; Evans, 2004; Jauhari & Thomas, 2013), the critical factors for successful partnerships are 1) healthy, respectful, professional relationships; 2) clear communication; 3) trust; and 4) clear, mutual goals. Partners need to have a deep understanding of one another’s goals, as well as those of the partnership (Killion, 2011).

Developing and sustaining a partnership requires considerable effort from the parties involved. Partnerships go through different phases (Killion, 2011) and, to be sustainable, need to survive any difficulties that arise. Members who are committed to the partnership are not immune to competing professional pressures and, at times, may be unable to fulfil their partnership commitments. Having a large core membership is essential to the ongoing survival of a partnership because members will have competing pressures and at times will be unable to commit time to a partnership (Walsh & Backe, 2013). Healthy, positive relationships are more likely than any written agreement to identify problems that occur and present potential solutions (English, 2013). Partnerships offer both opportunities and challenges, so it is important that partners consider both benefits and challenges before entering a partnership (Killion, 2011). However, the challenges involved in a partnership are often hidden in the beginning even when partners have been explicit about predicting
challenges. Such challenges can be financial but also relate to time and responsibility (Killion, 2011).

### 2.6.2 School–university partnerships.

Partnerships between schools and universities provide opportunities for community members – including practising teachers and PSTs, school leaders, parents, and university academics – to learn from each other. According to Goodlad (1991) and Walsh and Backe (2013), the essential elements of school–university partnerships are a shared concept, clear and sound purpose, mutual governance, and evaluation of outcomes. Although the goals of schools and universities are not dissimilar – i.e. improved outcomes for students and producing employable professionals respectively – the differing nature, culture, funding, and resources associated with schools and universities mean that they have different priorities (Bickel & Hattrup, 1995). A successful partnership between a school and a university has to focus on common ground (Butcher, Bezzina, & Moran, 2011). The general foci of schools are the curriculum, teaching, student support, and leadership, whereas those of universities are teaching, research and service (Castle, 1997). A mutually beneficial partnership, with goals that meet the foci of both schools and universities, is more likely to be sustainable (Oberg De La Garza & Kuri, 2014; Walsh & Backe, 2013).

### 2.6.3 Benefits of school–university partnerships.

School–university partnerships provide opportunities such as authentic learning experiences for PSTs; research opportunities for universities; and professional development for schools. Teacher education institutions have used school–university partnerships for authentic experiences such as professional experience and service learning for a long time (Ledoux & McHenry, 2008). PSTs who participate in school–university partnerships where they have greater opportunities to teach “real” children feel more prepared and able to
convert theory into practice. Schools are always looking for ways to design, implement, and improve new programs but often lack the resources to evaluate progress. Conversely, universities have abundant research and evaluation capacities, so partnerships between schools and universities should be beneficial for both (Walsh & Backe, 2013). Partnerships between universities and other organisations also enable universities to reach new audiences (English, 2013).

School–university technology partnerships are said to be beneficial to PSTs (Dawson & Norris, 2000) and children because the PSTs are exposed to technology-rich classrooms and children increase their technological competence. School–university technology partnerships are said to create goodwill: for the school, because parents are satisfied that their children have greater access to technology; for the teachers, because they may be afforded the opportunity to enrol in postgraduate classes (Christie, 2000). If the learning of children, practising teachers, and PSTs can occur concurrently, the benefits of the partnership tend to be maximised (Chorzempa, Isabelle, & de Groot, 2010).

Partnerships are more likely to be successful with the inclusion of parents and carers. How parents and carers perceive mLearning is important, given the growing interest of schools and government in the BYOD model of technology integration (DEEWR, 2015c; U.S. Department of Education, 2010). In schools where there is a high turnover of teachers and school leaders, the parent body becomes the stable component of the school community. Providing parents with up-to-date research on current trends enables them to make informed decisions for their children at home and school.

In 2013 the Australian government commissioned the Digital Education Advisory Group (DEAG) to provide a blueprint for digital education in the 21st century. The DEAG recommended that schools reach out to the community and form partnerships to make education and learning more relevant and authentic. The DEAG made eight
recommendations, two of which referred explicitly to partnerships. Recommendation four – strengthening partnerships in education – involved the dissemination of ideas regarding technology integration using partnerships and using school-university partnerships to bring expertise into schools. Recommendation seven, embedding innovation in learning, recommended developing community and industry partnerships by developing relationships with training organisations such as universities (DEEWR, 2015c).

2.6.4 Challenges to school–university partnerships.

Key challenges to school–university partnerships are a turnover of participants, and a lack of time and resources (Jones, Ryan, & Eckersley, 2014). Additional challenges associated with school–university partnerships are the loss of instructional time for other theory and content, changing demographics, policy changes, and change of direction (Ledoux & McHenry, 2008; Officer, Grim, Medina, Bringle, & Foreman, 2013). Academics may feel that partnerships detract from research (Walsh & Backe, 2013) whereas in fact, aspects of the partnership may generate research opportunities. Partnerships between schools and universities are seldom easy and once formed must adapt all the time as people and circumstances change. If problems can be shared as they arise, they can be solved collaboratively (Bickel & Hattrup, 1995). Although partnerships between schools and universities are ideal for teacher training and professional development, in reality, the dichotomy between schools and universities means that school-university partnerships can be contentious. According to C. Clark (1999), mistrust is the natural state of the relationship between schools and universities. Killion (2011) refers to relationships between schools and universities as the struggle between “town and gown”. Nevertheless, with sustained willingness and effort, partnerships can and have succeeded (AITSL, 2012).
Successful partnerships need sustained ongoing commitment from all stakeholders, which requires time and effort (Walsh & Backe, 2013). Sustainable partnerships should be able to survive periods of difficulty such as funding being exhausted or changes in direction being mooted. Keeping multiple participants in partnerships informed using clear, ongoing communication about the partnership and goals will minimise the effects of change in participants (Walsh & Backe, 2013).

Teachers and school leaders may feel that partnerships are another pressure added to those they already face (Walsh & Backe, 2013). If a partnership is imposed from above or inherited from a predecessor, it is less likely to be sustainable than one initiated by a school or university. Traditional school–university partnerships, where the university offers a short, single professional development session with little collaboration, have been shown to be ineffective (Cochran-Smith & Lytle, 1993). For professional development, long-term partnerships are most useful for practising teachers and PSTs (Crawford, Roberts, & Hickmann, 2009). The realities of staff shortages, limited time and resources, and potentially high staff turnovers mean that long-term partnerships may be difficult to sustain. The answer may lie in establishing short term partnerships for accomplishing a specific purpose, after which the partnership is disbanded.

2.6.5 Section four summary.

This section of the review defined partnerships in general and school–university partnerships in particular. The benefits of school–university partnerships identified in the literature were professional experience and service-learning opportunities for PSTs; professional development for schools; research opportunities for universities; and evaluation of teaching and learning programs for schools. The challenges identified in the literature were time pressures; staff turnover; conflicting task pressures; and missional dichotomies between
schools and universities. Given the literature on school–university partnerships and the lack of uptake of mLearning in early childhood education, research question two was developed to guide the research: What are the impacts of mLearning implementation in schools on school-university partnerships?

2.7 Chapter conclusion

It is clear from the current research that mLearning, although in its infancy, is currently being promoted by educational policy makers in Australia and elsewhere. The lack of uptake of mLearning in early childhood have been shown to be related to a host of reasons. There are opponents to the use of all technology (including mLearning) in early childhood education, and because the early phase of education is vital to children’s development, it is important that new initiatives or innovations are properly researched (Radesky, Schumacher, & Zuckerman, 2015). Research such as that undertaken here is required because mLearning permeates the lives of young children at home and increasingly in schools. As such, parents and educators need an understanding of how mLearning can be used as an educational tool. The difference between using mLearning for recreational and educational purposes needs clarification for parents, carers, and educators.

mLearning is beneficial to children’s learning because it provides children with a tool to enhance and individualise their learning (Buckingham, 2013). Children seem to enjoy using mLearning and so become engaged and motivated to learn. However, for mLearning to be used as a transformational learning tool in education, it must be used by a trained educator who becomes a facilitator of learning.

The challenges to mLearning implementation in early childhood education are that inappropriate use may be detrimental to children’s learning and development. Teachers without the necessary technological knowledge may not be able to use mLearning in a
developmentally appropriate manner to enhance children’s learning. If mLearning is used as a supplementary activity or as a time filler, it is unlikely to have an educational benefit. Teachers and teacher educators need time for professional development so they can gain the necessary skills to integrate mLearning effectively into their teaching and children’s learning. When teachers possess the mLearning skills to transform children’s learning they are able to share knowledge with the wider school community, including parents and carers so that concerns and questions can be addressed.

Good technological leadership can overcome most of the challenges to mLearning uptake, such as funding, professional development, and technological support. There is no suggestion that mLearning is a quick fix to learning. Neither is it the intention that children use devices in isolation, completing tasks unrelated to whatever else is going on in the classroom. Integrating new technology into the classroom requires thought and commitment from teachers, in aspects such as in choosing appropriate hardware and software, and developing appropriate pedagogies to support the curriculum (Flewitt et al., 2014).

The partnership model used in this study aimed at being mutually beneficial to the school and the University. Working together, schools and universities can implement new initiatives, share knowledge and learn together. In this research, the synergy between the PSTs and practising teachers was an example of a mutually beneficial two-way partnership. This study puts forward a model of an mLearning partnership that aims to increase the uptake of mLearning in early childhood education by overcoming some of the barriers identified earlier in this review.