The analysis of technology self-efficacy in pre-service and practising early childhood educators as a lens for understanding preparation for technology integration

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The analysis of technology self-efficacy in pre-service and practising early childhood educators as a lens for understanding preparation for technology integration

A thesis submitted in fulfillment of the requirements for the award of the degree

Master of Philosophy

from

University of Wollongong

by

Michelle Gregory

Faculty of Social Sciences
School of Education
August 2017
Declaration of originality

I, Michelle Gregory, declare that this thesis submitted in partial fulfilment of the requirements for the conferral of the degree Master of Philosophy, from the University of Wollongong, is wholly my own work unless otherwise referenced or acknowledged. This document has not been submitted for qualifications at any other academic institution.

________________________________
Michelle Gregory
August 2017
Acknowledgements

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Finally, I dedicate the work in this thesis to Mum – an Educator herself and my lifelong Educator and guide. My passion and dedication to complete this is in your memory.
Abstract

As the availability of digital technology for young children increases, it is important to understand potential challenges educators face with its use in early childhood education. Educators play an important role in shaping children’s learning and development, but concerns have been raised that early childhood professionals feel ill-equipped to effectively integrate technology into their teaching practices. The current lack of a framework or policy for high quality technology use in the early years in Australia presents a further challenge. This situation makes it critical to learn more about early childhood educators’ attitudes and perceptions of technology as they are key agents of educational change.

The focus of this study was to explore the self-efficacy of pre-service and practising educators’ for integrating technology in early childhood education. This research advances understanding of technology self-efficacy by developing a tailored measure suitable for the Australian early childhood education and care (ECEC) context and using this to better investigate the influence that individual perceptions may have on technology use.

The study used Bandura’s theory of self-efficacy as a conceptual framework for a mixed methods inquiry into how prepared early childhood educators from varying qualification backgrounds feel to achieve effective, high quality technology integration. Document analysis was used as the foundation for the development of the Early Childhood Technology Self-Efficacy (ECTSE) scale, which was then pilot tested prior to use. Where the ECTSE scale provided a quantifiable measure of self-efficacy, qualitative interviews with a sub-set of participants provided a means to further explore the role of self-efficacy in shaping educator practice.

Findings revealed that both pre-service and practising educators have mid-range ratings of self-efficacy when it comes to technology integration. Despite this, participants in this study felt under-prepared to effectively integrate technology. In particular, practising educators reported using technology with children at a more
basic level and had a limited understanding of technology integration aligned with EYLF outcomes. The results also highlight how personal beliefs may impact on levels of self-efficacy towards technology integration in early education and how factors such as training, support and personal teaching philosophies can act as further influences.

The study’s findings all underscore the influence of educators’ beliefs on achieving effective technology integration and the importance of educators’ self-perceived competences and self-efficacy. Educators need to feel they have the necessary skills to effectively use technology in their specific context. The findings suggest that future policy and program development needs to: 1) shift the teaching attitudes of early childhood educators to embrace the potential of technology, 2) acknowledge that the frequency of professional development is associated with higher technology use, and that providing educators with targeted professional learning on the use of technology in developmentally appropriate ways could help educators more effectively integrate technology, and 3) support early childhood services to develop a technology policy or plan to appropriately incorporate technology into existing practices to meet the developmental needs of young children and remain up to date.

Overall, this study intended to explore technology self-efficacy amongst pre-service and practising EC educators and from this, better understand how prepared these educators feel to integrate technology effectively. The development of the ECTSE scale is a key contribution to the field of early childhood research, lending itself to further implementation across the sector. In addition, the findings of the study offer new insights into technology integration from the perspective of educators, and starts to explore concerns about poor quality technology integration by understanding the pedagogical beliefs influencing such decisions. The results from this study offer a foundation for further research and professional-development offerings tailored to address the lack of relevant guidelines and frameworks for the early years in the Australian, as well as contextual application to existing EYLF outcomes.
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Chapter One Introduction

Children are growing up in a constantly changing and fast-evolving digital world (Plowman & McPake, 2013). Technology and interactive media are already present in the lives of young children and their educators and is beginning to affect early-learning environments. Through touchscreen devices, children can read e-books, play educational games, take photographs, practice emergent writing skills and record their own videos. Whilst these advances offer exciting opportunities, the introduction of new technologies, digital devices and applications also raises questions about developmentally appropriate use, especially for younger children.

The integration of technology into early childhood education and care (ECEC) settings is one that can evoke strong emotions from parents and educators alike. In the past, some have viewed technology as a threat to playful learning and children’s development (Cordes & Miller, 2000; Healy, 2003). More recently, researchers have embraced and promoted the use of technology for exploration and discovery for young children (Hatzigiannu & Margetts, 2012). Technology can offer challenging experiences that strengthen existing early childhood educational practices and respond to children’s curiosity. Since technology integration in early childhood education is a slow and complex process (Inan & Lowther, 2010), more needs to be known about the role of technology in young children’s lives and the factors that influence integration and best practice in prior-to-school educational settings.

1.1 Background

The high demand for quality ECEC services to support children’s learning and development gives a positive indication of increasing understanding of early childhood education’s important role in the lives of young children (Karvelas, 2014). Recent research has confirmed the consensus that participation in high-quality ECEC benefits children’s development and life trajectories (Melhuish, Howard, Siraj, Neilsen-Hewett, Kingston, de Rosnay, Duursma, & Luu, 2016). Along with parents, families and communities, early childhood educators play an important role in the education and support of young children. There is a general consensus, supported by research, that well-educated and well-trained education professionals are a key
factor in providing high-quality ECEC (Litjens & Taguma, 2010). The training and education background of early childhood educators affects the quality of ECEC services primarily through their knowledge, skills and competencies. There is strong evidence that enriched environments and high-quality pedagogy and practice are fostered by better-qualified staff; and better-quality pedagogy leads to better learning outcomes (Litjens & Taguma, 2010). It is also considered important that staff believe in their ability to organise and execute courses of action to bring about desired outcomes.

Technology integration within the Australian early-childhood context is plagued by a lack of available frameworks or policies on technology use (ECA, 2016). Early childhood educators draw on material from the United States early education sector to build their own knowledge and perspectives in order to offer the required support and scaffolding young children need to succeed. The joint position statement of the National Association for the Education of Young Children (NAEYC) and the Fred Rogers Centre for Early Learning and Children’s Media (2012) proposes:

*Educators must be knowledgeable and prepared to make informed decisions about how and when to appropriately select, use, integrate and evaluate technology and media in order to answer parents’ questions and steer children to technology and media experiences that have the potential to exert a positive influence on their development (p.10-11).*

This statement highlights the need for educators to be aware of the multiple uses of technology and understand the potential it holds for enhancing pedagogy and practice. As technology tasks become daily occurrences, policy-makers cannot make assumptions regarding educators’ ability to judge effective use of ICT. Updating hardware, lodging online payments and integrating innovative resources into interactive learning experiences for young children require task specific skills and competence. Early childhood educators of today and the future must be equipped with new skills to navigate the changing face of early childhood education whilst maintaining high-quality.
What is important for the sector is guidance about and understanding of high-quality technology use and how educators can be best supported in this. Without a model of high-quality technology use and an understanding of knowledge levels and support capacity, the sector lacks clarity on the expectations for technology use as well as a motivating environment to foster children and educators’ growth and skill development. Technology integration in early childhood education calls for further research. Researchers are only beginning to understand the benefits of technology on children’s learning and how educators’ self-efficacy across the sector can have an effect (Worch, Li & Herman, 2012; Ertmer, Ottenbreit-Leftwich, Sadik, Sendurur & Sendurur, 2012).

The extent to which educational technology enriches the learning environment is not certain. Technological changes in the classroom can lead to adverse emotional responses and the educational use of computers in the learning environment can be determined by educators’ existing knowledge, skills and attitudes (Tsitouridou & Vryzas, 2003). Current research on ICT in ECEC, however, has tended to focus predominantly on the child and how technological developments and enhancements influence their learning. Therefore, more research is required into educators’ attitudes and use of computers in the Australian birth-to-five educational context. Given the important role educators play in shaping children’s learning and development, greater understanding of how prepared pre-service and in-service teachers in the specialised field of early childhood education feel about using technology in teaching and management tasks is crucial.

While it has been suggested that early-years professionals lack confidence in their ability to effectively use technology (Wheatley, 2004), there is little empirical research to support the idea that they are in fact “techno-phobic”. Several researchers (i.e., Ertmer, Ottenbreit-Leftwich, Sadik, Sendurer & Sendurer, 2012; & Kent & Giles, 2017) have explored educators’ attitudes towards and perceptions of technology when examining ICT use and found a significant relationship between the two. Ertmer et al. (2012) used interviews to examine the relationship between classroom practice and pedagogical beliefs. Similarly, in a quantitative manner, Kent
and Giles (2017) completed a five-item Likert survey measuring self-efficacy for teaching with technology amongst 62 pre-service teachers. Both studies noted that the strongest indicators for effective technology integration were existing attitudes and beliefs and current levels of knowledge and skills. However, Ertmer et al’s study focused on primary educators (K-12) in a structured classroom environment and Kent and Giles’ participants were only pre-service educators and hence, neither study provided specific contextual data relating to early childhood educators.

The focus of the current study was to explore the level of preparation for using technology in early childhood education from the perspective of both pre-service and practising educators and how self-efficacy interplays with such preparation. Concerns have been raised about early-childhood professionals feeling ill-equipped to effectively integrate technology into the teaching practices. Many practising educators as well as students from both vocational and tertiary training centres are thought to underestimate their own personal ability to use technology soundly and, as a result, have been labeled “techno-phobic” (Nikolopoulou & Gialamas, 2015). The concern is that these educators may fail to capture the full potential of technology for children in their care and work less productively on management tasks that also involve the use of technology.

1.2 Significance
Research focusing on educator attitudes and beliefs about technology integration is sorely needed given the changing nature of education in the current digital age and the potential impact of teacher’s perceptions on integration and support. This research addresses the lack of understanding of how early childhood educators’ levels of self-efficacy towards technology use affects technology practice. Increases in availability and options for technology use in ECEC makes it imperative to understand the challenges educators may face when integrating technology into their learning environments. This lack of understanding is significant given the importance of early childhood education in influencing children’s future academic pathways. It is critical to know more about early childhood educators’ attitudes and perceptions of technology in prior-to-school educational settings. Technology must
first be in use before judgements can be made on its positive or negative effects on children’s learning. The current study advances understanding of technology self-efficacy by introducing a tailored measure suitable for the ECEC context and using the measure to better understanding the influence such perceptions may have on technology integration.

The NAEYC and Fred Rogers Centre (2012) supports the need for further research to inform future practices:

Research-based evidence about what constitutes quality technology and interactive media for young children is needed to guide policy and inform practice, and to ensure that technology and media tools are used in effective, engaging and appropriate ways in early childhood programs (p.11)

Research by Blackwell, Lauricella and Wartella (2014) demonstrates first hand that attitudes towards the value of technology, confidence in use and support have the strongest effect on technology use. Drawing on survey data from 1234 U.S early childhood educators, the researchers used path analysis to demonstrate the dynamic relationship between targeted support and strong technology visions to influence educator confidence, attitudes and ultimately, use (Blackwell et.al, 2014). These findings strongly demonstrate the need to assess how self-efficacious educators within the Australian early-childhood sector feel about technology in order to move forward with professional development and technology-policy planning. Building digital capacity enables all to take full advantage of digital and online resources and minimise any “digital divide” within the sector (Ewing, 2016).

1.3 Research Questions
The 2012 joint position statement from the National Association for the Education of Young Children (NAEYC) and the Fred Rogers Institute has provided a level of guidance to early childhood educators on effects uses of digital technology. The statement’s release demonstrated increasing acceptance that technology affects the young children’s lives, families, and educators. As a result, this study was designed to investigate:
How prepared do pre-service and practising early childhood educators feel to integrate technology into early-years settings?

To collect data in response to this question, additional sub-questions were used to develop an understanding of participants’ self-efficacy in integrating ICT in the early-childhood sector. Each sub-question was designed to explore antecedents to self-efficacy judgments and acknowledge other factors that may be important:

1. How self-efficacious do pre-service and practising early childhood educators feel about using technology with the children in their care?
2. How self-efficacious do pre-service and practising early childhood educators feel about using technology in management tasks?
3. How important do pre-service and practising early childhood educators believe technology is in children’s early learning and development?
4. What do pre-service and practising early childhood educators perceive to be the obstacles and challenges to integrating technology in ECEC settings?
5. What do pre-service and practising early childhood educators see as their role in adopting new technology in early childhood education and care?

1.4 Methodology
The aim of this study was to understand educators’ levels of technology self-efficacy within their specific contexts and to determine the key factors that affect their integration of technology in ECEC settings. In this research, an embedded mixed-method research design allowed for collection and analysis of qualitative and quantitative data and offered a practical approach to addressing the research questions. The premise of embedded mixed methods is that a single data set is not sufficient, so the scope and the breadth of the data is expanded by including quantitative and qualitative data components. The quantitative data provided an understanding of technical self-efficacy across a larger representation of the early-childhood sector, but did not consider the individual contexts of the diverse range of participants. The qualitative data explored the participants’ experiences and contexts in greater detail.
The context for this research involved two participant groups from pre-service education settings and from operating early childhood education centres to capture a broad picture of the early education and care sector. These groups are not mutually exclusive; rather, they capture a timeline of progression through the early-childhood sector, drawn together through the common theme of technology integration.

The preliminary stages of the study integrated document analysis and a pilot test in the development of a new specifically tailored data-collection measure. Following the completion of this, the research progressed to an embedded mixed-methods design. The goal of the research was to provide a deeper understanding of educator perceptions and self-efficacy towards technology and to determine the impact of self-efficacy on the integration of technology in ECEC settings. The combination of data-collection methods in the mixed-methods design provided a comprehensive account of educator views about technology.

1.5 Terms / Definitions

Before exploring the current study, terms used in this research are briefly outlined:

- **Centre-based care** refers to early childhood educational services provided in a purpose-built environment specifically licensed to provide care for infants, toddlers and/or preschoolers. These services are range from long day care services to preschools and are open for differing hours each day.

- **Early-childhood education and care (ECEC)** refers to prior-to-school settings accommodating children aged between zero and five years of age. This may include long day care and preschool settings.

- **Early childhood (EC) educator** refers to anyone working in an early learning environment who is counted towards child-adult ratios. The training and qualifications of such individuals may vary and will be explored in depth later.

- **Digital technology or information communication technology (ICT)** refers to forms of technology most often used in prior-to-school settings. This was
divided into two key areas for the purpose of data collection: teaching and management.

1.6 Subjectivity Statement
The researcher engaged in this study was a female post-graduate student from the University of Wollongong. Specific exposure to technology integration in early learning environments inspired the researcher to complete this study, gaining a further understanding of how technology integration can grow and shape early learning opportunities. Initial engagement with participants commenced through established relationships in the sector and developed over time through ongoing work with the Early Start initiative. The researcher’s undergraduate qualification as an Early Childhood Teacher and previous teaching experience guided the practical implications of the research and contributed to an understanding of the need for guidance and support for technology integration. Engagement with regional and rural ECEC services through the position of Early Start – Learning Technologist provided positive experiences in engaging with early childhood educators for research purposes. The researcher also acknowledges that this background experience brought particular subjectivities to the study, which required careful consideration when collecting and analysing data and presenting the results in this thesis.

1.7 Structure of the thesis
The thesis is presented in five chapters. The first chapter has provided an introduction to the research study. Chapter Two explores previous research in the area of technology use in ECEC, the importance of ECEC and factors influencing levels of self-efficacy amongst early childhood educators. Chapter Three presents the research methodology, outlining the research approach and context, as well as the research procedures employed in the study. Chapter Four describes the findings from the mixed-methods data collection in related to the research questions. Finally, Chapter Five reviews these findings, draws conclusions and discusses implications for both future research and early childhood educator practices.
Chapter Two Literature review

2.1 Introduction

Recent literature indicates a rise in the consideration of ICT in early childhood education reforms (Jeong & Kim, 2017). Previous research examining technology use in prior-to-school educational contexts has come from the perspective of the child, with researchers exploring the role of technology in supporting children’s learning (Baskin & Williams, 2006; Jung & McMullen, 2012). More recently, international researchers have begun exploring technical self-efficacy amongst early childhood educators in specific educational contexts (Blackwell et al., 2013; Kerckaert et al., 2015, Nikolopoulou et al., 2015). While there has been increasing focus across international early childhood contexts, researchers are only beginning to explore the levels of technology self-efficacy in early childhood educators, both pre-service and practising in the context of Australian ECEC (Lemon & Garvis, 2016).

The purpose of the current study, therefore, was to gain a deeper understanding of self-efficacy with regards to technology use amongst early childhood educators, which may affect pedagogical practice. Detailed research with a focus on educator attitudes and beliefs around technology integration is sorely needed given the changing nature of education in the current digital age and the potential impact of teacher’s perceptions on integration and support. Educator attitudes with respect to the use of technology in early childhood education have not been well researched. Yet within the wider literature, studies have indicated a strong link between self-efficacy beliefs and the adoption of digital technology to enhance pedagogical programs (Garvis & Pendergast, 2011; Guo, Justice, Sawyer, & Tompkins, 2011; Dong and Newman, 2016). The current study explores and reflects on technology preparation for both pre-service and practising early childhood educators’ beliefs and attitudes towards technology integration in early childhood education.

This chapter explores literature and research on the multi-faceted use of technology in ECEC. The first section examines technology in children’s lives and its use in ECEC, including trends in use. The second section explores early childhood education and the impact of educator practices on quality education and care. The third section
examines the construct of self-efficacy and the domain-specific nature of self-efficacy. The final section explores factors that influence practice and how this affects how prepared EC educators feel to integrate technology.

2.2 Technology and young children

With technology becoming part of daily life, young children now have multiple opportunities to interact with digital media devices both in the home and in educational contexts. With this comes increasing need to understand where technology fits in the lives of young children as well as explore both the affordances and potential concerns regarding its use. Understanding of research-based pedagogies for using technology with young children helps to ensure the effectiveness of technology in enhancing children’s learning (Saltan, F. & Arslan, K. 2017). Moreover, evaluating current usage patterns allows for growth and development in a constantly changing environment.

Recent media reports have begun to acknowledge the potential benefit of engaging young children in digital-technology experiences (Marks, 2016). There continues to be real concerns, however, regarding young children and technology around the protection of privacy and promotion of online safety, ensuring age-appropriate and good-quality content, being alert to advertising and gambling and many more issues of concern. Research examining the impact of technology on child outcomes has been mixed, with researchers highlighting both benefits and concerns. However, with the wide availability of connected, touch technology, it is virtually impossible to lock it away from babies and young children (ECA, n.d), and therefore it is no longer an issue of should we or shouldn’t we but rather how best to use technology to support positive learning outcomes.

Jung and McMullen (2012) concluded that some of the possible positive outcomes from technology use with young children include increased social interaction, facilitated language learning, increased participation and enthusiasm for learning and increased use in effective teaching. Other studies have demonstrated the production of creative ideas and higher-order abstract thinking through technology.
engagement (Aldhafeeri, Palaiologou & Folorunsho, 2016). Hong and Trepanier-Street (2004) stated that “when technology is integrated in a meaningful way into an early childhood curriculum, the possibilities for the construction of knowledge in both the children and teacher are greatly expanded” (p. 93). The interactive aspect of technological tools supports a constructivist environment in which young children can explore their ways of knowing (Schriever, 2018) and promotes sharing conversations and collaboration among children and adults (Hong & Trepanier-Street, 2004), a core element of most early-learning environments. An exciting area of educational development in the digital space is also the use of assistive technologies for children with disabilities (Elliott, 2013). Digital technology opens new avenues for individualised programs to be developed and implemented to enrich inclusive learning and play environments for all children.

Many carers of young children acknowledge that young children can make use of technology like it is ‘second nature’ however when it comes to making professional decisions around the use of digital technology in ECEC, there appears to be reservations around it’s suitability (Ficken, 2013). Discussions around the negative effect of technology and associated concerns have possibly contributed to unsuccessful or inappropriate integration in ECEC contexts. Concerns about childhood obesity, behaviour problems, and general health effects have all been raised (Elliott, 2013). Investigators have explored how screen time may be affecting children’s developing brains and several recommendations have been made by health authorities about optimal screen time. The Australian Council on Children and the Media (ACCM) supports educators and families with evidence-based information regarding media exposure and promotes positive and healthy technology environments. Their key concern is that parents and educators must understand the technology that young children encounter and be able to evaluate its use for their own context. The ability to assess the risks, benefits and encourage appropriate use is important, and currently requires further evidence based support and information.

2.2.1 Usage patterns and guidelines
Research regarding the impact of portable and instantly accessible screen time on learning, behaviour and family dynamics has lagged considerably given its rate of adoption (Radesky, Schumacher, & Zuckerman, 2015). There is growing concern that adults’ constant, distracted device use models poor technology habits for children. The ethics of adult uses of technology, particularly in ECEC settings and for documentation is one key issue identified within the Australian context (ECA, n.d). Encouraging positive role modelling by adults, aids in developing good, healthy, life-long habits and self-regulation regarding the use of technology.

Within the Australian ECEC context, guidelines available to educators on children’s digital technology use focuses mostly on the amount of screen time, and is founded in research into the health and physical impact of technology. In 2016, Early Childhood Australia (ECA) began a partnership with leading experts in the field to develop a ‘Statement on Digital Technology for Young Children’ (ECA, 2016). This was in acknowledgement of the need for guidelines to support for educators and parents in a changing digital learning environment. In May 2017, they released a survey collating data from parents, families and EC educators regarding technology use. This initial survey was aimed at identifying key concerns and opportunities with technology and young children and the kinds of guidance that would support quality practice in education and family settings. Results are due in late 2017 and will further inform the content of the Statement on Digital Technology for Young Children’, supporting children and families to achieve digital literacy skills necessary to participate responsibly in a digitally-engaged society (ECA, n.d).

Conversation about the best ways to use digital technologies in ECEC are not new. Over the last few years these conversations have transformed from ‘should we?’ to ‘how should we?’ One of the key concepts for consideration is that when engaging children with a digital technology, whether it is an app, a new device or a website, it is not usage per se but how we use it that is critical to its success (Highfield, 2014). To this end, the acceptance of technology and the attitudes of educators responsible for its integration into ECEC are important to understand. Acknowledging the key role these educators play in young children’s learning and development and
enhancing this through high quality technology practice is important to ensure best outcomes for children.

2.3 Early Childhood Education and Care

Effective ECEC is thought to promote children’s learning and development as well as contribute to children’s mental well-being (Perren, Herrmann, Iljuschin, Frei, Korner & Sticca, 2017). As a result, educators need support to maintain high-quality practice, in both pre-service and in-service contexts. Acknowledging the impact of regulations and legislation on EC educators work and ensuring information and resources are available to foster and support the valuable work of EC educators across all ECEC services is an important investment.

In 1993, Australia became the first country to require long day care services to complete a quality-accreditation process, known then as the Quality Improvement and Accreditation System (QIAS). In 2012, this process received a distinct overhaul to encompass all services, regardless of their management structure. All early childhood education and care services across Australia are regulated through the National Quality Framework (NQF). Within the NQF are three key components; National Law and Regulations, National Quality Standard and National Learning Frameworks (ACECQA, 2008). Each of these elements influence the work and daily operations of early childhood services across Australia. The National Law and Regulations govern the NQF and provide detail on a range of operational requirements for an early childhood education and care service. The National Quality Standard (NQS) is a key aspect of the NQF and sets a high benchmark for early childhood education and care services across Australia. The NQS includes a series of seven quality areas that govern service provision for young children and gives services and families a better understanding of quality care and education. Areas include items such as staffing arrangement, leadership and service management, children’s health and safety and education program and practice. These seven areas of quality are assessed within centre environments and staff are provided a final rating, ranging between working towards, meeting or exceeding quality. The assessment and rating process is a continuous improvement cycle, with staff working
on Quality Improvement Plans between assessment visits in order to document and clearly capture their targets and goals in achieving high quality. There have been differences of opinion about the quality and success of the quality-assurance system (Harrison, Skouteris, Watson, & Ungerer, 2006; Ishimine, Tayler, & Bennett, 2010). One element that continues to be clear is the importance of quality relationships and high-quality education and care in delivering positive outcomes for children (Brown & Inglis, 2013). There is also recognition within research that engagement in professional development and support not only improves knowledge and skills but enhances self-efficacy beliefs in educators; this, in turn, enhances learning and positive experiences for young children (Russell, Carey, Kleiman, & Venable, 2009).

Results from a study by Tayler, Ishimine, Cloney, Cleveland and Thorpe (2013) analysed data from the E4Kids study (Effectiveness Early Educational Experiences). This study tracked the “multi-dimensional development progress of young children in the context of the child’s family, ECEC programs and the social and economic community” (Tayler et.al, 2013, p. 14). Their discussion concluded that no ECEC service can be complacent about pedagogy and practice within their everyday programs and still achieve and maintain high-quality practices and demonstrated the impact of existing differences between funding, resource, child and parent characteristics and organisational structure on quality.

ECEC quality is often defined by the structural and process characteristics that are believed to foster and nurture child development (Slot, Leseman, Verhagen & Mulder, 2015). Whilst the evidence for strong and consistent relationships between structural and process quality is far from conclusive, it is understood that for the cost-efficiency of ECEC a strong relationship is beneficial. Process quality refers to children’s daily experiences, encompassing social, emotional, physical and instructional aspects. Structural quality is the main objective of statutory regulations and national curriculum, and includes items such as child ratios, group size and educator qualifications (Slot et.al, 2015). While numerous studies have highlighted the important of both aspects of quality, one factor that repeatedly shows as important is significant role of the educator in shaping children’s experiences and
learning outcomes. Palaiologou (2016) reported that improving the quality of ECEC and learning outcomes for children required a highly skilled workforce. Educators are a powerful influence on children’s early learning experiences; it is not only qualifications that lead to improved quality. Previous studies have established the importance of educator self-efficacy and engagement to classroom quality and fostering academic achievement (Guo et al., 2012). Children’s social interactions with educators and their peers are seen as determining what the children learn and how they feel about learning more than physical program features (Melhuish et al., 2016).

In summary, the EC educator plays a critical role in shaping the quality of ECEC service. Increasingly, expectations are that an element of this role is the effectively integrate technology to support children’s learning and development. However, research has not clearly shown how prepared EC educators, both pre-service and practising feel to complete this task. One way to explore this is through the concept of self-efficacy which is outlined below.

2.4 Self-Efficacy

Self-efficacy, a key construct of social learning theory, provides an extensive theoretical framework for understanding human behaviour in varying contexts. Self-efficacy is defined by Bandura (1994) as “people’s belief about their capabilities to produce designated levels of performance” (p.72) and as efficacy beliefs are based on perceptions of particular behaviours, self- efficacy is to be considered a context and domain-specific construct (Dong & Newman, 2016). It does not indicate a global personality trait; rather, it is situation-specific depending on the behavioural context (Jeong & Kim, 2017).

In this study, self-efficacy provided a lens for understanding the attitudes and behaviours of educators when using technology. There is increasing evidence showing an individuals’ belief about their abilities and the anticipated outcome of their efforts can have a powerful influence on behaviour (Kiili, 2016). Within the realm of technology, it is important to take into account the ways in which
individuals’ technical self-efficacy may influence their engagement (Dong & Newman, 2016).

A recent study of pre-service EC educators’ computer self-efficacy by Guo, Justice, Sawyer, and Tompkins (2011) examined factors associated with educator self-efficacy in a general context. These factors included teaching experience, sense of community and children’s engagement. A key finding from their study was the impact of an educator’s sense of community (i.e., collaboration and professional networking) on self-efficacy. Pre-service educators had greater self-efficacy when they felt supported by peers and able to collaborate on tasks. Given the uniqueness of ECEC services in having a team of educators working together as opposed to one individual in a classroom such as primary school environments, this concept opens a new channel of thought about models of professional development, where collaboration amongst educators is used as an avenue to support self-efficacy (Guo et al., 2017).

Personal judgments of our knowledge, skills, strategies and/or techniques all shape efficacy beliefs, with lower levels of self-efficacy thought to correlate with lower levels of engagement in activities or experiences (Bandura, 1994). Significant research has been conducted on educator self-efficacy across various domains, and the concept continues to receive ongoing attention in research relating to technology acceptance and integration into workplaces and education institutions (Huffman et al., 2013; Ratten, 2013; Sun et al., 2012).

A lack of confidence in working with digital technology specifically influences the integration of technology use (Albion, 2010; Palaiologou, 2016). In their review, Aldhafeeri, Palaiologou & Folorunsho (2016) concluded that the individual construct of self-efficacy can be seen as a critical predictor of future trends in computer attitudes and use patterns. Self-efficacy beliefs can be a key predictor in actual task performance and influence the quality of analytic reasoning and thinking. Lemon and Garvis (2016) explored pre-service primary teacher self-efficacy in using ICT using the ‘Teacher Self-Efficacy Scale.’ In a sample of 121 educators they found that individuals
with lower computer self-efficacy would complete technology tasks less efficiently, and make more errors. They recommended strategies such as observation, practice, reflection and social cultural support be explicitly linked to digital technologies in order to build professional capacity. In addition, it is acknowledged that that further research into the relationship between self-efficacy and computer engagement is needed in order to meet the ever-changing environments in ECEC (Lemon & Garvis, 2016).

2.4.1 Measuring self-efficacy

In this study, the focus was on examining early childhood educators’ judgement of their skill and capacity to use ICT through the measurement of self-efficacy. A review of existing scales revealed a lack of suitable tools for measuring technology self-efficacy among EC educators. Whilst numerous methods have been used to assess educator’s level of confidence and attitudes towards technology in education settings, there exists a need to explore EC educator self-efficacy to understand professional development needs.

Kerckaert, Vanderlinde, and van Braak (2015) investigated the role of ICT in early childhood education. Their study purpose was to develop a valid and reliable instrument to measure EC educators’ ICT use. The researchers acknowledged that no suitable tool was available and hence devised an instrument that explored self-efficacy with regards to basic ICT skills and attitudes in addition to using ICT to support content and learning needs. Whilst elements of this instrument were useful for transformation to the Australian context, a number of additional variables were included that were specific to the Belgium context in which it was administered.

The technology acceptance model (TAM) has also been widely used to assess confidence and attitude towards technology integration (Teo, Lee & Chai, 2008). TAM describes how user beliefs and attitudes are closely related to individual’s intentions to perform. The measure originates from Ajzen and Fishbein’s (2000) theory of reasoned action and emphasises two specific variables, perceived usefulness and perceived ease of use, as the fundamental determinants of user
acceptance. Numerous studies have been completed using the TAM in business, commercial and educational contexts (Drennan et al., 2005; Hasan & Ahmed, 2007). Analysis of the TAM however indicated a shortcoming exemplified by a study of pre-service teachers attitudes to technology in which 51.3% of the data collected on pre-service teachers attitudes to technology was left unexplained due to a lack of acknowledgment of individual variables, such as intrinsic motivation and emotion (Teo, 2010)

In addition to the TAM, a widely used efficacy measurement scale has been the Teachers’ Sense of Efficacy Scale (TSES) (Oh, 2011). This was designed and administered to both pre-service and in-service educators as pre and post measure for coursework units (Oh, 2011). The TSES comprises three subscales, addressing concepts of classroom management, instruction and engagement. The TSES does not address the specific domain of technology use and also has a broad scope across primary teachers and therefore, was not transferable to the context of this study.

The current study was designed to address a gap in the research, using a specifically designed self-efficacy tool to better understand technology integration in Australian ECEC contexts. Unlike previous studies, this study used a mixed method approach to explore perceptions and attitudes amongst early years educator, set within the context and culture of early years education and the over-arching national policy climate.

2.5 How prepared are Early Childhood Educators to integrate technology
Early childhood educators have often wrestled with the challenges and joys of technology. Over the years many have striven to be on the cutting edge, yet often struggled to achieve adequate and appropriate integration of technology into the learning experiences they create for young children (Dong & Newman, 2016). Findings from the Teaching Teachers for the Future project in 2011-2012, whilst focused on primary educators, identified ongoing concerns about teachers’ lack of technology confidence on the role of technology in learning and the isolation of technology knowledge from pedagogical expertise (Lemon & Garvis, 2016). Evidence
has identified a gap between personal and professional technology use, with distinct gaps between teaching standards, policy and reality. These are significant findings at a time when technology is emerging as an expected outcome of pedagogical planning decisions and use in learning environments (Lemon & Garvis, 2016).

2.5.1 Teaching philosophies and practices
The use of computers and other digital technologies continues to increase in early childhood programs, and these technologies can be used as a tool for improving program quality in many interesting and innovative ways (Donohue, 2003). Time, training and support, accessibility as well as personal properties including challenges to traditional teaching beliefs and philosophies all impact on the methods of technology integration observed in ECEC settings (Juong & Kim, 2017). Educators need to be comfortable in supporting children as they use the equipment, allowing them to “take the lead” (Clark & Moss, 2005, p. 75). Past research has indicated that many countries share a common condition with respect to the use of technology in education, and that all educators face a period when their skills must change rapidly as expectations and high levels of investment and accountability shift (Chen et al., 2006, Dong & Newman, 2016; Aldhafeeri, Palaiologou & Folorunsho, 2016). Whilst the positive impact on program quality, staff development and children’s learning can make an investment in digital technology and training a good decision, the actual use of such items remains infrequent, particularly in early childhood education (Wartella, Schomburg, Lauricella, Robb, & Flynn, 2010). Eteokleous (2008) described educators’ use of technology as a more traditional and didactic practice, rather than a meaningful student-centred experience. This suggests that technology is still being used as a substitute for traditional tools rather than an extension of the curriculum.

Tsitouridou and Vryzas (2003) further stated that resistance to using technology springs often not only from insufficient knowledge or understanding, but from a more general fear of computers and that this anxiety can readily be passed to the children in their care. As educators’ self-efficacy beliefs have been positively associated with quality teaching practice, it is important to understand the
contextual factors that can influence the formation of self-efficacy beliefs (Guo et al., 2011). Previous studies and literature have attempted to highlight various factors that influence the effective implementation of technology in the early-years learning environment. Blackwell et al. (2013) directly explored the factors influencing technology integration specifically for early childhood educators, as it was viewed as a subgroup underrepresented in literature in the area. They identified an interplay between intrinsic personal properties and extrinsic factors that influence the adoption of ICT in early learning environments. Whilst factors such as access, experience and professional development can influence educator engagement, when it comes to actual use, personal factors come into play, particularly with more modern technologies such as mobile tablets and coding devices. Educators indicated a limit to what they can do with the technology, unable to make use to the extent they desired or felt the technology afforded (Backwell et al., 2013).

Early studies on the state of technology use in early childhood settings found as a point of concern that many ECEC settings pay “lip service” to the importance of technology. As one participant stated, “*We might have something within the centre documentation which might say ‘We believe that ICT is a good thing’...But we haven’t got any kind of strategic plan to take that forward in a really coherent way.*” (Simpson et al. 1999, p. 253). This study highlighted an introductory need for broad use of technology in pre-service teacher education courses and professional-development offerings. Since then later research has supported technology as part of everyday practice. Schriever (2018) argued that learning with technology should be viewed as a tool for valuable learning through integration in multiple learning activities. Such practice can assist educators to move beyond mere awareness of technology and begin to increase their skills and technological understanding to support children’s learning (Wheatley, 2004). In 2013, the HighScope educational program in the US released its own position statement on young children and technology in the context of their early-childhood services. The HighScope approach emphasises integrating technology as a choice, not a necessity, and asserts that it should supplement interactions with other materials, people, events and ideas (Epstein, 2013). This chronology demonstrates not only the increase in prevalence of
digital technology in educational contexts but also an increasing awareness that digital technology requires specific pedagogical understanding in order to best supplement and support existing ECEC practices.

As early childhood education has tended to be a low-tech profession (Donohue, 2016), many educators have come to technology as adult learners and can be challenged by technology when face-to-face interactions and relationships sit at the heart of their work. For some educators, the immersion of technology challenges the underpinning beliefs and philosophies of early childhood education (Keengwe & Onchwari, 2009). Recent research by Lindahl and Folkesson (2012) found that early childhood educators could be classified into two groups: those who embrace technology and those who feel it challenges their traditional teaching beliefs or philosophy. The participants in their study demonstrated ambivalence about technology use and expressed concerns about the educator’s need for control when using technology. This was seen as going against the philosophy of supporting children’s independence and open ended learning as part of early childhood education (Lindahl & Folkesson, 2012).

Edwards et al. (2017) sought to understand the different roles technology has between ECEC settings and home environments. Drawing on Brofenbrenner’s ecological model, they found potential for thinking about technology provision in ECEC in a way that brought consideration of how and why educators are using (or not using) technology to the fore. Acknowledging that the use of technology is relative to the setting (be it home or ECEC) fosters the emergence of an understanding about how technology can most feasibly be used to support children’s learning and development (Edwards et al., 2017). They concluded that the role of technology in ECEC settings lacks clear guidelines and understanding, resulting in complex emotional responses amongst various educators.
2.5.2 Barriers to technology use

A multiple case-study design completed by Ertmer et.al (2012) also revealed the impact of a number of intrinsic and extrinsic barriers to technology use. Intrinsic barriers encompassed such things as pre-existing educator beliefs, attitudes towards the value of technology and self-efficacy in using technology and demonstrated that the attitudes of educators and their beliefs have important functions in supporting the integration of technology into educational activities (Ertmer et al., 2012). Extrinsic barriers included issues of access and affordability, professional development and workplace support. Whilst their study showed that the extrinsic barriers had greater impact on technology use, the authors acknowledged that their participants were all “award-winning technology-using teachers” (p.428), and hence their intrinsic barriers had been sufficiently overcome, yielding a lower result for the barriers’ impact.

When discussing educator barriers to technology use in early childhood education, it is important to distinguish between knowledge and beliefs. Calderhead (1996) defined beliefs as “suppositions, commitments and ideologies” (p.715) whereas knowledge is “factual propositions and understandings” (p.715). Whilst an educator may have the technical knowledge to operate technology, this does not lead them to believe in the value or importance of integrating this into pedagogical practice. In fact, researchers such as Clark and Peterson (1986) found that those more in favour of technology and more willing to experiment were more likely to adopt it in their teaching. This highlights the important need to understand what attitudes educators hold towards technology and what value they place on it in the first place before attempting to enhance support and educator professional-learning.

In a study that explored factors affecting technology integration, Blackwell et al. (2013) found that receiving professional development alongside collaborating on a technology policy or plan were both positively associated with technology use. Furthermore, the frequency of professional development also predicted an increase in technology use, indicating that building professional capacity is a key ingredient in the development of technological practices in early childhood education. This
research has demonstrated a need for further training of EC educators in order to achieve high quality technology integration. Effective models for building professional capacity in this respect call for professional learning experiences that address educators’ existing views and offer opportunities for articulating the role of technology in individual curriculum plans. As no specific guidelines or framework is available with the Australian context, the choice and nature of technology is left to the educators’ discretion (Kallery, 2015). This study will contribute to the development of effective professional-learning programs by providing a clearer picture of educators’ beliefs, attitudes and self-efficacy as a foundation for technology integration practices.

2.6 Chapter Summary
The significance of early childhood education in young children’s lives and the key roles of educators in shaping children’s learning and development demonstrates the need for focused research in this context. Acknowledging educators and the values they bring to pedagogy and practice can be a foundation for building professional capacity and fostering high quality education and care. With regards to the use of ICT with young children, technology is simply a tool that can be used in the early childhood learning environment to help provide exciting and challenging learning opportunities. Whilst important to understand the impacts and affordances of such technologies on children’s learning and development, policymakers must also encourage EC educators to act as mindful media mentors, with an understanding of their own personal beliefs and values.

Understanding self-efficacy can provide insight in the attitudes and behaviours of individuals. However, there is a gap in understanding such concepts in relation to EC educators. The current development of a supporting policy and framework for technology use in ECEC in Australia is not only critical to supporting the sector, but also presents an ideal time to initiate a change in understanding. It is important to take into account the ways in which individuals’ technical self-efficacy may influence individuals’ engagement with technology prior to the formation of curriculum plans or professional learning models.
Past research has indicated that low self-efficacy in working with digital technology specifically influences the integration of technology use. However, there is a distinct lack of attention awarded to understanding this in the early childhood educational context. This study brings awareness to the current climate of ICT integration in ECEC, acknowledging both the context specific and domain specific nature of self-efficacy as a key construct in achieving high quality technology use.

The following chapter outlines the processes and procedures completed in the current study designed to acknowledge and better understand how prepared educators feel to integrate technology meaningfully in Australian ECEC services. The study is designed to capture views from both pre-service and practising educators to explore the diverse workforce in the Australian early-childhood sector. This study will serve as the first step in addressing an area of education that has been under-researched in previous years.
Chapter Three Methodology

3.1 Introduction

In the US in 2012, the Fred Rogers Centre, in partnership with the National Association for the Education of Young Children, released a position statement that was designed to provide guidance to early childhood educators on effective uses of media and technology. This statement recognised the increased prevalence of digital media in the lives of children families and educators, as well as the important role educators play in supporting young children’s learning and development. An accompanying review of research indicated significant gaps in understanding educator levels of preparedness through teacher training and professional development.

The acceptance of technology use to prepare children for the “Knowledge Society” (Siraj-Blatchford & Siraj-Blatchford, 2010) is increasing, however little research exists about technological self-efficacy. The aim of this study was to understand educators’ levels of technology self-efficacy within their specific contexts and to determine the key factors that affect the integration of technology in ECEC settings.

The overarching research question that was investigated was:

*How prepared do pre-service and practising early childhood educators feel to integrate technology into early years settings?*

To collect data in response to this question, additional sub-questions were used to develop an understanding of participants’ self-efficacy towards ICT integration in the early-childhood sector. Each sub-question was designed to explore antecedents to self-efficacy judgements and identify other factors that may be at play.

1. *How self-efficacious do pre-service and practising early childhood educators feel about using technology with the children in their care?*
2. *How self-efficacious do pre-service and practising early childhood educators feel about using technology in management tasks?*
3. *How important do pre-service and practising early childhood educators believe technology is in children’s early learning and development?*
4. What do pre-service and practising early childhood educators perceive to be the obstacles and challenges to integrating technology in ECEC settings?

5. What do pre-service and practising early childhood educators see as their role in adopting new technology in early childhood education and care?

This chapter describes the research design and explains the choice of both quantitative and qualitative methods. It also explains the research procedures that involved the development of a data-collection measure as part of an embedded mixed-methods study. Finally, it describes the research design with relation to participants, data collection and data analysis.

3.2 Research approach

Over recent decades, the mixed-methods research approach has grown in popularity for its ability to address complex research problems. Whereas quantitative data may assist in providing a big picture, it is the personal story, captured through thoughts and feelings in qualitative data, that brings depth and texture to the research (Hodgkin, 2008). Given that self-efficacy is a personal and contextual concept, the need for appropriate data sources was clearly identified when designing the research study. In this research, mixed-methods research offered a practical approach to addressing the stated research questions and increased levels of applicability to the sector by examining them in different ways. Although quantitative data can provide an understanding of technical self-efficacy across a larger representation of the early-childhood sector, it does not consider the individual contexts of the diverse range of participants or offer the same level of insight into educator perspectives. Detailed research with a focus on educator attitudes and beliefs about technology integration is sorely needed given the changing nature of education in the current digital age and the potential impact of teachers’ perceptions on integration and support.

Whilst the design and implementation of any two mixed-methods studies will never be exactly alike, there are a number of key principles to consider during the research process (Creswell & Plano-Clark, 2011). The research process for this study was
established as a fixed mixed-methods design, whereby the use of quantitative and qualitative methods was predetermined and implemented as planned. Where the questionnaire data was proposed to provide a quantifiable measure of self-efficacy, the qualitative interview data was planned to provide a means to further explore the ways in which self-efficacy influences educator practice.

Embedded design is a mixed-methods approach in which the research combines the collection and analysis of data sets within a traditional quantitative research design (Creswell et al., 2011). The premise of embedded mixed methods is that a single data set is not sufficient; expansion of the data occurs when both quantitative and qualitative data components are included to increase its scope and breadth. In this research, the qualitative data was required to answer some of the secondary research questions due to the exploratory nature of the study. The concept of development was key in analysing the multiple data types. Development involves using one data-collection method after the other, with the foundation/primary research method guiding the secondary in terms of decisions regarding sample, measurement, and implementation (Creswell et al., 2011). Using contextual data to identify key characteristics ensured that diversity across participants was captured and guided some of the semi-structured interview in terms of completed training and qualifications.

### 3.3 Research Context
When analysing real-life situations, it is important to consider the participants’ contexts (Creswell, 2013): that is, not only highlighting similarities and differences between experiences and beliefs but also identifying components of culture or environment that may influence the results. The context for this research involved two participant groups from pre-service education settings and early childhood education centres to capture a broad picture of the early education and care sector. These groups are not mutually exclusive; rather, they capture a timeline of progression through the early-childhood sector, drawn together through the common theme of technology integration. They provide a global, broader picture on the nature of technology use across the sector, generating a discussion about the
integration of and engagement with technology in different contexts in early childhood education and care.

Research on teacher barriers to technology integration has previously focused on K-12 education and while this can provide a background for investigating early childhood educators, it is imperative to note the distinct variations between early childhood educators and K-12 teachers (Blackwell et.al, 2013). First, the variation with respect to education qualifications is a particular characteristic of the prior-to-school education context within Australia. ECEC services include staff from vocational training courses, including Certificate III level and Diploma levels, as well as tertiary-qualified teachers and, in some instances, specialised support staff. These educators are all considered within workplace ratios and many engage in the same professional development and learning opportunities.

This research recruited two groups of participants that reflected variations in qualifications and work experience across the ECEC sector. Whilst the potential for variations in attitudes and beliefs as a function of qualifications was not a focus of the current study, the diversity in qualifications and work experience of those working in ECEC services called for the need to include both participant groups.

3.3.1 Pre-service Early Childhood Educators
The sample of pre-service teachers was selected to ensure representation of the three levels of qualifications amongst early childhood educators: Certificate III, Diploma, and degree-qualified. TAFE NSW has been Australia’s leading provider of vocational education and training for more than 100 years (TAFE NSW, n.d). Early education and care is a key field of study within TAFE NSW, growing and evolving directly from the community and responding and adapting to the needs of the rapidly changing early-childhood sector. TAFE NSW offers a range of nationally recognised qualifications including Certificate III and Diploma of Early Childhood Education and Care. Graduates from these courses are eligible for work in long day care, preschools and many other prior-to-school settings. For this research, class locations were selected at the Wollongong and Shellharbour TAFE campuses. Both
campuses offer a range of early childhood education and care courses of study, providing access to students at a range of stages in their professional learning careers. Within both the Certificate III and Diploma programs of study, there are a number of units of competency that relate to the use of technology in early childhood education. Students are introduced to using audio and visual methods for gathering and documenting children’s information and technology is mentioned within the units as a new and emerging skill for children.

Overall, TAFE documentation is limited in its explicit links to information technology, with minor elements integrated into several units of competency. There is a recurring theme of documentation, observation and reflection with regards to technology use in early childhood.

The Faculty of Social Sciences at the University of Wollongong operates as an integrated faculty, offering undergraduate and postgraduate programs of study with a particular emphasis on flexible and blended delivery. The particular focus of this inquiry is the Bachelor of Education – The Early Years program within the School of Education. This degree was introduced in 2009 as a new approach to teacher preparation, with a high level of practical community engagement embedded in the students’ course work (UOW, n.d). The Bachelor of Education – The Early Years program is specifically designed for working with children from birth to five years of age and is formally recognised by the Australian’ Children’s Education and Care Quality Authority (ACECQA). As a result, students graduate as early childhood teachers and can seek employment in a range of prior-to-school settings such as long day cares and preschools, assuming roles of educational leader and/or director.

During the first session of year one of the degree, all students complete the core subject Learning and Teaching with Technology (EDIC101). This subject is very much an innovative and ‘emergent’ subject, constantly drawing on new research findings to inform practice. Students are exposed to a wide variety of computer applications and processes and encouraged to explore these weekly from a teaching and learning perspective. The subject outcomes are diverse and range from skill development to
the ability to evaluate software resources and critically engage with current research and ideas on educational technology.

3.3.2 Practising Early Childhood Educators

The Australian early-childhood sector has experienced dramatic change over the past five to 10 years, resulting in a very diverse network of educators and service providers. The demand for quality early childhood education and care is high across many metropolitan and regional areas, with access and cost often a primary concern for governments. Within the sector, service provision takes on many forms, each meeting the needs of families and caregivers in different ways. Services such as centre-based care, family day care and out-of-school-hours care all make up the broader early childhood education and care sector. For the purposes of this study, educators were selected from centre-based care environments. Centre-based care may be managed privately by small-business operators or, within larger franchises that operate numerous centres in a geographical area, or solely consist of community-based centres.

In addition to the diverse range of services within the sector, educators working in centre-based environments may also possess a range of skills and experience within their broader team. Qualified educators may come from a vocational-training background, such as a Certificate III or Diploma qualification or a tertiary-training background, holding a bachelor’s degree in early childhood education. Each of these qualifications differs in content and delivery methods as well as practical experiences; this means that educators often bring very diverse and unique skill sets to their workplaces.

3.4 Ethical considerations

When conducting research, it is important to consider various ethics issues of relevance to the study. This research study received ethical approval from the University of Wollongong’s Human Research Ethics committee with several key ethical considerations identified. The study focused on personal beliefs and self-efficacy towards technology use. As such, it was important that the participants felt
they could share their feelings without fear of judgement. The interviews were approached without any set ideas of “right” or “wrong” technology integration or judgements on appropriate use. The interview questions were structured to gain insight into educators’ perceptions of technology use and integration in early childhood education rather than judge the quality of current practices and support.

With regards to participant respect and privacy, the research demonstrated respect towards work and study environments as well as being honest about all aspects of the research. The participants were provided with detailed information on the purpose and methods used in the study and written consent was obtained from all prior to their involvement in the research (Appendices A and B). All participants’ right to privacy was respected, with no information made available that enabled personal identification of the participant or their workplace. The background history of each participant’s teacher training and technological experience was documented in a de-identified fashion. Participant identification was through workplace or study details only (i.e., TAFE NSW student, Diploma) when recording, discussing and analysing data. Information about the research clearly stated that participant involvement was voluntary and could be withdrawn at any time without prejudice.

Being reflective in nature and with voluntary participation, the research offered participants the opportunity to look at their own teaching perspectives as a guide for future practices. The objective research process ensured that ethical relationships were established and provided opportunities for connections between the University of Wollongong and the wider early-childhood community.

3.5 Research procedures

The research was completed through a range of established procedures as outlined in Figure 1.
Research Procedures

Figure 1

Development of self-efficacy measure:
*Early Childhood Technology self-efficacy scale (ECTSE scale)*

Document analysis
Pilot testing

Embedded mixed-methods study

Quantitative data collection
*Early Childhood Technology self-efficacy scale (ECTSE scale)*

$n = 240$

Qualitative data collection
Individual interviews with sub-set of participants

$n = 11$
3.5.1 Development of self-efficacy measure

A review of existing scales indicated that there were no suitable assessment tools for measuring technology self-efficacy for early childhood educators. The development of a new tool for use, drawing on ideas from existing self-efficacy items but taking into account the complex nature and current status of technology within the early-childhood context was clearly needed. Self-efficacy judgements are specific to the behaviours and contexts in which they occur and are measured by asking individuals how confident or capable they feel to manage or complete specific tasks (Laver et al., 2012). Scales to measure certain aspects of technology self-efficacy have been developed, validated and used extensively in research (Compeau & Higgins, 1995; Torkzadeh & Van Dyke, 2001; Kerckaert et al., 2015). While each of these scales offers strength in its own research context, more work was needed to develop a tool that was specific to self-efficacy in technology use in early childhood education. Whilst many previous tools also provided useful insights into the measurement of self-efficacy, one identifiable concern with many of the measures within these scales was their focus on component skills rather than assessment of one’s ability to carry out a task, providing an inadequate reflection of self-efficacy (Compeau et al., 1995). This was addressed in this study through the development of specific questionnaire items that required participants to assess their ability or confidence in completing tasks relevant to early childhood educators. The two key elements in completing this process included document analysis and pilot testing. Each element is outlined below.

3.5.1a Document Analysis

The research began with a document analysis, which is a means for generating new directions, lines of inquiry and perspectives (Gall et al., 2007). Analysis of government policies, frameworks, and legislation along with tertiary and vocational subject information outlines was conducted to provide contextual information on how important technology is believed to be within the broader early childhood curriculum, and to create a better understanding of the specific context for which a new data instrument was to be designed. The document analysis process needed to ensure that all other elements of the research design would be able to capture
current views and reflect the issues and concerns of educators. Identification of relevant data sources was drawn from the researchers existing experience in the early-childhood sector as well as collegial input. Such documents formed the backdrop for the use of technology in early childhood education within the contexts of the participant groups, addressing concepts relevant to the macro system of operation.

Documents used in this stage of analysis included:

4. University of Wollongong subject outlines – Bachelor of Teaching (Early Childhood) – study program years 1 to 4 and Bachelor of Education – The Early Years – study program years 1 to 3, University of Wollongong.
   a) EDIC101 – Teaching and Learning with Technology
   b) EYST302 – Science and Technology for Young Children
   c) ECIC102 – ICT in Early Childhood Teaching and Learning
   d) ECKS202 – Science and Technology in Early Childhood
5. TAFE Unit outlines and key skills documentation – Certificate III and Diploma level, TAFE NSW.

In the document analysis, technology was categorised into two types: ICT as a subject (teaching children awareness of technology and digital literacy) and ICT as an educational tool (used by educators to enhance and support children’s learning). Appendix C details the full method and results of this analysis, which took the form of interpretations supported by the documents listed above, which in turn allowed the researcher to generate appropriate and relevant items on the self-efficacy scale.
From the document analysis, a questionnaire consisting of three sections was designed, with a focus on ICT as an educational tool. The Early Childhood Technology Self-Efficacy (ECTSE) scale was created to ensure it was applicable within the Australian context. The new items were composed based on the previous phase of document analysis as well as consultations with early childhood educators and specialists. The initial version of the ECTSE scale developed for this study can be found in Appendix D.

Table 1 details the sections of the ECTSE scale, designed to capture a broad measure across the domain-specific context of early childhood educator technology self-efficacy.
Table 1

*Components of the Early Childhood Technology Self-Efficacy (ECTSE) scale*

<table>
<thead>
<tr>
<th>Section 1</th>
<th>Example items</th>
</tr>
</thead>
</table>
| Participant information, including education qualifications as well as work history. This ensured that whilst participants were not identifiable, a clear picture of the context of the individual is captured. | Are you currently working in the child-care industry?  
Are you currently studying?  
Do you recall completing any study relevant to using technology in your studies? |

<table>
<thead>
<tr>
<th>Section 2</th>
<th></th>
</tr>
</thead>
</table>
| EC educators’ perceived beliefs about their ability to complete tasks common to early childhood education and care services with regards to technology use. Items included teaching tasks as well as management tasks. | Develop learning experiences using internet resources  
Effectively manage a group lesson that involves the integration of technology  
Use database software to record information (fees, budgets, attendances etc) |

<table>
<thead>
<tr>
<th>Section 3</th>
<th></th>
</tr>
</thead>
</table>
| The integration and application of technology into the early learning environment, in accordance with the Early Years Learning Framework. This section was designed to apply specifically to the context of Australian early education. | Children are encouraged to use information and communication technology to investigate and problem-solve.  
Educators integrate technology into children’s play experiences and projects, helping children to identify the uses of technology in real everyday situations. |
3.5.1b Pilot testing

A pilot test was designed to support the development of the ECTSE scale. The focus of the pilot test was to measure and test the validity of its intended meanings. Following statistical guidance obtained during the pilot-study process, it was established that insufficient power (i.e. numbers of target participants) was available to complete quantitative measures of validity and reliability. As a result, a qualitative approach to the assessment of validity, reliability and sensitivity was adopted, allowing for the integration of participants’ own interpretations.

Participants

For the pilot study a small group of individuals were selected from a pool of volunteers from each of the three proposed participant settings: vocational education, tertiary education and the early-childhood sector. These individuals closely represented the intended participants of the research. A discussion-group session was held with 18 University of Wollongong students enrolled in their fourth year of the Bachelor of Early Childhood Education program and 13 TAFE NSW students from a Certificate III course at the Wollongong campus. Students within both these groups ranged from recent high-school graduates to mothers returning to study, with a combination of full-time and part-time study progressions. In addition, 13 early childhood educators working in a private long day care centre were asked to participate in the pilot study during a monthly staff meeting. Participants held a range of qualifications, from university-qualified teachers (n=4) to trainees (n=2), support staff workers (n=2) and Diploma-level staff (n=5).

Data Collection

Initial contact with pre-service educators was made through subject coordinators and class tutors. Following approval from these individuals, class times were established to approach students and provide information packages outlining the research. Practising early childhood educators were approached within their centres, through staff meetings or through established relationships with the researchers. The information package outlined the research and provided clear details about the collection of data, participant privacy and the manner in which data would be used.
Appendix A contains the participant information sheet provided to all potential participants, which clearly stated to student participants that their involvement would in no way influence their participation in their desired course of study. Appendix B contains the written consent form participants completed for participation, which was then stored securely for the duration of the research. Following completion of the questionnaire, an informal discussion was held using a focus-group protocol developed to guide the conversation. This allowed elements of the questionnaire to be further explored. Participants in each pilot group were clear in their discussion around issues of content validity and pattern answering.

Data Analysis
Based on findings and observations during the pilot study, a key revision for the subsequent inquiry was to modify the representation of the Likert-scale categories. Previously, category data had only been given for the extremes of the scale, describing a measure of 1 and a measure of 5. Feedback from pilot-study participants was that further clarification was required as to what each number represented on the scale. The ECTSE scale was modified, as shown in Appendix E, so that each number was clearly defined; this also allowed the researcher to capture clearer differentiations in self-efficacy magnitude. In addition, some wording of specific items was modified in each section to ensure clarity. For example, in Section One many participants failed to accurately demonstrate their completed study and work experience due to confusion with the wording. This section was redesigned and wording modified to ensure that all participants answered the correct questions relevant to their study and work experience. Finally, the design of the ECTSE scale was modified to shorten its appearance. Section Two had previously been displayed over two pages, and some participants did not fully understand the difference between the two scales. These were redesigned to be presented on one page, allowing the questionnaire to be presented across four pages in total.

3.5.2 Embedded Mixed-Methods
Following the development of the data-collection measure, the research progressed to an embedded mixed-methods design. The decision was made to conduct the
qualitative data collection within the same time period as the quantitative as the purpose of the supplemental data was to enhance and strengthen data collected through the questionnaire.

3.5.2a Participants
Participants from ECEC services were recruited using the researcher’s established relationships within the sector. Services in partnership with the University of Wollongong’s Early Start initiative were also involved. These services ranged from community-based preschools to private long day care services and preschools run by the NSW Department of Education (DoE). All centres were using technology to varying degrees, with some embracing new methods and other limited in their inclusion of digital technology. Directors were initially contacted via phone or email to arrange distribution of the questionnaires at the next possible staff meeting. In some cases, where centres were located in more remote areas or where time restraints were a factor, paper copies were left for completion during staff breaks along with postage-paid envelopes to return the paper questionnaires by post. Electronic questionnaires were also created and copies of a Survey Monkey web link were given to participants to complete in their own time.

Table 2 details the personal characteristics of the practising early childhood educators. Due to the hierarchy of employment within the early childhood education and care sector, staff possessed a variety of qualifications from both vocational and tertiary training institutions as well as differing levels of teaching experience. This diversity in staffing aided in capturing a wide cross-section of perspectives. Participants involved in the research held a range of positions from educational leaders, to Directors and support workers each involved in the care of young children from various age groups.
Table 2

*Personal Characteristics of Practising Early Childhood Educators*

<table>
<thead>
<tr>
<th>Qualification</th>
<th>Male</th>
<th>Female</th>
<th>Average Age (years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Certificate III</td>
<td>1</td>
<td>29</td>
<td>25.7</td>
</tr>
<tr>
<td>Diploma</td>
<td>0</td>
<td>35</td>
<td>32.9</td>
</tr>
<tr>
<td>Undergraduate tertiary</td>
<td>2</td>
<td>29</td>
<td>36.3</td>
</tr>
<tr>
<td>Postgraduate tertiary</td>
<td>1</td>
<td>4</td>
<td>48.4</td>
</tr>
<tr>
<td>Other</td>
<td>0</td>
<td>5</td>
<td>18</td>
</tr>
</tbody>
</table>

Sixty-seven TAFE NSW students and 79 tertiary students participated in the study; however, for the purpose of reporting results, a total of 146 were analysed within the student group. Of the student participants, only 23% were engaged in a form of employment within the early-childhood sector, most commonly as part-time or casual workers; this meant that work experience was minimal for the student group. Amongst the 94 practising early years educators, 64% were engaged in full time employment, with the majority indicating their workplace to be long day care.

Training and education completed by early childhood professionals varied greatly, demonstrating the diverse context of the research.

In consultation with academic staff at the University of Wollongong and head-teachers at local TAFE campuses, numerous class times were identified as suitable for data collection. Participants in the student group were from very diverse backgrounds, including young school leavers as well as mature-aged students returning to study and the workforce. Qualifications that students were working towards included Certificate III and Diploma at TAFE and Bachelor of Education – Early Years. Table 3 details questionnaire responses that show the personal characteristics of the pre-service early childhood educators.
Using the database of Section One questionnaire data and consent forms, individuals who had volunteered to participate in an interview were identified. Purposive sampling allowed the selection of individuals who could offer insight. In this instance, study, qualifications and teaching location formed the key inclusion criteria to ensure diversity of participants within the boundaries of the target population. Eleven interviews were planned, each occurring within one week of when the participant completed the questionnaire.

### 3.5.2b Data collection

Consultation with ECEC services determined the most convenient method of data collection. For most services, this was during an after-hours staff meeting or professional-development session. A presentation was made to educators that introduced the research and gave potential participants a clear understanding of the research requirements. This process took 10 minutes, followed by any additional question time. Once individuals agreed to participate, the questionnaire process took a further 15 minutes, after which completed questionnaires were collected.

<table>
<thead>
<tr>
<th>Qualification</th>
<th>Male</th>
<th>Female</th>
<th>Average Age (years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diploma</td>
<td>3</td>
<td>41</td>
<td>24.7</td>
</tr>
<tr>
<td>Certificate III</td>
<td>2</td>
<td>21</td>
<td>19.8</td>
</tr>
<tr>
<td>First Year – Bachelor</td>
<td>1</td>
<td>35</td>
<td>20.2</td>
</tr>
<tr>
<td>Second Year – Bachelor</td>
<td>2</td>
<td>10</td>
<td>20.9</td>
</tr>
<tr>
<td>Third Year – Bachelor</td>
<td>0</td>
<td>14</td>
<td>28.5</td>
</tr>
<tr>
<td>Fourth Year – Bachelor</td>
<td>2</td>
<td>14</td>
<td>23.8</td>
</tr>
</tbody>
</table>
Participants were thanked for their input into the research process and advised they would be contacted for interviews in the next week if they had consented to.

University and TAFE classes involving students at various stages of their study progression were visited, ensuring a wide cross-section of participants. In some instances, students were yet to complete practical placement in a centre and therefore had very limited sector experience. Prescheduled class times on the Wollongong University campus were allocated for research data collection through prior arrangements with subject coordinators and tutors. Five university classes were attended to capture students from each year of study and a total of three TAFE NSW classes were attended at Shellharbour (two classes) and Wollongong (one class) campuses. This captured students from Certificate III courses as well as Diploma courses.

At each class, as with the practising educators, a presentation was made to students that introduced the research and gave potential participants a clear understanding of the research requirements. This process took 10 minutes, followed by any additional question time. Once individuals agreed to participate, the questionnaire process took a further 15 minutes, after which completed questionnaires were collected. Participants were thanked for their input into the research process and advised they would be contacted for interviews in the next week if they had consented to be interviewed.

Appendix F details the interview protocol that, informed by quantitative data collection, involved the use of predetermined questions designed to create a sense of order for the interview and collect similar types of data from all participants. The overall interview was semi-structured, with the opportunity to explore issues that arose spontaneously, depending on the direction of the interview (Doody & Noonan, 2013).

The interview process involved one-on-one interviews with participants recruited through the quantitative phase of data collection. Interviews were held within a
week of completing the questionnaire to ensure participants’ views were still current and they felt part of the complete research process. One-on-one interviews ensured a truly individual response, allowing participants to offer a personal perspective of self-efficacy. As the research progressed and participant recruitment expanded, some interviews were moved to phone interviews. This allowed greater flexibility in scheduling as well as including participants from more remote areas who had since become involved. All interviews, both phone (n = 4) and face-to-face (n = 7) followed the same interview protocol. The major variation was the time of the interviews, with phone interviews progressing for approximately 30 minutes and face-to-face interviews closer to one hour. In both instances, interview dialogue was recorded electronically and later transcribed for analysis.

Individual interviews with the student participants were scheduled for mutually convenient times outside of class. Interviews followed the specified interview protocol and lasted approximately one hour. During this process, interview responses were recorded electronically and later transcribed for analysis. University participants completed these on the Wollongong campus whilst TAFE NSW students were met at a local café. Table 4 summarises the personal characteristics of those who participated in one-on-one interviews.
<table>
<thead>
<tr>
<th>Participant context</th>
<th>Gender</th>
<th>Age</th>
<th>Qualification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Practising educator – long day care</td>
<td>Female</td>
<td>41</td>
<td>Diploma</td>
</tr>
<tr>
<td>Pre-service educator – TAFE NSW</td>
<td>Female</td>
<td>18</td>
<td>Studying Certificate III</td>
</tr>
<tr>
<td>Pre-service educator – UOW</td>
<td>Female</td>
<td>32</td>
<td>Third year Bachelor of Education – The Early Years</td>
</tr>
<tr>
<td>Pre-service educator – UOW</td>
<td>Female</td>
<td>19</td>
<td>First year Bachelor of Education – The Early Years</td>
</tr>
<tr>
<td>Practising educator – preschool</td>
<td>Female</td>
<td>20</td>
<td>Certificate III</td>
</tr>
<tr>
<td>Pre-service educator – TAFE NSW</td>
<td>Female</td>
<td>25</td>
<td>Studying Diploma</td>
</tr>
<tr>
<td>Practising educator – private preschool</td>
<td>Female</td>
<td>22</td>
<td>Diploma</td>
</tr>
<tr>
<td>Pre-service educator – UOW</td>
<td>Female</td>
<td>19</td>
<td>Second year Bachelor of Education – The Early Years</td>
</tr>
<tr>
<td>Pre-service educator – TAFE NSW</td>
<td>Female</td>
<td>22</td>
<td>Studying Diploma</td>
</tr>
<tr>
<td>Pre-service educator – UOW</td>
<td>Female</td>
<td>26</td>
<td>Fourth year Bachelor of Early Childhood Education</td>
</tr>
<tr>
<td>Practising educator – long day care</td>
<td>Female</td>
<td>27</td>
<td>Early childhood teacher</td>
</tr>
</tbody>
</table>
3.5.2c Data Analysis

The study used a variety of methods to analyse the data. The ECTSE scale was analysed first, with findings shaping and informing the themes drawn from the individual interviews. The interviews were analysed to examine some items of significance found within the quantitative data as well as to add depth and expand on findings aligned with the research questions.

Early Childhood Technology Self-Efficacy (ECTSE) scale

Initially, descriptive statistical techniques, designed to organise and summarise the numerical data were applied to the responses to regarding technology use for children’s learning, technology use for management tasks and technology use aligned with the EYLF outcomes. Frequencies and averages indicated the spread of scores. Measures of variability, whilst not central to the study, indicated the dispersion of scores around the mean, providing insight into potential individual and group differences amongst participants (Gall et al., 2007). In addition to this, t-tests were conducted on all items to identify those of statistical significance. Differences between pre-service educators and practising educators were examined to better understand the variances between these two participant groups. These results were used to provide a framework for potential correlation within the collected qualitative data.

Individual semi-structured interviews

According to Creswell’s data-analysis spiral (2013), qualitative data analysis is not a linear approach; rather, it is a process of analytic iterations whereby findings are extracted from the collected data set. In this research, the interviews were transcribed and then coded to determine the key themes, categories, and ideas within the data. Table 5 provides an overview of the key broad themes that emerged from the data.
### Table 5

*Key Themes Drawn from Educator Interviews*

<table>
<thead>
<tr>
<th>Theme</th>
<th>Definition</th>
<th>Example quote</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technology use for children’s learning experiences</td>
<td>Using technology as a resource during learning experiences with young children as part of a daily routine or program</td>
<td>“…I don’t think we need robots or anything like that but I think using the technology you see everyday and that some children would see at home in a centre is good. It kind of extends their home environment to school to make them feel comfortable. I know I would prefer a centre that has some technology than none at all.”</td>
</tr>
<tr>
<td>Skill development</td>
<td>Learning of basic technology skills, through both pre-service teacher education courses and professional development</td>
<td>“We were talking about it on the way in. There were things we felt confident with after we tried them but because it was first year we thought, ‘Now, we’re getting closer to being in the field now so maybe it would be more helpful to do something at this time.’”</td>
</tr>
<tr>
<td>The importance of technology in early learning</td>
<td>How vital technology resources are in children’s early learning experiences as well as educators’ management tasks</td>
<td>“I think it’s important especially for preschoolers because when they go to school they’re going to be using computers, so it’s good for the industry to try and keep up with what’s happening elsewhere.”</td>
</tr>
<tr>
<td>Category</td>
<td>Question</td>
<td>Response</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>--------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Challenges to technology</td>
<td>What affects educators’ ability to embrace and effectively integrate technology into the different facets of their job</td>
<td>“I think access to things. I use my own iPad because we don’t have enough for everyone in the centre.”</td>
</tr>
<tr>
<td>Educators role in using technology</td>
<td>What educators perceive to be their role in using technology in early childhood education and care services</td>
<td>“Teaching with technology would be a shared experience- it’s not something that children do themselves so your role is to lead the children and help facilitate their use of it.”</td>
</tr>
<tr>
<td>Confidence (and origins)</td>
<td>Feelings towards being able to use technology effectively and where these feelings come from</td>
<td>“I don’t have a lot of confidence in a lot of technology but I seem to get through using a bit of trial and error.”</td>
</tr>
</tbody>
</table>
Thematic analysis is an effective approach for identifying, analysing, and reporting on patterns or themes in a meaningful and rich manner (Braun & Clarke, 2006). In line with this, relevant data was extracted through NVivo software to produce a table that compared responses amongst participants. This allowed the researcher to compare responses amongst participant groups as well as determine the frequency of certain codes or themes.

**Combining the data**

Merged data analysis allowed the study to examine the extent to which the qualitative and quantitative phases of data collection in Stage Two were congruent or divergent, and further explain any divergent findings (Creswell et al., 2011). In this study, the data was merged for side-by-side comparison, presenting the findings in a discussion format. This approach allowed for easy comparison and support between the different data sets. The primary data set (quantitative) was analysed, followed by the secondary data (qualitative). Decisions were made as to how the data could be integrated and interpreted to support or augment the research questions (Creswell et al., 2011).

**3.5.2d Quality of the study**

In a mixed-methods study, quality can be judged through the validity of the study. Literature surrounding mixed-methods research has debated how to deal with validity, being that qualitative and quantitative approaches employ different definitions and standards of validity (Creswell et al., 2011). Teddlie and Tashakkori (2009) suggest that the validity of mixed-methods research be measured by design quality and interpretive rigor, including the appropriateness of the research questions, design adequacy and analytic adequacy. For the quantitative component of this study, results were judged for content validity; that is, that the self-efficacy scale measured what it was intended to measure. For the qualitative component, the triangulation of data from multiple individuals determined the level of validity in the qualitative data sources.
3.6 Summary
This chapter has outlined the methodology and research design, including a detailed overview of the development of a new data-collection tool, integrating both document analysis and a pilot study. These key processes allowed a specifically tailored tool to be designed and presents a contribution to the area of technology research in early childhood education into the future. Due to the contextual nature of self-efficacy as a concept for research, this also ensured that the theoretical framework of the study was acknowledged in the broader instrument design.

The goal of the research was to provide a deeper understanding of educator perceptions and self-efficacy towards technology and to determine the key factors that affect the integration of technology in ECEC settings. A combination of data-collection methods was used, including the newly developed ECTSE scale, to provide a comprehensive account of educator views about technology. The following chapter provides an analysis of the data in relation to the specific research questions.
Chapter Four Results

4.1 Introduction
The aim of this research was to examine levels of preparedness for using technology in early-childhood learning environments, using self-efficacy as a foundation for understanding behaviours. A review of research in the area of technology and early childhood education indicates that despite an increase in the acceptance of technology for preparing children in the “Knowledge Society” (Siraj-Blatchford & Siraj-Blatchford, 2010), technological self-efficacy is limited. The results of this study are organised into six sections as a reflection of the research questions. The first section examines how prepared pre-service and practising early childhood educators feel for the integration of technology into early-years educational settings. The following five sections explore the remaining sub-questions for this study: 1) How self-efficacious do pre-service and practising early childhood educators feel about using technology with the children in their care? 2) How self-efficacious do pre-service and practising early childhood educators feel about using technology in management tasks? 3) How important do pre-service and practising early childhood educators believe technology is in children’s early learning and development? 4) What do pre-service and practising early childhood educators perceive to be the obstacles and challenges to integrating technology in ECEC settings? and 5) What do pre-service and practising early childhood educators see as their role in adopting new technology in early childhood education and care?

4.2 Educators levels of preparedness in integrating technology
Just as with any other resource, when integrating technology into an early-learning environment or experimenting with a new resource, educators should experience some form of preparation. The nature of this preparation may depend on the experience itself, the educators’ prior experiences and exposure to such resources as well as what is deemed most useful for professional development and training.

Two hundred forty responses to the ECTSE scale were analysed to determine how self-efficacious pre-service and practising educators feel in relation to technology integration. In addition to this scale, 11 participants were invited to complete an
interview exploring the issues that affect self-efficacy in a broader sense, including challenges and obstacles for technology integration as well as the level of importance or value given to technology use with young children.

The educational background of EC educators is varied with respect to both the level of qualification received and the awarding institution. While pre-service teacher education is guided by accreditation requirements (AITSL, 2015) there is still potential for variation in content and coverage. Participants were asked to indicate the level of training they had received in the use of technology as well as their familiarity with using it as part of the ECTSE scale. Table 6 presents a summary of completed training and professional-development courses across both participant groups.
Table 6

*Completed Technology Training Courses within Participant Groups*

<table>
<thead>
<tr>
<th>Examples of technology training completed</th>
<th>Pre-service Educators</th>
<th>Practising Educators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indicated they had completed technology training</td>
<td>70 participants</td>
<td>26 participants</td>
</tr>
<tr>
<td>48% of pre-service educators</td>
<td>28% of practising educators</td>
<td></td>
</tr>
<tr>
<td>“Presentations for subjects, using PowerPoint and Word”</td>
<td>“Use of SMART Board applications”</td>
<td></td>
</tr>
<tr>
<td>“EDIC101 first year”</td>
<td>“At Uni”</td>
<td></td>
</tr>
<tr>
<td>“Had a lesson on how to use Mac computers”</td>
<td>“Computer studies – making web pages, business studies, using Microsoft programmes”</td>
<td></td>
</tr>
<tr>
<td>Briefly evaluating a piece of software for use in a preschool setting during TAFE course”</td>
<td>“In primary education training”</td>
<td></td>
</tr>
<tr>
<td>“Business Administration Certificate and Microsoft Office applications”</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The scope of technology-specific training and education completed across all participant groups was varied: however, for most participants it was still quite insignificant, based on completed qualifications and work experience. Just under half of the pre-service educators had completed any form of technology training, and less than a third of practising educators. This could be attributed to the currency of educators’ teacher training, with one participant indicating she completed her undergraduate study between 1986 and 1989 and that “technology is very different now. Now additional study has encompassed technology related elements” (Playgroup facilitator, postgraduate trained). Participants also indicated that some of their technology training had occurred through non-education-based courses: these included certificates in administration and business management. This may suggest a limitation in the availability of education or pedagogically-based professional development. Another participant described her technology training as “self-taught” (Long day care educator, Bachelor’s degree) through using iPads with her own children and SMART boards in other educational environments such as her own children’s school classrooms.

Amongst pre-service educators, 48% recalled completing some form of study of technology within their pre-service qualification. This included the tertiary first-year subject EDIC101 – Learning and Teaching with Technology, which participants commented was more focused on technology hardware and software than on the underpinning pedagogical practices supporting children’s learning. Further to this, very few pre-service educators had experience with technology beyond using Microsoft Word and PowerPoint for assessment tasks, potentially compounding their lack of workplace experience with technology. This was further reflected when exploring levels of self-efficacy indicated in other data collected, where skills and basic integration of technology hardware remained the focus.
The references made by pre-service educators were surprising given the currency of their training and studies. One pre-service educator expressed concern that the level of exposure to technology had decreased nearing the end of her study and that some further practical experiences would be beneficial before entering the workforce:

There were things we felt confident with after we tried them, but we’re getting closer to being in the field now so maybe it would be more helpful to do something at this time to be prepared again. (UOW, Bachelor of Early Childhood Education - fourth year student)

Despite practical teaching experiences throughout the duration of their courses, many pre-service educators are obviously still not exposed to technology integration in actual learning environments: “Not having experience or any preparation training meant I wasn’t really thinking I was a five on the scale...” (TAFE NSW, Certificate III student). Moreover, one practising educator felt a distinct difference between her being able to simply “use” technology during her work as opposed to teaching children the skills themselves. This demonstrates a varied level of understanding as to the potential of technology in supporting and developing children’s learning.

4.3 Using technology in children’s early learning experiences

The nature of education and learning is changing with the introduction of new technologies. Trends in the use of digital technology indicate that when used effectively it can be an effective tool for improving program quality (Donohue, 2016). Despite an increase in the prevalence and availability of some digital technologies, the actual use of such items remains infrequent. One purpose of the current study was to develop a deeper understanding of the personal levels of self-efficacy towards common technology tasks within the context of early childhood education and care, as a possible explanation for why usage remains somewhat infrequent and limited. The first series of questions in the ECTSE scale explored pedagogical aspects of technology use, from educator-specific tasks to child-educator joint tasks. Educators indicated their self-efficacy towards each task on a five-point scale (1
being not at all confident and 5 being very confident), considering factors such as training, experience and knowledge.

The items used in this section of the ECTSE scale were chosen to clearly reflect the specific context in which pre-service and practising EC educators would be engaging with technology. Items were derived from existing literature as well as the researchers experience in ECEC services. These items ranged from basic technology tasks to more complex project-based approaches and pedagogical tasks within the learning environment.

Table 7 shows the mean score across the eight-item scale for both participant groups. T-tests comparing the responses across the two educator groups revealed significant difference between pre-service and practising educators in their preparedness and confidence in using the internet as a resource in their teaching. The two participant groups showed similar experiences in using music resources, playing digital video files or working with digital images with both pre-service and practising educators demonstrating quite high levels of self-efficacy for these tasks.
Table 7

The Means (and Standard Deviation) for Pre-service and Practising Educators for Their Perceptions on How Self-efficacious They Feel Towards Technology Use in Teaching

<table>
<thead>
<tr>
<th></th>
<th>Pre-service Educators</th>
<th>Practising Educators</th>
<th>T</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N = 146</td>
<td>N = 94</td>
<td></td>
</tr>
<tr>
<td>Create digital videos</td>
<td>2.97 (1.20)</td>
<td>3.11 (1.35)</td>
<td>-0.78</td>
</tr>
<tr>
<td>Create, organise, and manipulate digital images</td>
<td>3.73 (1.10)</td>
<td>3.47 (1.23)</td>
<td>1.68*</td>
</tr>
<tr>
<td>Play digital music or video files</td>
<td>4.33 (0.99)</td>
<td>4.19 (1.03)</td>
<td>-1.03</td>
</tr>
<tr>
<td>Develop learning experiences using Internet resources</td>
<td>4.21 (0.77)</td>
<td>3.74 (1.08)</td>
<td>-3.89**</td>
</tr>
<tr>
<td>Select developmentally appropriate software resources and game for young children (Internet resources)</td>
<td>4.15 (0.77)</td>
<td>3.54 (1.09)</td>
<td>-2.89**</td>
</tr>
<tr>
<td>Select developmentally appropriate software resources and game for young children (CD-ROM resources)</td>
<td>4.03 (0.89)</td>
<td>3.82 (1.11)</td>
<td>1.48</td>
</tr>
<tr>
<td>Effectively manage a group lesson that involves the integration of technology</td>
<td>3.39 (0.95)</td>
<td>3.29 (1.20)</td>
<td>0.66</td>
</tr>
<tr>
<td>Help to support and assist children to create their own documents for learning</td>
<td>3.47 (0.98)</td>
<td>3.28 (1.23)</td>
<td>1.29</td>
</tr>
</tbody>
</table>

* p<0.05  ** p<0.01
An analysis of responses to items 4 and 5 reached significance with pre-service educators indicating higher levels of self-efficacy than practising educators with respect to developing learning experiences using internet resources, \( t(240) = -3.89, \ p < 0.01 \), and selecting developmentally appropriate software resources for young children from the internet, \( t(240) = -2.89, \ p < 0.01 \). Lowest levels of efficacy were seen for more complex tasks like the development of digital videos \( (t(240) = -0.78) \), a pattern shared across both pre-service and practising educators. Not surprisingly, the highest efficacy was noted for the more simplest tasks like playing digital music and video \( (t(240) = -1.03) \).

Interview participants raised issues of security and privacy and the use of the internet, with one educator emphasising the need for educator and parent engagement with technology sources: “...there is so much more it could do. And, wearing my mum hat’ you just don’t know about security and things on certain devices” (TAFE NSW, Certificate III student). In this respect, little is known about the role of educators and families in supporting technology use; however, digital platforms can provide a context for adults to interact with children in a more comfortable fashion. For example, a parent with limited reading skills may have difficulty engaging in print books, while an e-book may be able to scaffold print reading, allowing the parent to interact more with their children (Robb & Lauricella, 2014).

4.3.1 The Early Years Learning Framework (EYLF)
The Early Years Learning Framework (EYLF) was developed by the Council of Australian Governments, in consultation with the early-childhood sector and early-childhood academics, to realise the vision of providing all young children with opportunities to maximise their potential and develop a foundation for future learning success (DEEWR, 2009). The EYLF draws on considerable evidence, both domestic and international, that early childhood is a vital period in children’s learning and development. The framework is designed for use by early childhood educators working in partnership with families, with specific emphasis on play-based
learning and the importance of communication and language in children’s social and emotional development.

The EYLF conveys three key principles for children’s lives ‘Belonging, Being and Becoming’ (Department of Education, Employment and Workplace Relations (DEEWR), 2009), and communicates these principles through five learning outcomes:

1. Children have a strong sense of identity.
2. Children are connected with and contribute to their world.
3. Children have a strong sense of well-being.
4. Children are confident and involved learners.
5. Children are effective communicators.

The items used in the third section of the ECTSE scale reflected outcomes 4 and 5, exploring the specific child-centred items of the EYLF. Processes such as collaboration and problem-solving were a focus, with children resourcing their own learning through connecting with people, places, technologies, and accessing information to make meaning and represent their thinking.

Table 8 demonstrates the mean scores across the nine-item scale for both participant groups (pre-service and practising educators). A series of t-tests were conducted to determine whether pre-service and practising educators differed in their sense of confidence or self-efficacy with respect to supporting children in using technology to extend their learning. Results revealed that pre-service educators were significantly more likely to feel confident in aligning technology use to the EYLF across all items than practising educators.
<table>
<thead>
<tr>
<th>Outcome</th>
<th>Description</th>
<th>Pre-service Educators</th>
<th>Practising Educators</th>
<th>T</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outcome 4 – Children are confident and involved learners</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Educators encourage children to explore the purpose and function of a range of tools, media, sounds and graphics.</td>
<td>3.80 (.81)</td>
<td>3.21 (1.11)</td>
<td>-4.79 **</td>
</tr>
<tr>
<td></td>
<td>Children are encouraged to use information and communication technology to investigate and problem-solve.</td>
<td>3.73 (0.78)</td>
<td>3.29 (1.06)</td>
<td>-3.73 **</td>
</tr>
<tr>
<td></td>
<td>Educators introduce appropriate tools, technologies and media to enhance children’s learning.</td>
<td>3.96 (0.79)</td>
<td>3.32 (1.23)</td>
<td>4.9 **</td>
</tr>
<tr>
<td></td>
<td>Educators experiment with different technologies.</td>
<td>3.98 (0.92)</td>
<td>3.23 (1.20)</td>
<td>5.38 **</td>
</tr>
</tbody>
</table>
**Outcome 5 – Children are effective communicators**

<table>
<thead>
<tr>
<th>Description</th>
<th>Mean 1</th>
<th>Mean 2</th>
<th>Z</th>
</tr>
</thead>
<tbody>
<tr>
<td>Educators and children engage together with technology in a fun and meaningful manner.</td>
<td>4.25 (0.82)</td>
<td>3.56 (1.17)</td>
<td>-5.31 **</td>
</tr>
<tr>
<td>Educators encourage collaborative learning about and through technology between children.</td>
<td>3.86 (0.97)</td>
<td>3.38 (1.17)</td>
<td>-3.4 **</td>
</tr>
<tr>
<td>Educators teach skills and techniques that allow children to explore new information and represent ideas using technology.</td>
<td>3.78 (0.91)</td>
<td>3.09 (1.06)</td>
<td>-5.33 **</td>
</tr>
<tr>
<td>Educators integrate technology into children’s play experiences and projects, helping children to identify the uses of technology in real, everyday situations.</td>
<td>4.05 (0.80)</td>
<td>3.16 (1.12)</td>
<td>-4.97 **</td>
</tr>
<tr>
<td>Educators integrate technology into children’s structured learning activities using tools for designing, drawing, editing, reflecting, and composing.</td>
<td>3.86 (0.86)</td>
<td>3.23 (1.09)</td>
<td>-7.2 **</td>
</tr>
</tbody>
</table>

* p<0.05
** p<0.01
Mean scores for each item demonstrate that pre-service educators assessed their self-efficacy in aligning technology to EYLF outcomes higher than practising educators. Further analysis of the responses indicated significance for every item, at a significance level of $p<0.01$. Even within outcome 4, one item that did not explicitly mention technology (“Educators encourage children to explore the purpose and function of a range of tools, media, sounds and graphics”) still indicated significance, $t(240)=-4.79, p<0.01$. Differences across the two educator groups may be due to pre-service educators having limited to no practical teaching experience, and therefore less of an understanding of any practical implications or challenges for using technology.

It is worth noting that many of the practising educators had completed their professional training and education before the release of the EYLF in 2009 and whilst their understanding of its implementation across certain learning areas may have been strong, the relationship between technology and the EYLF may not have been so clear. Document analysis of the EYLF also demonstrated limited reference to digital technologies, providing few clear practical strategies in which educators could actively engage. Educators are encouraged through the EYLF to promote children’s learning through outcome 4 by “introducing a variety of tools, technologies and media and providing skill development for young children” (DEEWR, 2009). The issue of self-efficacy is also introduced in the framework, where educators are encouraged to develop their own confidence in using the technologies available to the children: however, the availability of suitable resources and support to do so appears limited, something that was reinforced by a number of the participants in this study:

“I think I probably gain more confidence by doing some sort of specific learning or professional development. I think places like TAFE and WEA have a few courses, but they probably won’t help with using it to teach young children” (UOW Bachelor of Early Childhood – fourth year student)

Whilst neither pre-service nor practising educators made direct reference to the EYLF throughout the interviews, four practising educators spoke about engaging with
children and learning together: “learn as the children learn” (Long day care, Diploma-trained). This relates to outcome 5, where educators and children engage together with technology. These practising educators had accepted that the children in their care could inform and support their technology practices, and used this to facilitate engaged and reciprocal teaching and learning experiences. Despite this, references to the important learning outcomes and pedagogical practices was very limited.

4.4 Using technology to support management tasks
In addition to the pedagogical uses of technology for early childhood educators, a number of managerial and administrative tasks comprise educators’ work. These include but are not limited to submitting attendance records for government childcare rebates, communicating with families and parents, and documenting correspondence and enrolment details to sustain service delivery. Those who study for a degree often step into leadership roles that may require elements of management; others at varying qualification levels may aspire to owning their own services. Either way, their level of managerial and administration work is likely to increase. Whilst some elements of technology use in educators’ personal lives may transfer to management tasks easily (i.e., use of email, word processing), additional tasks that educators can encounter challenge traditional ICT use.

The items used in this section of the ECTSE scale were again chosen to clearly reflect the specific context in which pre-service and practising early childhood educators would be engaging with technology outside of pedagogical experiences. Items explored the types of software that may be used and educators’ feeling of self-efficacy towards achieving their required tasks using such a resource. Educators indicated on a five-point scale (1 being not at all confident and 5 being very confident) their self-efficacy towards each task, considering factors such as training, experience and knowledge. Table 9 shows the average score across the seven-item scale for both participant groups. T-tests were conducted to determine whether there were significant differences between pre-service and practising educators in their attitudes towards technology for management tasks.
Table 9
The Means (and Standard Deviation) for Pre-service and Practising Educators for Their Perceptions on How Self-efficacious They Feel Towards Using Technology in Management Tasks.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Pre-service Educators</th>
<th>Practising Educators</th>
<th>T</th>
</tr>
</thead>
<tbody>
<tr>
<td>Create presentations for staff meetings or training days (e.g., using PowerPoint)</td>
<td>4.23 (0.87)</td>
<td>3.58 (1.23)</td>
<td>5.26 **</td>
</tr>
<tr>
<td>Create word-processed documents including newsletters</td>
<td>4.57 (0.77)</td>
<td>4.22 (1.22)</td>
<td>-3.32 **</td>
</tr>
<tr>
<td>Use spreadsheets to record statistical information (attendances, payments)</td>
<td>3.43 (1.22)</td>
<td>3.22 (1.37)</td>
<td>-1.24</td>
</tr>
<tr>
<td>Use database software to record information (fees, budgets, attendances)</td>
<td>3.02 (1.35)</td>
<td>3.01 (1.20)</td>
<td>-0.32</td>
</tr>
<tr>
<td>Use email to keep in contact with various business and professional organisations</td>
<td>4.56 (0.77)</td>
<td>4.42 (1.05)</td>
<td>1.2</td>
</tr>
<tr>
<td>Read and comment on professional blogs, websites and RSS Feeds</td>
<td>3.80 (0.95)</td>
<td>3.76 (1.12)</td>
<td>-0.38</td>
</tr>
<tr>
<td>Store and organise information on digital media (USB drives, CD-ROM)</td>
<td>4.74 (0.65)</td>
<td>4.29 (1.11)</td>
<td>-3.91 **</td>
</tr>
</tbody>
</table>

* p<0.05  ** p<0.01
4.4.1 Context of use

The contexts in which pre-service educators and practising educators make use of technology are very diverse, and are shaped by the requirements of their work and/or study. The mean scores in for each item presented in Section Two of the questionnaire demonstrated a higher level of self-efficacy amongst pre-service educators. However, t-tests revealed that these differences only reached significance for three items. There was a significant difference between participant groups in their use of PowerPoint \((t(240) = 5.26, p<0.01)\) and Word materials \((t(240) = -3.32, p<0.01)\), with pre-service educators indicating higher levels of self-efficacy for both items. The use of digital media to store and organise information was rated the highest for both participant groups although pre-service educators expressed significantly higher efficacy, \(t(240) = -3.91, p<0.01\).

These results reflect the context in which all participants were working; for example, students were more frequently exposed to assignments and assessments, which demanded the use of software such as PowerPoint and Word. For one pre-service educator, the use of such products with young children had not been explored before in her studies:

> We use them at TAFE for our class presentations and things, but we haven’t looked at them for teaching really. I guess that would be interesting to get the kids to use them. (TAFE NSW, Certificate III student).

In addition, participants in both groups expressed less confidence about the use of database software, with a mean score of just over 3 for both groups. This was reinforced in an interview with one educator, who clearly explained that her position within the centre influenced her exposure and experience and, as a result, her self-efficacy with using specific technology and software:

> I don’t know much about databases so I wouldn’t feel confident with that. We record attendances and things and then our Director uses the software to record it as is needed. If you asked her she would probably be much more confident and skilled in that area. (Educator, Private preschool, Diploma-trained)
Whilst many may consider database management a rarely used skill in early childhood education, the management of fees structures, enrolments and other administrative aspects of early-childhood services can very much make use of database software.

4.4.2 Educators versus children as users of technology
Analysis of the interview data showed that technologies in many early-childhood settings are still reserved for educator use. Both pre-service and practicing educators spoke of using newer mobile devices for image capture and online documentation and communication platforms:

Technology helps my own observations – I just find it easier to make notes on before my programming time. We’ve just started using an app that we can share and communicate with families… But it’s going to take a bit to get used to. (Early childhood teacher, Long day care)

One educator indicated that the use of technology for observations and family communication had come from their upper management, and that staff were struggling to adjust due to a lack of training before its implementation. As Ertmer et al. (2012) found, support and training are imperative to generating positive experiences with technology and promoting higher levels of self-efficacy amongst users. Without this, participants indicate that their levels of self-efficacy, and hence engagement, are compromised.

4.5 Importance of technology in children’s early learning and development
One of the key themes observed from the qualitative data analysis referred to the value individual place on technology and the importance it has in their pedagogical beliefs. Throughout the interviews it became apparent that the level of value given to the importance of technology in ECEC strongly influenced the educators’ technology use and interest in learning more. This theme correlates directly with the notion of self-efficacy: individuals’ sense of value and achievable outcomes can directly influence their personal behaviour choices. Ten participants indicated that they were interested in further training however, 35% of these specific individuals
flew they would do so merely to “keep up” (UOW, Bachelor of Education – The Early Years, second year student).

Educators were asked to reflect on where they felt technology should sit within their pedagogical practices, as well as on their own personal self-efficacy towards technology, both within education and in general. This was designed to elicit variations between personal technology use and use in teaching. Interestingly, one of the key values that both participant groups gave to technology was in relation to school readiness and transitions. Thirty-eight percent of educators interviewed strongly felt that technology should be used to add value to school-readiness programs and support children during their transition to formal schooling. Practising educators demonstrated a greater understanding of the support and opportunities technology could facilitate for young children in their care:

Some children don’t have access to technology in their home environment so giving them access to it in an early-childhood environment would give them more social capital in terms of starting school…. ( Educator, Preschool, Certificate III trained)

As the participants were advocates for the early childhood education and care sector, they also valued technology as a way forward for the sector in demonstrating value and justification for the importance of early childhood education in establishing strong and positive learning foundations for young children:

I think it’s important especially for preschoolers because when they go to school they’re going to be using computers so it’s good for the industry to try and keep up with what’s happening elsewhere. (Educator, Long day care, Diploma-trained)
For two pre-service educators, the value of technology in early learning was not something on their radar:

The more I talk to you about it, I think the more I build up a value towards it. I’ve seen it with my children and I know they use it more and more, so it is probably only a matter of time that it comes down to early childhood (TAFE NSW, Certificate III student)

This may be attributed to a range of intrinsic and extrinsic factors, including work experience, study programs and general technology usage outside of educational contexts. In addition, one pre-service educator who was still wary of full integration for young children and wished to avoid what another pre-service educator had termed a “tick the box – we have technology” (UOW Bachelor of Education – The Early Years, third year student) approach:

I think it could be really important considering how much use they’re going to get out of it over their lifetime. Everyone uses it now so [they’ll] probably need it in a way. So they’re not relying solely on it but use it in a way that they still understand the importance of gross motor and physical activity and stuff, and not just a ‘do this but don’t do that’ type of thing. (UOW, Bachelor of Education – The Early Years, second year student)

4.6 Obstacles and challenges associated with technology integration
The increased prevalence but continued under-use of technology in early childhood education makes it imperative to understand barriers or challenges faced when integrating technology into early-childhood environments. Previous studies have attempted to highlight various factors that influence the effective implementation of technology in the early years learning environment (Blackwell et al., 2013). Within this study, extrinsic barriers dominated participants’ responses; however, it should be noted that overall awareness of the importance of confidence and self-efficacy was relatively high, with means ranging from 2.97 to 4.74 amongst pre-service educators and 3.01 to 4.42 among practising educators.
4.6.1 Training and Skill Development

Skill development is a key consideration for educators when planning for technology use in their teaching. Educators indicated a high level of discomfort with “trial and error” approaches and with finding their own resources, and very much preferred the opportunity to develop the appropriate skills in pre-service courses or professional development: “I think I probably gain more confidence by doing some sort of specific learning or professional development.” (UOW Bachelor of Education – The Early Years - third year student). This was particularly the case for activities specific to the education context, such as selecting appropriate resources and developing learning experiences using internet resources. Participants saw activities unique to the educational context, especially those grounded in effective pedagogy, as necessitating more-structured professional learning opportunities.

Experience and support were also key themes that emerged from the interview data. Around two-thirds (n = 64%) of educators interviewed valued the potential for technology integration to “enhance children’s learning experiences” (UOW Bachelor of Education – The Early Years, first year student). Without adequate support and planning, technology integration will have less effect and less positive outcomes (Ertmer et al., 2012). However, there are questions about how strongly this can be overshadowed by challenges or obstacles that educators face, including the need for training and further skill development, lack of available time and limited access to technology. Ertmer et al., (2012) suggested that replicating technology tools in authentic professional-development offerings were key to overcoming many of these barriers. Web 2.0 technologies such as blogs and wikis were identified as ways for the early-childhood sector to develop new ideas for their teaching in a continual, collaborative and “on the job” fashion (Ertmer et al., 2012, p. 434). These items were scored moderately on the ECTSE scale (3.76 for practising educators and 3.80 for pre-service educators), with one educator explaining in her interview;

…there were things like the RSS feeds – and I don’t even know what that is – and the professional blog we never really had exposure to. We’ve just really mainly used journal articles and accessed those things. (UOW Bachelor of Early Childhood Education, fourth year student).
By far the greatest challenge identified by both pre-service and practising educators was the notion of workplace experience and experimentation. Eight out of the 11 interview participants addressed this in their response, highlighting the need for time and training to develop their confidence and skills. A number of educators felt they needed time to experiment with the technology. This was seen as integral to effective pedagogical integration and daily application: “...educators experiment with the technologies and then having enough knowledge to then [help] the children.” (UOW, Bachelor of Education – The Early Years, third year student)

4.6.2 Lack of available time
When speaking with early childhood educators, it became clear that technology was still very new to early childhood education and that time to experiment and explore more complex tasks was very much a limiting factor in its development and curriculum integration. Respondents preferred to have the opportunity to experiment and test technology before using it with children. However, this was not always available to staff, with a combination of pre-service and practising educators indicating they struggled to find time to experiment and test resources:

“I think having the time for educators [to] experiment with the technologies and then having enough knowledge to transfer it to the children’s experiences is our biggest challenge.” (UOW Bachelor of Early Childhood Education – fourth year student)

4.6.3 Limited access to technology
Whether on practical teaching experiences or professional placements or working in centres, all of the participants interviewed noted that access to technology was a challenge. One pre-service educator shared a story of a centre with limited technology: “The centre I was working in didn’t have much. I mean they had a computer for the staff and things but couldn’t use it with the children” (TAFE NSW, Diploma student). From this stemmed discussion of and noting of issues concerned with budgeting and funding available at different services; for example: “Our centre just doesn’t have the money to buy much equipment.” (TAFE NSW, Diploma student). This limited access, whilst it may be considered a logistical and financial
consideration, does have implications for the pedagogical value of technology. As discussion about access continued with one participant, who described the impact that limited access to technology may have on broader educational outcomes:

“What I hadn’t really noticed was the specific outcomes with technology. It makes me wonder what we might be missing by having a limited offering for the children...I mean children are encouraged to use it to investigate and problem-solve where possible...I know for myself it isn’t my first thing I go to. And that’s because it isn’t readily available on the floor.” (TAFE NSW, Diploma student)

4.7 Educators’ role in adopting technology

Educators personal views on their role in young children’s use of technology will influence their pedagogy and behaviours in the same way as their views on the importance of technology (Nikolopoulou et al., 2015). An individual’s personal teaching philosophy will affect their view on the educator’s role and their position in accepting and integrating technology in early-learning environments.

Currently within the Australian early-childhood context there is no framework or policy that clearly outlines the role early childhood educators should play in using technology in their services. This lack of framework was evident through the level of uncertainty present among practising educators. Practising educators in particular were unable to articulate their exact role; however, they believed it involved balancing technology use with existing curriculum practices and not letting it overshadow children’s natural learning experiences:

“There needs to be a balance between...general screen time and natural experiences. What they can see in one area they can then see in the real world and vice versa. What they may not be able to see in the real world they can access and see on the technology.” (UOW, Bachelor of Early Childhood Education, fourth year student)
One practising educator felt that her role was to leave it to other staff, indicating that technology is very much considered as something used in isolation from other learning experiences:

“...got to weigh up the benefits. I personally, in a work environment, prefer to let someone else do the technology bit of it and I would do the playing in the mud bit.” (Preschool educator, Diploma-trained)

Typical comments from pre-service educators suggested a need for scaffolding, supporting previous notions of using technology with children in supportive and encouraging contexts. This demonstrates a different level of understanding, as pre-service educators could articulate more clearly how their role with technology merged with more traditional early-childhood teaching philosophies. Pre-service educators felt that technology was to be a shared experience: “It’s not something that children do themselves so your role is to lead the children and help facilitate their use of it.” (Preschool educator, Certificate III).

4.8 Chapter Summary

The results presented in this chapter provide an insight into educators’ levels of self-efficacy towards technology integration in early education. The data highlighted the external factors and personal beliefs that may affect self-efficacy when using technology with young children, including training and support, personal teaching philosophies and contexts of use. A combination of data sources was analysed to examine the research questions, and the findings revealed that educators across a variety of teaching qualifications and work contexts appeared to have mid-range self-efficacy regarding technology integration.

When assessing how self-efficacious pre-service and practising early childhood educators were using technology with the children in their care, it becomes clear that technology use is still very much at a basic level. Educators feel most self-efficacious completing tasks that hold some resemblance to their personal contexts, such as playing music and video files or managing digital images. Pre-service educators demonstrate higher levels of self-efficacy across many items particularly
using the internet to resource and expand their teaching experiences. However, the same educators also mentioned that they did feel under-prepared by their various levels of teaching training, and would be interested in further study of technology issues. Practising educators felt less self-efficacious, attributing this to insufficient time to experiment with technology and to test and trial experiences and resources prior to use with children, as well as to limited access to technology across settings.

As qualitative responses were integrated with quantitative data, the findings began to suggest that a number of factors affect feeling of self-efficacy beyond the realm of technology. Personal views on the value and importance of technology, as well as philosophies of educator roles within the learning context, were strong predictors of behaviour (and hence self-efficacy). These findings underscore the influence of the educational context and level of experience on achieving positive and appropriate levels of technology integration.

The following chapter discusses these results in relation to the research questions and literature in the area of self-efficacy and technology use in early childhood education. Research limitations, directions for future research and practical implications are also addressed.
Chapter Five Discussion/Conclusion

5.1 Introduction

The aim of the current study was to understand levels of technology self-efficacy, within the specific context of ECEC as a way to examine how prepared EC educators are to integrate technology into their work. Devising a tailored instrument that allowed this to be done against a foundation of early-childhood literature and policy documents ensured that current trends and revisions within the sector were addressed. This instrument also allowed insight into educators’ preparedness and self-efficacy to effectively use technology in early-learning experiences to be more deeply explored. The findings identify some of the potential challenges that affect educators’ self-efficacy and their use of technology to support children’s learning. Overall, the findings from the study show that educators feel under-prepared to integrate technology in their teaching activities, with practicing educators indicating lower levels of self-efficacy for effective and appropriate technology integration than pre-service educators.

The current study was designed to develop a deeper understanding of how prepared and confident EC Educators feel about the use of technology within ECEC settings. Technology and interactive media have become an increasing presence in the lives of children and families. Early childhood educators have an important role to play in supporting effective practice as well as accessing developmentally appropriate resources. This is a technological age, yet many educators’ initial training can be traced back to a time where technology was less of a presence; as a result, variations were seen between pre-service and practising educators. It is therefore important to develop a deeper understanding of the potential for variation in use and attitudes as a function of educators’ characteristics. The following chapter draws on research findings in examining factors that influence educator beliefs and attitudes while exploring the potential for variations as a function of context (i.e., differences between pre-service and practising educators).

The first section examines how prepared the educators felt about integrating technology into early educational settings, and the following section considers
possible differences in technological self-efficacy among pre-service and practising EC educators, both in learning experiences and to support management tasks. The next section explores how important pre-service and practising EC educators believe technology is in children’s early learning and development. The fourth section considers challenges the educators identified in their use of technology in ECEC settings followed by what educators perceive their role to be in adopting new technology in early childhood education and care. The final section discusses potential implications of these results for future research and policy development in the area of technology integration in early childhood education. Overall, the study provides insight into personal influences on technology integration specific to early childhood education, a sub-group that has not been well represented in previous research and literature on technology integration in formal education.

5.2 Preparedness of early childhood educators to integrate technology

Technological support and education are considered significant factors in facilitating greater technology integration in early childhood education (Yurt et al., 2011). Educators are expected to follow technological innovations and adapt them to their learning environments. Yet the questionnaire data in this study suggested that the scope of technology training completed by both pre-service and practising educators was very limited and that, as a result, many educators felt under-prepared. Although educators have positive attitudes towards the use of technology in learning environments, it can be said that they require a more complex understanding of quality technology use that enhances learning. The demand to remain up to date with ever-evolving technology hardware appears to have resulted in a decrease in feelings of preparedness and therefore in confidence with technology use. It is necessary for educators both pre-service and in-service to have technology education that enables them to follow the latest trends, be aware of opportunities and possibilities in using technology and possess the basic skills and information to succeed (Yurt et al., 2011).

Participants who had completed technology-related training, either within their study or as a professional-development course indicated that they felt it was
insufficient and failed to progress beyond the basic. As a result, their technology use was still very much skill-focused. Without further developing this basic level of competence, educators can fail to move beyond skill development to embrace technology as a broader element within their curriculum planning in alignment with the EYLF. One way of addressing this is to provide for rich hands-on experiences with technology. Findings from a study by Lux and Lux (2015) demonstrated the positive impact of engaging in technology-rich field experiences for primary educators. Pre-service educators completed a range of authentic practical experiences using technology, and demonstrated that these experiences significantly influenced perceptions of pedagogy and technology. Positive impacts included confirming existing teaching and learning beliefs, introducing new ideas regarding pedagogical practices and inspiring valuable awareness of innovative uses of technology in ECEC settings (Lux & Lux, 2015).

Overall, the level of preparation, training and support received by early childhood educators, both pre-service and practising, in integrating technology is limited. Whilst this can obviously be associated with the availability of professional-development courses and the content design of pre-service education programs, there may be any number of additional external and intrinsic factors influencing educators’ perceptions of preparedness. Motivation and incentive to be innovative with technology is low if there is a lack of understanding of what technology can bring to early childhood education environments, both for children and educators. This is associated with the multiple obstacles and barriers faced by educators in using technology, discussed later in this chapter.

5.3 Self-efficacy in using technology with young children
Knowledge, skill and prior experience are not the only predictors of personal behaviours: individuals’ personal judgements of their knowledge, skills, and strategies all enter into the formation of efficacy beliefs that can influence personal levels of success. Bandura’s social cognitive theory and the construct of self-efficacy, when applied to the use of technology, suggests that people with higher levels of self-efficacy will engage more frequently in technology-related activities and persist
longer in coping with barriers or challenges. As a result, self-efficacy can be a key predictor in actual task performance. It is imperative to understand educators’ beliefs and recognise their influence on engagement and actual pedagogical practice as a first step towards effective sector development (Nikolopoulou & Gialamas, 2009).

With regards to self-efficacy levels when using technology with young children, the quantitative data indicated mid-range to high scoring for self-efficacy. Further exploration through the qualitative data, however, demonstrated that this was not always reflected uniformly in practice. The overlap between pedagogical tasks, such as accessing online music and videos, and personal technology use demonstrated areas of higher self-efficacy. Educators’ skills in digital technology in their personal lives corresponded with a higher measurement of self-efficacy. However, tasks that were specific to the educational context or required engagement with children resulted in apprehension and lower levels of self-efficacy. The implementation of technical resources and the ability to effectively enhance children’s learning was still limited, regardless of training, experience or participant attributes. Whilst some of the educators in the current study held positive attitudes towards the use of technology, they required more support to ensure that this would translate to practice. Educators may use technology because they have access to it but still feel limited in what they can achieve with it (Blackwell et.al., 2013). Findings from the current study align with previous research (eg. Donohue, 2003), showing that educators need time to play, explore, discover and integrate these experiences with their existing knowledge of developmental theory and research to better use technology as they desire or as they feel the technology affords. This suggests that technology integration requires adequate resource allocations as well as a vision for where it fits into existing curriculum practice to achieve high-quality use.

In 2015, Early Childhood Australia conducted their “DigiBiz” survey of early childhood educators across the country. The survey was specifically designed to better understand how early childhood educators keep up with digital technology and how they can use it. The results showed that services with a digital-technology
plan or strategy gain more from their technology than those without. Having a clear educational goal in mind before using an app, website, digital camera or any other digital tool assists educators to use technology appropriately (Robb et al., 2014). Educators with a digital plan are also able to remain up to date with technology and have specific avenues in place to achieve this, ranging from internal technology champions to external support. Because participants indicated in this study that the practical application of technology in accordance with curriculum guidance is their greatest point of concern, professional engagement within the sector is required to better facilitate high-quality technology use that is aligned with all other areas of education and care. Having a technology plan puts technology at the service of early education and care – not the opposite. Educators can build on existing skills and knowledge and include strategies to build these practices into everyday systems as well as regular planning cycles.

Planning for the use of the technology rather than relying on chance is the key to high quality and enables educators to be intentional. However, resources, materials, and support from experts in the field are necessary to do so, and participants indicated a high level of willingness to engage in such support and development. Blackwell et al. (2013) suggested that providing a technology policy that lays out how to appropriately integrate technology to meet the developmental needs of young children was the first step in increasing professional capacity. The dynamic relationship between teacher confidence, attitudes and use of technology demonstrates the importance of targeted professional support and strong technology visions in ECEC settings (Blackwell et al., 2014).
5.4 Self-efficacy in using technology for administration and management

For educators across the early-childhood sector, digital technology has changed the way in which they manage finances, keep records, write newsletters, give presentations, and upskill themselves (Donohue, 2016). Blackwell et al. (2013) identified uses of technology for administration tasks in ECEC settings, showing that newer mobile technologies are used predominantly for administration tasks including communicating with parents, documenting children’s learning and online professional development. This correlates with the practical strategies described by the participants in this study, who found that mobile technologies required “less time away from the children” (Preschool educator, Diploma-trained).

Managing an early-childhood service involves many complex daily tasks and challenges for which specific technology tools are appropriate. Whilst these tools can aid in making these tasks more manageable, the results of this study indicated that educators’ self-efficacy for the use of specific technology for management tasks in ECEC settings was limited. In particular, practising educators felt less confident with using programs such as spreadsheets, databases and presentation tools. Further analysis into the reasons behind this would indicate whether it is the skills required or the tasks themselves that yielded such a response. For example, some of the practising educators surveyed are not involved in management processes, and hence have a lower understanding of the skills required in maintaining attendance records and budget-keeping. Pre-service educators considered creating documents such as email, Microsoft Word documents and PowerPoint presentations achievable tasks, with many indicating that this stems from their current study requirements: “We’ve used all those programs for our assessments and to make class presentations” (UOW Bachelor of Education – The Early Years, Third year student). These results align with previous responses to an international online survey (Donohue, 2003) that found that whilst many educators are making use of technology for service management, their use is constricted by the individual needs of each service and the skills of the administrator responsible.
Leadership and management is a key quality area within the National Quality Standard (NQS), with 13 elements within the standard, each contributing to overall centre quality as assessed by the NQS. Many practising educators who are currently operating in management positions may feel under-prepared, due to the lack of acknowledgement given to the important of technology in many leadership and management facets. The provision of professional learning opportunities that acknowledge the requirements of such roles and provide suitable training resources is key to ensuring educators are willing to take on management positions, feel confident in the use of technology to support their work, and use it to its full potential. Technology in this capacity has the potential to raise the professional profile of early childhood education and more importantly, ensure that educators are connected across a community of practitioners.

5.5 Importance of technology for early learning
Research in 2003 indicated that early childhood educators held positive yet moderate views towards technology use (Tsitouridou & Vryzas, 2003). This reinforced earlier work by Landerholm (1995) that indicated that the majority of educators’ personal and professional views about technology were quite positive and that these positive attitudes could be regarded as a strong marker for future usage patterns. Acknowledging these views is important in understanding the impact of an educator’s personal beliefs about the importance of ICT in early learning environments. Findings from the current study suggest that educators’ feelings toward the use of technology continue to be mostly positive, yet supports are inadequate to ensure that these attitudes can translate to effective practice.

Although the actual use of technology in early education is still in its relative infancy, the participants in this study have shown that technology is not always seen as a threat to playful learning and that more efforts could be made to support those enthusiastic about its integration. Further to this, interview responses indicated that early childhood educators understand the value of technology integration in early childhood regardless of whether they are current practitioners or still studying. Previous research citing “technophobia” amongst educators (Arikan, 2007) was not
demonstrated in the current study, with educators demonstrating interest in its use, in particular “high-quality technology use”. Limitations to usage were attributed to a lack of resourcing rather than a lack of interest or commitment. Currently, Early Childhood Australia (ECA) is working with a small reference group of academics and experts on the development of an Australian statement on young children and digital technology. This statement is in response to calls from the sector to offer support to the early childhood education and care sector, children, families, decision-makers and technology developers to understand technology use with young children, and help them decide how to recognise good technology use (ECA, 2016). Given the clear links between policy and practice (Ertmer et al., 2012) there is hope that this will go some way toward achieving a cultural shift and increasing commitment to integrated technology practices within the ECEC context.

5.6 Obstacles and challenges presented by technology integration

To develop a clearer understanding of educator approaches to pedagogy and practice it was necessary to also develop a deeper understanding of the potential challenges to technological integration within ECEC contexts. One of the main extrinsic barriers identified by educators in the current study was the inherent lack of training and targeted professional-development programs supporting the use of technology. Professional development must be considered a crucial factor in stimulating technology use that transcends teaching basic skills and attitudes (Kerckaert et al., 2015).

According to Galanouli, Murphy, and Gardner (2004), various approaches have been used to support professional learning for technology use. A review of the IBM Kidsmart Early Learning programme, where local authorities received training to then pass on to centre workers, indicated that it had been a major catalyst for improving the practical application of ICT in early-childhood settings (Galanouli et al., 2004). Educators embraced a “train the trainer” approach and developed collegial relationships and networks that facilitated the transfer of knowledge in an active learning community. This in turn raised the awareness of practitioners and policy-
makers for the need for sustainable ICT training for the early years workforce. Given that the success of professional development hinges not just on content but also on shifts in attitudes and skills (Melhuish et al., 2016), studies such as the current one, which sheds light on educator perceptions and attitudes, will be important in developing effective models for fostering practice change. Understanding levels of self-efficacy and using this to create a foundation for professional learning that strengthens and builds the capacity of staff will enable the early childhood education sector to move into the future. Professional-development models must be re-conceptualised to include strategies for facilitating change in teacher’s attitudes and beliefs (Ertmer et al., 2012).

Whilst there is the idea that policy-makers and government authorities want early childhood educators to integrate technology into their practice, a challenge in the Australian context is that early childhood educators are currently not obliged to use technology in their teaching. In addition, research into the inherent benefits of technology for young children’s development and learning is still very new (Radesky et al., 2015). Therefore, professional-development initiatives must take into account the competence levels and actual use of technology in prior-to-school environments. In addition, early childhood teacher education should offer students an overview of different possibilities and technology tools so they may form their own opinion about technology for future practice. In today’s society, where mobile tablets in early education are no longer unimaginable, educators need to be challenged to think about the role such technology can have in their daily practices.

Establishing appropriate regularity of professional development has been seen to increase use of technology in early childhood education (Blackwell et al., 2013). However, a lack of clarity about the educator’s role in supporting technology use is still creating a culture of uncertainty. Technology can evoke very emotional and personal responses amongst educators, fuelled by media reports relating to the addictive, destructive nature of technology for very young children (Donohue, 2016). Overcoming this is a cultural shift, and as part of this shift, educators must take an active role in engaging with technology themselves and understanding its
importance in their work. Only then will organisations that provide training, resources, and funding facilitate a change in offerings.

While the cost of technology has decreased over the years, access to digital technology is still commonly considered an obstacle for many early childhood educators. Research by Robb et al. (2014) found that whilst providers had access to digital cameras (92%), computers (84%) and TVs/DVDs (80%), access to newer technologies is still very much lower; for example, just 29% had mobile tablet access (Robb et al., 2014). This is an important issue for consideration by government and funding organisations, with research from 2014-2015 indicating that access to technology for families within lower socio-economic groups is becoming increasingly challenging, and as a result the “digital divide” across Australian families is getting deeper. Ewing (2016) argues that as more resources shift to online delivery and the importance of connectivity increases, the disadvantage faced by those not online, or even those with limited access will increase. Just as important is the digital capacity of educators. Enabling educators to access and assess online resources to take full advantage of digital technology remains a critical issue. Participants in this study indicated that access to ICT was a challenge faced in ECEC services, potentially limiting their levels of self-efficacy due to reduced exposure to technology-enhanced learning experiences.

5.7 Role of educators to introduce technology in early learning experiences

Whilst technology is still a relatively new concept in ECEC, educators’ beliefs about the value and importance of technology have been shown to have a strong influence on self-efficacy levels (Blackwell et al., 2014). Results indicating medium to high levels of self-efficacy established in this study through the ECTSE scale were further explained in the interviews. Despite the increased prevalence of computers and newer mobile devices, the actual use of technology remains infrequent, especially in early childhood education. Many educators in this study were adopting technology with which they feel comfortable from personal use; however, they did so with a low level of understanding of its place within the guiding EYLF.
Edwards et al. (2017) found that many educators felt that their primary role in introducing technology was to control children’s access. Educators focused on negotiating and accepting technology use as part of their daily planning and developing skills and abilities much more than on successful curriculum integration. It is here that technology integration becomes not only an access and availability issue, but one fundamentally entwined with the personal attributes of educators (Blackwell, 2013). Understanding educators’ roles with technology is a developing concept that cannot be transformed immediately, but rather requires a combination of resources, materials, and input from sector experts to build knowledge and understanding to the next level.

5.8 Limitations
The findings from this study contribute to the field of early childhood education by not only increasing understanding of the current perspectives on technology within the sector but acknowledging some of the obstacles and barriers associated with such perspectives to plan and best support early years educators across all contexts of study and employment. The use of digital technology in ECEC has grown each year and this trend will continue for the foreseeable future (Donohue, 2016). However, issues of computer literacy and self-efficacy will remain as a significant barrier for many early childhood educators service offerings until professional development and accessibility are transformed.

This study can be considered a first step in exploring the link between effective technology use in early childhood education and care and educators’ beliefs. Measuring technology self-efficacy within the context of early childhood education was an exploratory and lends itself to further development and research. There were inevitable limitations associated with this research. The inquiry is currently limited to participants in one geographical area. While students were studying at various locations within that area, its general demographics may limit the generalisability of the results. While the research strategy used in this study may be applicable to other contexts and some findings may be transferable, specific findings may also be unique to the environment studied.
The use of Likert scales presented a number of challenges and limitations. Brace (2008) suggests that there are four interrelated issues of which researchers must be aware:

- **Order effect:** The order in which response codes are presented can create bias, with a general tendency shown towards the left side of the completion scale.

- **Acquiescence:** This is the tendency of respondents to answer “yes” or agree with statements rather than disagree. The environment in which the questionnaire is completed has a strong influence on this issue by making respondents feel comfortable with their answers.

- **Central tendency:** This is the reluctance of participants to use extreme positions. Research has been conducted into variations in responses between three and five-point scales, eliciting varying proportions of “extreme” responses.

- **Pattern answering:** Often a sign of boredom or fatigue when completing a questionnaire, pattern answering occurs when a respondent falls into a routine of answering questions.

All of these may have been factors in the questionnaire data, and could be addressed in further development of the ECTSE scale.

### 5.9 Directions for Future Research

The importance of teachers’ self-perceived competences and self-efficacy can hardly be overestimated and educators need to feel that have the necessary skills to use technology effectively in their specific education context (Kerckaert et al, 2015). It is necessary for both pre-service and practising educators to receive technology support and training so that they can follow the latest technological trends, be aware of potential opportunities and have the basic information and skills required to then develop their pedagogical practices to reflect broader early childhood education philosophy and practice.
Three key points to draw from this research in terms of future policy and program development include: 1) shifting the teaching attitudes of early childhood educators to embrace the potential of technology; 2) acknowledging that greater frequency of professional-development activities is associated with higher technology use, and that providing educators with targeted professional learning on the use of technology in developmentally appropriate ways could help educators more effectively integrate technology; and 3) supporting services to develop a technology policy or plan to encompass how to appropriately incorporate technology elements into existing practices to meet the developmental needs of young children and remain up to date.

5.9.1 Attitudes towards technology

Whilst the prevalence of technology in early education may be primarily influenced by extrinsic properties, when it comes to its actual use, personal properties – in particular, individual attitudes – matter (Blackwell et al., 2013). This study, which explicitly explored educator attitudes towards technology in early childhood education, found that educators’ confidence was the greatest influence on technology use. This was observed in Blackwell et al. (2013) with respect to traditional technologies (such as computers and digital cameras) as well as newer mobile technologies (such as iPads and tablet computers). Such findings further support the significance of this research to demonstrate how educator self-efficacy in using technology plays a critical role in shaping attitudes towards the value of technology. This makes intuitive sense, as educators with higher self-efficacy would have better attitudes towards using it in their pedagogical practice. As a result, shifting the teaching attitudes of early childhood educators to embrace the positive potential for technology to affect children’s learning could have the greatest effect on actual use of technology in the classroom (Blackwell et al., 2013). Sheingold (1995) argued that the greatest issue with overcoming intrinsic challenges to technology integration was for educators to confront the notion of creating learning environments “fundamentally different from the one they themselves experienced” (p.23). Because, as the results of this study demonstrate, there is limited understanding about technology integration as part of a broader early-childhood
learning environment, refocusing professional development and pre-service educator programs holds the potential to achieve this. Particular areas for shifting views may include understanding appropriate developmental practice, documenting learning, and catering for individualised learning needs.

5.9.2 Professional development
Participants in this study felt under-prepared to effectively integrate technology despite mid to high-range levels of self-efficacy on the ECTSE scale. Experimentation opportunities as well as support resources and professional training were identified as areas of need and interest amongst both pre-service and practise educators. As a result, ECEC services and administrators investing in technology must also invest sufficient time and resources as part of long-term strategies that support educators in understanding effective technology use in young children’s learning environments. Blackwell et al. (2013) found that receiving professional development has a positive association with technology use and that consistent professional development can be associated with higher use. Thus, providing tailored programs on developmentally appropriate technology use could help educators to more effectively integrate technology and cultivate positive technology-related experiences. It should be noted also that understanding the contextual differences between early childhood settings’ use of technology may influence professional development planning and therefore, a potential extension of research in this area.

However, Ertmer et al. (2012) also suggested that professional development that focuses merely on content is insufficient for supporting practice change. This was identified amongst participants in this study who felt that the technology training they had completed had been insufficient, often due to the focus on skill development. Efforts must be made to refocus teacher education and professional development on strategies that facilitate changes in educator attitudes and beliefs in addition to the development of technical literacy and skills. This is supported by research by Jeong and Kim (2017), who suggested that effective professional learning, particularly in the context of technology, first requires deeper consideration of educator attitudes and beliefs. Using the results from this study as a
foundation, professional-development offerings may be tailored to inform guidelines and framework in the Australian context, as well as their application to existing EYLF outcomes. Identifying key opportunities for engagement and integration will aid in increasing self-efficacy levels through supporting educator attitudes and beliefs. Brown and Englehardt (2017) presented the notion of “sensemaking” in their case-study analysis of educators’ use of iPads. They suggested stepping educators away from the act of how to teach using technology and engage in more observation of children’s engagement with technology. This can better equip educators to understand “the sensemaking of the children themselves within the learning process” (p.34). This process tended to shield the participants in their study from negative experiences and allowed opportunities to discuss, experience, unpack and critique the use of iPads alongside the children. Employing this approach also aligns strongly with the underpinnings of the EYLF: children are encouraged to develop a sense of Being, Belonging and Becoming, taking ownership for their learning and active engagement with the environment (DEEWR, 2009).

Without supportive professional learning opportunities, tension between attitudes towards technology and practical applications will remain (Blackwell et al., 2014). No matter how standardised teacher-education programs or professional-development modules become, educators’ will make sense of incorporating technology differently, guided by their previous experiences and perceptions (Brown & Englehardt, 2017). This runs the risk that technology will not be used to the fullest potential, and in a manner that reflects how young children develop and learn.

5.9.3 Technology policies and plans
Early Childhood Australia, as the leading voice for educators across Australia, has identified the need for guidance about young children’s engagement with technology. In previous years, educators and organisations have sought information as best they could, with individuals developing their own rules and language about healthy digital practices (ECA, n.d). A joint statement, not dissimilar to the NAEYC statement (2012), would assist all educators and families to have a shared understanding of the role of technology in young children’s lives, what quality
practices look like in each setting, and how to achieve them. The sector awaits the release of this statement in 2018.

In addition to a broad statement on technology use, Blackwell et al. (2013) supported the development of technology policies for ECEC setting that lay out appropriate technology integration in their individual context. Research on teachers in older educational contexts suggests a strong vision for school technology can have positive associations with teacher attitudes toward and use of technology (Somekh, 2008). This association may be heightened in ECEC given the continued debate over the appropriateness of young children using technology and the need to justify use in early learning environments. Applying this to the Australian context, educators have the opportunity to use planning processes within the NQF. Quality Improvement Plans are an essential component of the NQS assessment and rating process and offer educators the chance to reflect, establish goals and become intentional with their technology use. Building on existing team strengths and identifying areas of need places technology at the service of educators, not the opposite. Educators can build technology into everyday systems as well as regular planning cycles, achieving high-quality integration without compromising existing curriculum plans.

5.10 Chapter summary

The focus of this study was to explore the self-efficacy of pre-service and practising educators’ for integrating technology in early childhood education. This research advances understanding of technology self-efficacy by developing the ECTSE scale, a tailored measure suitable for the Australian early childhood education and care (ECEC) context.

Findings revealed that both pre-service and practising educators felt under-prepared to effectively integrate technology despite having mid-range ratings of self-efficacy. In particular, practising educators reported using technology with children at a more basic level and had a limited understanding of technology integration aligned with
EYLF outcomes. These findings all underscore the influence of educators’ beliefs on achieving effective technology integration and the importance of educators’ self-efficacy in advancing pedagogy and practice.

In summary, the development of the ECTSE scale is a key contribution to the field of early childhood research, lending itself to further implementation across the sector. Findings of this study offer new insights into technology integration by understanding the pedagogical beliefs of educators, and begins to explore concepts of high-quality technology integration in Australian ECEC contexts.
References


Appendices

Appendix A

- Practising educator information sheet
- TAFE NSW student information sheet
- UOW student information sheet
Participation Information Sheet

Is ‘techno-phobia’ real? Investigating the self-efficacy of early years educators towards ICT integration.

RESEARCHER(S): Michelle Gregory

PURPOSE OF THE RESEARCH
This is an invitation to participate in a study conducted by researchers at the University of Wollongong. This project is student research and aims to investigate the use of ICT in early learning environments. It aims to evaluate the self-efficacy beliefs held by in-service and pre-service early years teachers from a variety of settings. The research will provide informative feedback to guide future planning in this area.

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METHOD AND DEMANDS ON PARTICIPANTS
If you choose to be included, you will be asked to participate in data collection procedures including surveys, questionnaires and interviews designed to provide information regarding your confidence in using ICT in early years environments.

- Phase 1 of the research study has no requirements on participants and involves document analysis of information from the early years sector and a situational analysis of the centres involved in the study.
• Phase 2 of the project involves the completion of a questionnaire, requiring 15-20 minutes. It is anticipated that this will occur either during a scheduled meeting time or may be completed online at the participants’ leisure.

• Phase 3 of the project requires a 1-hour interview, exploring in more detail beliefs and attitudes towards ICT. Up to five (5) participants will be chosen at random to complete this phase, at a time that is mutually suitable. During the interview process, material will be audiotaped to allow for later analysis. This material will be stored on the University campus with the student researcher involved. Typical questions in the interview will include; Do you feel comfortable about your ability to work with technology? If computer use increases in early years, do you feel threatened by the possible need to learn more about how to use technology? Does making use of technology in your daily work enhance your performance of tasks? To what extent do you believe you could use technology in your current teaching?

POSSIBLE RISKS, INCONVENIENCES AND DISCOMFORTS
Apart from your time for the written data procedures and interviews, we can foresee no risks for you. Your involvement in the study is voluntary and you may withdraw your participation from any part of the study at any time. Survey data may still be included in the study, with consent from the participant, however any interview data obtained will not be utilised and withdrawn. Refusal to participate in the study will not affect your relationship with the University of Wollongong.

BENEFITS OF THE RESEARCH
This research will provide a basis for future decisions on the development of ICT professional development programs, support networks and other such materials for early years educators. This research will be published as a Doctoral thesis, with the
possibility of a paper being written for educational conferences or journals. Confidentiality is assured and you will not be identified in any part of the research.

FUTURE RESEARCH ACTIVITIES
Given the nature of this project and the implications initial findings may have on early childhood teacher training and professional development, there is considerable scope for further research. If consenting, the researcher will store contact details of participants willing to be re-called to future research projects should they arise following the completion of this research. This may involve additional surveys, questionnaires or interviews to provide researchers with longitudinal data on this area.

ETHICS REVIEW AND COMPLAINTS
This study has been reviewed by the Human Research Ethics Committee (Social Science, Humanities and Behavioural Science) of the University of Wollongong. If you have any concerns or complaints regarding the way this research has been conducted, you can contact the UoW Ethics Officer on (02) 4221 4457. For any questions concerning the research itself and associated procedures, please contact Michelle Gregory or A/Prof Sue Bennett.

Thank you for your interest in this study and we look forward to your anticipated participation.
Participation Information Sheet For TAFE NSW Students

Is ‘techno-phobia’ real? Investigating the self-efficacy of early years educators towards ICT integration.

RESEARCHER(S): Michelle Gregory

PURPOSE OF THE RESEARCH
This is an invitation to participate in a study conducted by researchers at the University of Wollongong. This project is student research and aims to investigate use of ICT in early learning environments. It aims to evaluate the self-efficacy beliefs held by in-service and pre-service early years teachers from a variety of settings. The research will provide informative feedback to guide future planning in this area.

INVESTIGATORS
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METHOD AND DEMANDS ON PARTICIPANTS
If you choose to be included, you will be asked to participate in data collection procedures including surveys, questionnaires and interviews designed to provide information regarding your confidence in using ICT in early years environments. Phase 1 of the research study has no requirements on participants and involves document analysis of information from the early years sector.
Phase 2 of the project involves the completion of a questionnaire, requiring 15-20 minutes. It is anticipated that this will occur during a scheduled class time. Phase 3 of the project requires the initial completion of a written consent form, after which a 1-hour interview will be held exploring in more detail beliefs and attitudes towards ICT. Up to five (5) students will be chosen at random to complete this phase, at a time that is mutually suitable. During the interview process, material will be audiotaped to allow for later analysis. This material will be stored on the University campus with the student researcher involved. Typical questions in the interview will include; Do you feel comfortable about your ability to work with technology? If computer use increases in early years, do you feel threatened by the possible need to learn more about how to use technology? Does making use of technology in your daily work enhance your performance of tasks? To what extent do you believe you could use technology in your current teaching?

POSSIBLE RISKS, INCONVENIENCES AND DISCOMFORTS
Apart from your time for the written data procedures and interviews, we can foresee no risks for you. Your involvement in the study is voluntary and you may withdraw your participation from the study at any time. Submission of the survey will be considered tacit consent and due to the anonymous nature of the data, it may still be included after your withdrawal. However any interview data obtained through written consent will not be utilised and withdrawn from the project. Refusal to participate in the study will not affect your relationship with the University of Wollongong.

BENEFITS OF THE RESEARCH
This research will provide a basis for future decisions on the development of ICT professional development programs, support networks and other such materials for early years educators. This research will be published as a Doctoral thesis, with the possibility of a paper being written for educational conferences or journals. Confidentiality is assured and you will not be identified in any part of the research.
FUTURE RESEARCH ACTIVITIES

Given the nature of this project and the implications initial findings may have on early childhood teacher training and professional development, there is considerable scope for further research. If consenting, the researcher will store contact details of participants willing to be re-called to future research projects should they arise following the completion of this research. This may involve additional surveys, questionnaires or interviews to provide researchers with longitudinal data on this area.

ETHICS REVIEW AND COMPLAINTS

This study has been reviewed by the Human Research Ethics Committee (Social Science, Humanities and Behavioural Science) of the University of Wollongong. If you have any concerns or complaints regarding the way this research has been conducted, you can contact the UoW Ethics Officer on (02) 4221 4457.
For any questions concerning the research itself and associated procedures, please contact Michelle Gregory or A/Prof Sue Bennett.

Thank you for your interest in this study and we look forward to your anticipated participation.
Participation Information Sheet For  
University of Wollongong Students

Is ‘techno-phobia’ real? Investigating the self-efficacy of early years educators towards ICT integration.  
RESEARCHER(S): Michelle Gregory

PURPOSE OF THE RESEARCH
This is an invitation to participate in a study conducted by researchers at the University of Wollongong. This project is student research and aims to investigate use of ICT in early learning environments. It aims to evaluate the self-efficacy beliefs held by in-service and pre-service early years teachers from a variety of settings. The research will provide informative feedback to guide future planning in this area.

INVESTIGATORS

STUDENT: Michelle Gregory  
SUPERVISOR: A/Prof Sue Bennett  
Faculty of Education  
02-4221 3172  
micgreg@uow.edu.au

METHOD AND DEMANDS ON PARTICIPANTS
If you choose to be included, you will be asked to participate in data collection procedures including surveys, questionnaires and interviews designed to provide information regarding your confidence in using ICT in early years environments. Phase 1 of the research study has no requirements on participants and involves document analysis of information from the early years sector.
Phase 2 of the project involves the completion of a questionnaire, requiring 15-20 minutes. It is anticipated that this will occur during a scheduled class time.

Phase 3 of the project requires the initial completion of a written consent form, after which a 1-hour interview will be held exploring in more detail beliefs and attitudes towards ICT. Up to five (5) students will be chosen at random to complete this phase, at a time that is mutually suitable. During the interview process, material will be audiotaped to allow for later analysis. This material will be stored on the University campus with the student researcher involved. Typical questions in the interview will include: Do you feel comfortable about your ability to work with technology? If computer use increases in early years, do you feel threatened by the possible need to learn more about how to use technology? Does making use of technology in your daily work enhance your performance of tasks? To what extent do you believe you could use technology in your current teaching?

POSSIBLE RISKS, INCONVENIENCES AND DISCOMFORTS
Apart from your time for the written data procedures and interviews, we can foresee no risks for you. Your involvement in the study is voluntary and you may withdraw your participation from the study at any time. Submission of the survey will be considered tacit consent and due to the anonymous nature of the data, it may still be included after your withdrawal. However any interview data obtained through written consent will not be utilised and withdrawn from the project. Refusal to participate in the study will not affect your relationship with the University of Wollongong.

BENEFITS OF THE RESEARCH
This research will provide a basis for future decisions on the development of ICT professional development programs, support networks and other such materials for early years educators. This research will be published as a Doctoral thesis, with the possibility of a paper being written for educational conferences or journals. Confidentiality is assured and you will not be identified in any part of the research.
FUTURE RESEARCH ACTIVITIES
Given the nature of this project and the implications initial findings may have on early childhood teacher training and professional development, there is considerable scope for further research. If consenting, the researcher will store contact details of participants willing to be re-called to future research projects should they arise following the completion of this research. This may involve additional surveys, questionnaires or interviews to provide researchers with longitudinal data on this area.

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This study has been reviewed by the Human Research Ethics Committee (Social Science, Humanities and Behavioural Science) of the University of Wollongong. If you have any concerns or complaints regarding the way this research has been conducted, you can contact the UoW Ethics Officer on (02) 4221 4457. For any questions concerning the research itself and associated procedures, please contact Michelle Gregory or A/Prof Sue Bennett.

Thank you for your interest in this study and we look forward to your anticipated participation.
Appendix B

- Practising Educator consent form
- TAFE NSW student consent form
- UOW student consent form
Consent Form For Early Years Professionals

Is ‘techno-phobia’ real? Investigating the self-efficacy of early years educators towards ICT integration.

RESEARCHER(S): Michelle Gregory

I have been given information about “Is technophobia real? Investigating the self-efficacy of early years educators towards ICT integration.” I have discussed this research with Michelle Gregory and I understand that this project is part of a Doctor of Philosophy at the University of Wollongong.

I understand that if I consent to participate in this project I may be selected to complete an interview for up to one (1) hour, at a time that suits both myself and the researcher. I understand that consent to participate in future research activities will form longitudinal data to be used in future research studies and not this particular project.

I understand that my contribution will be confidential and that there will be no personal identification in the data that I agree to allow to be used in the study. I understand that there are no potential risks or burdens associated with this study. If I choose to withdraw, my questionnaire data will remain in the study however any interview notes taken will be removed. My refusal to participate or withdrawal of consent will not affect my relationship with any of the researchers or the Faculty of Education at the University of Wollongong.

I have had an opportunity to ask Michelle Gregory any questions I have about the research. I understand that my participation in this research is voluntary.
If I have any enquires about the research, I can contact Michelle Gregory 42213172 and/or A/Prof Sue Bennett 4221 5738. If I have any concerns or complaints regarding the way the research is being or has been conducted, I can contact the Ethics Officer, Human Research Ethics Committee, University of Wollongong on 42214457.

By signing below I am indicating my consent to participate in the research. I understand that the data collected from my participation will be used primarily for thesis publication, with the potential for use in a journal or conference paper, and I consent for it to be used in that manner. I may also indicate my willingness to be contacted for future research activities.

Name (please print)

.................................................................

Signed                                      Date

.................................................................  ....../....../......

☐ I am happy to be contacted to complete an interview as part of this research project
☐ I am interested in participating in future research activities and am happy for the researchers to contact me

Contact details (phone and/or email)

.........................................................................................................................................................
Consent Form for TAFE NSW Students

Is ‘techno-phobia’ real? Investigating the self-efficacy of early years educators towards ICT integration.

RESEARCHER(S): Michelle Gregory

I have been given information about “Is technophobia real? Investigating the self-efficacy of early years educators towards ICT integration.” I have discussed this research with Michelle Gregory and I understand that this project is part of a Doctor of Philosophy at the University of Wollongong.

I understand that if I consent to participate in this project I may be selected to complete an interview for one (1) hour, at a time that suits both myself and the researcher. I understand that consent to participate in future research activities will form longitudinal data to be used in future research studies and not this particular project.

I understand that my contribution will be confidential and that there will be no personal identification in the data that I agree to allow to be used in the study. I understand that there are no potential risks or burdens associated with this study. If I choose to withdraw, my questionnaire data will remain in the study however any interview notes taken will be removed. My refusal to participate or withdrawal of consent will not affect my relationship with any of the researchers or the Faculty of Education at the University of Wollongong.
I have had an opportunity to ask Michelle Gregory any questions I have about the research. I understand that my participation in this research is voluntary.

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By signing below I am indicating my consent to participate in the research. I understand that the data collected from my participation will be used primarily for thesis publication, with the potential for use in a journal or conference paper, and I consent for it to be used in that manner. I may also indicate my willingness to be contacted for future research activities.

Name (please print)

............................................

Signed

............................................

Date

....../....../......
☐ I am happy to be contacted to complete an interview as part of this research project

☐ I am interested in participating in future research activities and am happy for the researchers to contact me

Contact details (phone and/or email)

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Consent Form For University of Wollongong Students

Is ‘techno-phobia’ real? Investigating the self-efficacy of early years educators towards ICT integration.

RESEARCHER(S): Michelle Gregory

I have been given information about “Is technophobia real? Investigating the self-efficacy of early years educators towards ICT integration.” I have discussed this research with Michelle Gregory and I understand that this project is part of a Doctor of Philosophy at the University of Wollongong.

I understand that if I consent to participate in this project I may be selected to complete an interview for one (1) hour, at a time that suits both myself and the researcher. I understand that consent to participate in future research activities will form longitudinal data to be used in future research studies and not this particular project.

I understand that my contribution will be confidential and that there will be no personal identification in the data that I agree to allow to be used in the study. I understand that there are no potential risks or burdens associated with this study. If I choose to withdraw, my questionnaire data may remain in the study with my consent however any interview notes taken will be removed. My refusal to participate or withdraw my consent will not affect my study in the Bachelor of Education- The Early Years nor my relationship with any of the researchers or staff.
I have had an opportunity to ask Michelle Gregory any questions I have about the research. I understand that my participation in this research is voluntary.

If I have any enquires about the research, I can contact Michelle Gregory 42213172 and/or A/Prof Sue Bennett 4221 5738. If I have any concerns or complaints regarding the way the research is or has been conducted, I can contact the Ethics Officer, Human Research Ethics Committee, University of Wollongong on 42214457.

By signing below I am indicating my consent to participate in the research. I understand that the data collected from my participation will be used primarily for thesis publication, with the potential for use in a journal or conference paper, and I consent for it to be used in that manner. I may also indicate my willingness to be contacted for future research activities.

Name (please print)

.................................................................

Signed Date

................................................................. ....../....../......
☐ I am happy to be contacted to complete an interview as part of this research project

☐ I am interested in participating in future research activities and am happy for the researchers to contact me

Contact details (phone and/or email)

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Appendix C

- Document Analysis

Document analysis served as the foundation for this study as it provided the context in which pre-service and practising educators are either studying or working. Identification of relevant data sources was drawn from the researchers existing experience in the early-childhood sector as well as collegial input. The results of this analysis took the form of interpretations, supported by the documents themselves and the new directions, lines of inquiry or perspectives that were opened through the analysis (Gall et al., 2007). In this study, initial document analysis of Government policies, frameworks and legislation outlined how pertinent technology is within the early childhood education and care sector. Tertiary and vocational subject information demonstrated the level of technology preparation pre-service educators may be exposed to during their current study. The combination of these documents formed a strong backdrop for using technology in the early childhood sector.

University subject information

The Bachelor of Education- The Early Years degree at the University of Wollongong has a strong social justice focus and offers unprecedented input from local and regional indigenous services with ongoing community consultations (UOW, n.d). The curriculum within the degree includes child development, service management, contemporary play theories, early intervention and transition to school. In each of these subjects and through the University’s commitment to innovative teaching and assessment strategies, new technologies are utilised to enhance student learning outcomes.

During the first session of year one of the degree, all students complete the core subject Learning and Teaching with Technology (EDIC101). This subject is very much an innovative and ‘emergent’ subject, constantly drawing on new research findings to inform practice. Students are exposed to a wide variety of computer applications and processes and encouraged to explore these weekly from a teaching and learning perspective. The subject EDIC101 is designed specifically to make strong connections
between theory and practice. Students are assessed on their ability to both design quality learning experiences for young children using technology but also justify these experiences through a sound theoretical foundation. The subject outcomes are diverse and range from student skill development to the ability to evaluate software resources and critically engage with current research and ideas on educational technology.

In the second session of year three of the degree, students have the option to select the elective Science and Technology for the Early Years (EYST302). While the focus of this subject is not on the use of technology, it does provide students with a very practical example of how technology can be used with early years children. A relationship has been established Kids Uni, the University on-campus child-care centre, and students visit the centre to observe and document learning experiences with the children. This activity forms a key learning outcome; ‘Make a digital resource in collaboration with preschool children’ and culminates in students submitting an assessment task and presentation in the final week of class.

**TAFE NSW Subject Information**

Within both the Certificate III and Diploma programs of study, there are a number of units of competency that relate to the use of technology in early childhood education.

Within the Certificate III program, students are introduced to using audio and visual methods for gathering and documenting children’s information. The unit “Develop understanding of children’s interests and developmental needs” is a component of the Group 1 Professional skills development domain and requires students to complete an assessment using digital photography and documentation.

Within the Diploma program, there are four competency units that cover areas of technology use. The Play and Creative domain for Cluster 1 students introduces students to planning experiences that align with both centre philosophies and Government regulations and legislation. “Organise experiences to facilitate and enhance development” and “Foster children’s creative and aesthetic development”
both encourage students to plan creative, challenging and integrated experiences. Technology is mentioned within the units as a new and emerging skill for children but also, as a focus for creating documentations and displays of children’s work. Play and Creative Cluster 2 units such as “Gather, interpret and use information about children” develop further skills from the Certificate II unit of competency. Students are encouraged to use relevant technology again to observe and document children’s information in a safe and effective manner. Students begin to develop their own system for observation, both with and without technology in creating a child portfolio of their own.

Finally, “Foster cognitive development in early childhood” is a Cluster 2 unit under the domain of development and care. This unit has the greatest application of technology, with students exploring resources, equipment and experiences around different forms of information technology. Students are introduced to different concepts and terminology and learn the value and sustainability of different resources. Assessment in this subject includes the evaluation of computer based resources as well as the planning of experiences that may use technology to enhance learning.

Overall, TAFE documentation is limited in its explicit links to information technology, with minor elements integrated into several units of competency. There is a recurring theme of documentation, observation and reflection with regards to technology use in early childhood. Five key skills considered by TAFE NSW as facets of employability in using technology are:

1. Using technology and related workplace equipment
2. Using technology to organise data
3. Adapting new technology skills requirements
4. Applying OHS knowledge when using technology
5. Applying technology as a management tool
Government legislation, policies and regulations

_Early Years Learning Framework (EYLF)_

The Early Years Learning Framework (EYLF) was developed by the Council of Australian Governments, in consultation with the early childhood sector and early childhood academics, to realise the vision of providing all young children with opportunities to maximise their potential and develop a foundation for future learning success (DEEWR, 2009). The EYLF draws on considerable evidence, both domestic and international, that early childhood is a vital period in children’s learning and development. The framework is designed for use by early childhood educators working in partnership with families, with specific emphasis on play-based learning and the importance of communication and language in children’s social and emotional development.

The EYLF conveys three key principles for children’s lives “Belonging, Being and Becoming” and communicates these principles through five learning outcomes:

6. Children has a strong sense of identity
7. Children are connected with and contribute to their world
8. Children have a strong sense of well-being
9. Children are confident and involved learners
10. Children are effective communicators.

Within outcome four, confidence to experiment and explore new ideas and becoming active participants in learning is fostered. Processes such as collaboration and problem solving are used across all aspects of the curriculum, with children learning to effectively transfer knowledge from one context to another. Further to this, children resource their own learning through connecting with people, places, technologies and natural and processed materials. According to the EYLF documentation, this is evident when children explore the purposes of a range of tools, media, sounds and graphics and when they experiment and use different technologies to investigate and problem solve (DEEWR, 2009). Educators are encouraged through the EYLF to promote this learning by introducing a variety of tools, technologies and media and providing skill development for young children.
The issue of self-efficacy is also introduced in the framework, where educators are encouraged to develop their own confidence in using the technologies available to the children.

Within outcome 5, the crucial nature of communication is addressed, with literacy and numeracy capabilities seen as important aspects of communication and vital to curriculum success. Acknowledgment of contemporary texts including electronic and print based media demonstrates that in an increasingly technological world, the ability to critically analyse texts is a key component of literacy.

Therefore, children are seen to benefit from opportunities to explore their world using technologies and to develop confidence in using digital media (DEEWR, 2009). Children can and should make use of information and communication technologies to access information, make meaning, investigate ideas and represent their thinking (DEEWR, 2009). This is evident, according to the EYLF, when children engage with real or imaginary technologies as props in their play or use technology to access images or information for drawing, design and composition. These experiences allow children to engage with technology for both fun and to explore diverse perspectives in the world around them. Early childhood educators can best facilitate this by providing access to a range of technologies, integrating technology into children’s play experiences and projects, teaching skills and techniques to encourage further use of the technology and possibly most importantly, encouraging collaborative learning both about and through technology between children and between children and adults (DEEWR, 2009).

**New South Wales Curriculum Framework**

The NSW Curriculum Framework was released by the NSW Department of Community Services as a foundation out of which come the daily experiences of children, families and early childhood educators (DOCS, n/d). It is clearly stated that the framework is designed as a rationale for practice, opening new possibilities for thinking and action and encouraging professionals to think creatively and innovatively. The framework is grounded in research, practical and theoretical
literature and provides a strong statement about the importance of the early years and the types of experiences that best support children learning and development (DOCS, n/d).

Media and technology are addressed individually within the curriculum framework due to the contemporary emphasis. It is acknowledged that most children experience technology as integral parts of their lives, with play, interests and concern shaped powerfully by media. Many may in fact be more knowledgeable and comfortable with it than adults (DOCS, n/d). The curriculum framework states that the use of technology needs to reflect the aims of the service, as there is limited value in simply replicating the opportunities children have in other areas of life. Technology is a medium for introducing new opportunities and possibilities to children and should be viewed just as other materials and equipment are; as a resource for encouraging children to make meaning and to engage in life enhancing relationships (DOCS, n/d).

Within the specific goals of the curriculum framework, technology is very much viewed as a learning tool for children. With regards to communication, children are encouraged to develop experience with technology and resources for mathematics, reading and writing as well as familiarity with the properties and characteristics of materials and technology used in the creative and expressive arts. For exploration, technology is used to assist children to develop the ability to represent their discoveries using creative and expressive media.

**National Quality Framework**

The Australian Government, in partnership with all state and territory governments, is making important changes to early childhood education and care in Australia to ensure all Australian children get the best possible start in education. This is being done through the introduction of a National Quality Framework which has been agreed by the Council of Australian Governments (COAG). The framework will be implemented progressively from 1 July 2010 (COAG, 2009).
The National Quality Framework will put in place a new National Quality Standard to ensure high quality and consistent early childhood education and care across Australia. These changes will help educators to improve their services in the areas that impact on a child’s development and empower families to make informed choices about which service is best for their child (COAG, 2009).

The National Quality Standard will improve quality through:

- Improved staff to child ratios to ensure each child gets more individual care and attention
- New staff qualification requirements to ensure staff have the skills to help children learn and develop
- A new quality rating system to ensure Australian families have access to transparent information relating to the quality of early childhood education and care services; and
- The establishment of a new national body to ensure early childhood education and care is of a high quality.

The new National Quality Framework will cover long day care, family day care, outside school hours care and preschools. Review of the new National Quality Framework finds reference to technology in only one area. While it may acknowledge the use of technology for management and administration tasks, there are no implementation guidelines or frameworks for teaching and learning. Under Part 9, Division 5- Requirements for early childhood teachers, 145 – Requirement for early childhood teacher – centre based services – fewer than 25 children it states (2)

To comply with sub-regulation (1), the early childhood teacher may be working with the service by means of information communication technology (COAG, 2009). While further clarification on this regulation is required from the governing bodies, it may infer than a teacher can in fact be considered to be ‘accessible’ and in compliance with the Government regulation simply by being contacted through ICT, be that video conferencing, audio conference or email. This would be seen as a dramatic shift in the design and operation of early years services across various regions.
National Childcare Accreditation Council (NCAC) Quality Improvement and Accreditation System (QIAS) Quality Practice Guide

The QIAS Quality Practice Guide is a publication designed to guide and assist long day care centres in planning for quality improvements in their child care practice and to fulfil the reporting requirements of the QIAS (NCAC, 2005). It is reviewed regularly and updated in order to remain a prime reference document for those working in the sector. Content in the Quality Practice Guide is based on current knowledge about best practice in early childhood education from both research and experience. The Quality Practices Guide details seven quality areas and the underlying principles by which quality child-care is defined. These quality areas include; Staff relationships with children and peers; Partnerships with families; Programming and evaluation; Children’s experiences and learning; Protective care and safety; Health, nutrition and wellbeing and Managing to support quality (NCAC, 2005).

Within these quality areas, the inclusion of technology in any of the underlying principles is limited. While again technology may be considered an element of general workplace duties, such as maintaining records of enrolled children, there is no acknowledgement of technology in the teaching or learning aspects of quality child-care. This is potentially demonstrating from a National perspective, technology is not seen as a sign of quality in child-care and also understood to not be readily accessible to all centres.

Summary

Information technologies are everywhere around us, both in society and in our homes and influencing many aspects of children’s everyday lives. However, the connection between technology and learning in early education is still emerging. The NSW Curriculum Framework focused on the educational value of technology, with little to no reference to teachers using technology or the develop of confidence and interest in technology. The newer EYLF addresses very basically the notion of self-efficacy and confidence, however does not extend on this or provide further elaboration. The focus is still very much on what children can do and learn from technology, with educators assumed to provide these resources and experiences as
part of their daily routines. This is evident through the use of language in the document such as ‘Educators can support this when...’ Assumptions have again been made the educators value such activities and possess the requisite skills across the various domains.

Within the new National Quality Framework, the potential for regulatory requirements to be met through means of ICT is a new innovation for the early childhood industry. With the prevalence of video conferencing and other such technologies increasing in early years services, there is potential for increasing contact and collaboration between early years services. However, further knowledge is needed to better understand how to develop and utilise the opportunities afforded through digital media to improve connectivity between educators, students and young children.
Appendix D

The following survey is part of a Masters in Education (Research) study conducted through the University of Wollongong. All information is anonymous and confidential unless otherwise stated.

Section 1 – This section asks you about your time working in the field of early childhood education. Your answers will remain anonymous.

Birthday (Year only) ____________

☐ Male ☐ Female

a) Are you currently working in the child-care industry?

☐ Yes ☐ No - move on to question b)
☐ Full-time

☐ Part-time

☐ Long Day Care

☐ Preschool

☐ Other ______________________

(0-5 year age range)
b) Are you currently studying?

☐ Certificate 3 in Children's Services     ☐ Certificate 4 in Children’s Services     ☐ Diploma in Children’s Services

☐ Undergraduate Bachelor of Teaching/Education (major in Early Childhood)

☐ First Year     ☐ Second Year     ☐ Third Year     ☐ Fourth Year     ☐ Honours

☐ Postgraduate (Masters, Graduate Certificate etc)

c) What is your highest COMPLETED level of study?

☐ Secondary / High school (Year 10 or Year 12)

☐ Certificate 3 in Children’s Services

☐ Certificate 4 in Children’s Services
☐ Diploma in Children’s Services

☐ Undergraduate Bachelor of Teaching/Education (major in Early Childhood)

  ☐ Three Year degree program   ☐ Four Year degree program   ☐ Honours

☐ Postgraduate (Masters, Graduate Certificate etc)
d) Do you recall completing any study relevant to using technology in your studies?

☐ Yes  ☐ No  ☐ Can’t recall

Please give any details of the subject:
Section 2- This section relates to your use of technology in two areas: Teaching and Management.

Please rate your level of confidence in being able to correctly complete each activity.
1 = No confidence that you can complete the activity correctly
5 = Complete confidence that you can complete the activity correctly

<table>
<thead>
<tr>
<th>Teaching with Technology: In your teaching, how confident are you in...</th>
<th></th>
<th></th>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Creating digital videos</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Creating, organising and manipulating digital images</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Playing digital music or video files</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Developing learning experiences using Internet resources</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Selecting developmentally appropriate software resources and games for young children</td>
<td>CD-ROM materials</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Internet resources</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
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</tbody>
</table>
Effectively managing a group lesson that involves the integration of technology

<table>
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<tr>
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<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
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Helping to support and assist children to create their own documents for learning

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
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</table>

Section 2 (cont’d) - Please rate your level of confidence in being able to correctly complete each activity.

1 = No confidence that you can complete the activity correctly

5 = Complete confidence that you can complete the activity correctly

**Management:** In the workplace, how confident would you feel to...

<table>
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<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Create presentations for staff meetings or training days (For example using Powerpoint)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Create word processed documents including newsletters</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use spreadsheets to record statistical information (attendances, payments etc)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

148
| Use database software to record information (fees, budgets, attendances etc) | 1 | 2 | 3 | 4 | 5 |
| Use email to keep in contact with various business and professional organisations | 1 | 2 | 3 | 4 | 5 |
| Read and comment on Professional blogs, websites and RSS Feeds | 1 | 2 | 3 | 4 | 5 |
| Store and organise information documents on digital media (USB drives, CD-ROM etc) | 1 | 2 | 3 | 4 | 5 |

**Section 3** - The new Early Years Learning Framework (EYLF) contains 5 outcomes for Early Childhood education. Each of these outcomes involves elements of technology use and learning and outlines the various roles and responsibilities for early years educators.
Please rate your level of confidence in being able to correctly complete each activity.

1 = No confidence that you can complete the activity correctly
5 = Complete confidence that you can complete the activity correctly

**Outcome 4: Children are confident and involved learners.**

<table>
<thead>
<tr>
<th>Activity</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Educators encourage children to explore the purpose and function of a</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>range of tools, media, sounds and graphics.</td>
<td>1</td>
<td></td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Children are encouraged to use information and communication technology to investigate and problem solve.</td>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Educators introduce appropriate tools, technologies and media to</td>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>enhance children's learning.</td>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Educators experiment with different technologies.</td>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>


Section 3 (cont’d) - Please rate your level of confidence in being able to correctly complete each activity.

1 = No confidence that you can complete the activity correctly
5 = Complete confidence that you can complete the activity correctly

**Outcome 5: Children are effective communicators.**

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Educators and children engage together with technology in a fun and meaningful manner</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>Educators encourage collaborative learning about and through technology between children.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>Educators teach skills and techniques that allow children to explore new information and represent ideas using technology.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>Educators integrate technology into children’s play experiences and projects,</td>
<td>1 2 3 4 5</td>
</tr>
</tbody>
</table>
helping children to identify the uses of technology in real everyday situations.

Educators integrate technology into children’s structured learning activities using tools for designing, drawing, editing, reflecting and composing.

**Additional Comments:** Are there other areas of technology use that you have found to be relevant to early years education? Please leave any comments you have below

Thank You for your participation
Section 1 – This section asks you about your time working in the field of early childhood education. Your answers will remain anonymous.

Birthday (Year only) __________

☐ Male ☐ Female

a) Are you currently working in the child-care industry?

☐ Yes ☐ No - move on to question b)

☐ Full-time ☐ Part-time

☐ Long Day Care ☐ Preschool ☐ Other ____________________________
(0-5 year age range)

b) Are you currently studying?

- Certificate 3 in Children’s Services
- Certificate 4 in Children’s Services
- Diploma in Children’s Services
- Undergraduate Bachelor of Education – The Early Years
- First Year
- Second Year
- Third Year
- Fourth Year
- Honours
- Postgraduate (Masters, Graduate Certificate etc)

c) What is your highest COMPLETED level of study?

- Secondary / High school (Year 10 or Year 12)
- Certificate 3 in Children’s Services
- Certificate 4 in Children’s Services
- Diploma in Children’s Services
- Bachelor of Teaching/Education (major in Early Childhood)
- Postgraduate (Masters, Graduate Certificate etc)
d) Do you recall completing any study relevant to using technology in your studies?

☐ Yes ☐ No ☐ Can’t recall

Please give any details of the subject:
Section 2- This section relates to your use of technology in two areas: Teaching and Management.

Please rate your skill level to successfully and competently complete each activity.
1 = No confidence/belief that you have the skills to complete the activity correctly
2 = Possibly posses some skills however no confidence in being able to use them to complete the activity
3 = Posses the skills however would not feel confident in completing the activity
4 = Posses the required skills and would be confident to attempt the activity, however may not be successful
5 = Complete confidence that you have the skills and knowledge to complete the activity correctly

<table>
<thead>
<tr>
<th>Teaching with Technology: In your teaching, do you feel confident you have the skills to...</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Create digital videos</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Create, organising and manipulating digital images</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Play digital music or video files</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Develop learning experiences using Internet resources</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Select developmentally appropriate software resources and games for young children</td>
<td>CD-ROM materials</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Internet resources</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Effectively manage a group lesson that involves the integration of technology</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
Help to support and assist children to create their own documents for learning | 1 | 2 | 3 | 4 | 5

**Management: In the workplace, do you feel confident you have the skills to...**

<table>
<thead>
<tr>
<th>Activity</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Create presentations for staff meetings or training days (For example using Powerpoint)</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Create word processed documents including newsletters</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Use spreadsheets to record statistical information (attendances, payments etc)</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Use database software to record information (fees, budgets, attendances etc)</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Use email to keep in contact with various business and professional organisations</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Read and comment on Professional blogs, websites and RSS Feeds</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Store and organise information on digital media (USB drives, CD-ROM etc)</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

Section 3 - The new Early Years Learning Framework (EYLF) contains 5 outcomes for Early Childhood education. Each of these outcomes involves elements of technology use and learning and outlines the various roles and responsibilities for early years educators.

Please rate your level of skill in being able to correctly and successfully complete each activity in your daily job.

1 = No confidence/belief that you have the skills to complete the activity correctly

2 = Possibly posses some skills however no confidence in being able to use them to complete the activity

3 = Posses the skills however would not feel confident in completing the activity

4 = Posses the required skills and would be confident to attempt the activity, however may not be successful

5 = Complete confidence that you have the skills and knowledge to complete the activity correctly
### Outcome 4: Children are confident and involved learners.

<table>
<thead>
<tr>
<th>Description</th>
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<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Educators encourage children to explore the purpose and function of a range of tools, media, sounds and graphics.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Children are encouraged to use information and communication technology to investigate and problem solve.</td>
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<td></td>
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<td>Educators introduce appropriate tools, technologies and media to enhance children’s learning.</td>
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<td></td>
<td></td>
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<tr>
<td>Educators experiment with different technologies.</td>
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### Outcome 5: Children are effective communicators.

<table>
<thead>
<tr>
<th>Description</th>
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<th>2</th>
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<th>4</th>
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<tr>
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</tr>
</tbody>
</table>

### Additional Comments:

**Thank You for your participation**
Appendix F

Interview Protocol

1. Tell me a little about what you are doing now:
   
a. Just studying:
      i. What course are you completing?
      ii. How long have you been studying?
      iii. Do you have an expected finish date?
      iv. What led you to choose this particular course?
      v. What sort of technology have you used whilst completing your study?

b. Studying and working:
   i. What course are you completing?
   ii. How long have you been studying?
   iii. Do you have an expected finish date?
   iv. What led you to choose this particular course?
   v. What sort of technology have you used whilst completing your study?
   vi. Tell me a little about your workplace? What sort of work are you doing currently- teaching and/or administration duties?
   vii. What is the primary age of the children you work with?
   viii. Do you use technology in your workplace at all? What types of things do you use most regularly?

c. Working only:
   i. Tell me a little about your workplace? What sort of work are you doing currently- teaching and/or administration duties?
   ii. What is the primary age of the children you work with?
   iii. Do you use technology in your workplace at all? What types of things do you use most regularly?
2. Recap of the survey responses:
   a. Section 2: Skill sets (teaching and management)
      i. Do you recall some of the skills outlined in the survey? How did you respond to these items?
         1. Confident/Positive - why do you feel this way? Have you had experience using these skills?
         2. Apprehensive/Negative - which areas in particular and why? Do you feel you have the skills to complete them? Would guided experience make you more confident?
   b. Section 3: Early Years Learning Framework
      i. Outcome four speaks of helping children become confident and involve learners. How did you respond to these items? How do you rate your capacity to integrate technology into this area of curriculum development? Do you have any examples of using technology in this way?
      ii. Outcome five refers to children as effective communicators. How do you rate your capacity to integrate technology into this area of curriculum development?
         1. High competency: where have you gained these skills? Have you any previous experiences you can share?
         2. Low competency - how might you emotionally respond to this section of the survey? Do you believe technology could benefit your teaching in this area?
   3. Dimensions of self-efficacy
      a. Importance of technology in early childhood education
         i. What value do you find in using technology with the children?
         ii. Do you feel any pressure from outside people to make use of technology in your work?
         iii. How do you feel about the increasing emphasis on using technology from a young age?
      b. Obstacle and challenges in using technology
i. What prevents you from using technology in your work or pre-service teaching experiences?

ii. Do you know of any support networks or materials available to assist in implementing technology into your daily work or pre-service teaching?

iii. Does the organisational structure of your workplace influence your use of technology (working participants only)?

c. Professional roles in using new technology

i. What is your understanding of the role of the teacher in using technology?

ii. Is technology something you see in the future of early learning?

iii. Should technology remain an ‘office tool’ in early childhood centres?