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**Teacher Education ICT Appropriation Model**

**TEAM:**

**A Model for ICT Appropriation in Early Childhood Initial Teacher Education**

A thesis

submitted in fulfilment

of the requirements for the degree

of

**Doctor of Philosophy**

in

**Education**

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## **Abstract**

Early childhood initial teacher education programmes are only beginning to use information and communication technology (ICT) as part of their curriculum. There is limited research or practice knowledge about *how* student teachers learn to use ICT for pedagogical purposes. This doctoral study investigated how student teachers might be supported to appropriate and integrate ICT into their developing teaching practice. The study endeavours to understand the experiences of student teachers and practising early childhood teachers. The 230 student teachers in the study were from one university in New Zealand that offers early childhood initial teacher education (ITE).

The study utilised interpretative, qualitative methodology. Data were collected over two years with two cohorts of student teachers who were engaged in online discussions in the course of their ITE studies. Thirty-three practising early childhood teachers participated in semi-structured interviews. The online discussions and the interviews provided the material for analysis. Analysis took the form of thematic analysis.

The key outcome from this study is the development of the Teacher Education ICT Appropriation Model (TEAM). This is a theoretical model for what is needed to support student teacher and teacher use of ICT. The model is underpinned by a sociocultural view of learning and acknowledges and responds to the social nature of teaching and learning. The model includes key elements – subjective norms, relational trust, ICT cultural tools and enjoyment – as central to creating a sociocultural pedagogical place and space for ICT use. It also takes into account the influence of policy, curriculum and assessment on teaching and learning. Findings indicate these elements are all interrelated in the successful development of effective pedagogy.

The thesis argues that, when curriculum takes a sociocultural perspective on learning, ITE must do so as well. This means that, where ITE includes introducing tertiary students to teaching with and through ICT, sociocultural elements must be taken into account and frame up ITE. This thesis sets out just such a frame.

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# Table of Contents

<b>Abstract.....</b>	<b>i</b>
<b>Acknowledgements.....</b>	<b>ii</b>
<b>Table of Contents .....</b>	<b>iii</b>
<b>List of Tables .....</b>	<b>vii</b>
<b>List of Figures.....</b>	<b>viii</b>
<b>Chapter One: Introduction and Background.....</b>	<b>1</b>
1.1 Introduction .....	1
1.2 Background .....	1
1.2.1 My Interest in the Research .....	1
1.2.2 International and New Zealand Policy and Practice Imperatives .....	2
1.2.3 Sociocultural Views of Learning .....	3
1.2.4 A Model to Explain Student Teacher Appropriation of ICT .....	4
1.2.5 Research Design.....	5
1.3 Definitions.....	6
1.4 Thesis Structure.....	8
<b>Chapter Two: Literature Review .....</b>	<b>10</b>
2.1 Introduction .....	10
2.2 The Influence of The Multimodal Nature of ICT on Education .....	11
2.3 ICT in Early Childhood Education International Policy.....	12
2.4 ICT in Early Childhood Education Policy in New Zealand.....	14
2.4.1 <i>Te Whāriki: The Early Childhood Curriculum</i> .....	14
2.4.2 Learning Stories: A Narrative Formative Assessment Framework .....	16
2.4.3 <i>Pathways to the Future: Ngā Huarahi Arataki – An Early Childhood Strategic Plan</i> .....	17
2.4.4 <i>Kei Tua o te Pae/Assessment for Learning</i> .....	18
2.4.5 Centres of Innovation.....	18
2.4.6 Foundations for Discovery Framework .....	19
2.4.7 The Education Review Office/Te Tari Arotake Matauranga.....	21
2.4.8 Graduating Teacher Standards: Aotearoa New Zealand.....	21
2.5 Early Childhood Teachers’ Use of ICT for Pedagogical Purposes.....	22
2.5.1 Teachers Using ICT for Pedagogical Purposes: International Studies	23
2.5.2 Teacher Use of ICT for Pedagogical Purposes: New Zealand Studies	26
2.6 ICT in Initial Teacher Education.....	31
2.6.1 Sociocultural Views and Initial Teacher Education.....	31
2.6.2 The Responsibilities of Initial Education Providers .....	36
2.6.3 Student Teacher Conceptions and Beliefs About ICT Use.....	41
2.6.4. Strategies that Contribute to Student Teacher Knowledge .....	42
2.7 Chapter Summary.....	48
<b>Chapter Three: Four Models .....</b>	<b>50</b>
3.1 Introduction .....	50

3.2 Concerns Based Adoption Model (CBAM).....	50
3.3 Technology Acceptance Model (TAM).....	56
3.4 Substitution, Augmentation, Modification and Redefinition Model (SAMR).....	60
3.5 Technological Pedagogical Content Knowledge Model (TPACK).....	63
3.6 The Four Models and Sociocultural Views of Learning.....	67
3.7 Looking Across the Models .....	70
<b>Chapter Four: Research Methodology and Design.....</b>	<b>71</b>
4.1 Introduction .....	71
4.2 Paradigms in Educational Research .....	71
4.3 Interpretative Research.....	72
4.3.1 Case Study within Interpretive Research .....	73
4.3.2 Data-gathering Methods.....	75
4.3.3 Data Analysis .....	77
4.3.4 Ensuring Trustworthiness .....	79
4.3.5 Ethical Considerations .....	81
4.3.6 Conclusion: Research Methodology and Design .....	82
4.4 Research Design for this Study .....	83
4.4.1 The Research Process.....	83
4.4.2 Teacher Participants .....	83
4.4.3 Student Teacher Participants.....	86
4.4.4 Data Collection .....	87
4.4.5 Thematic Data Analysis .....	89
4.4.6 Trustworthiness of this Study .....	92
4.4.7 Ethical Considerations for this Study.....	92
<b>Chapter Five: Teacher Understandings of the Uses of ICT.....</b>	<b>97</b>
5.1 Introduction .....	97
5.2 Teacher Pedagogy in Relation to ICT .....	97
5.2.1 Pedagogy as a Practice Incorporating On-going Assessment.....	98
5.2.2 Pedagogy as a Knowledge-Based Practice .....	103
5.2.3 Pedagogy as a Relational Practice.....	108
5.3 Subjective Norms .....	112
5.4 Relational Trust and ICT .....	115
5.5 ICT Cultural Tools .....	119
5.6 ICT and Enjoyment.....	121
5.7 Chapter Summary.....	121
<b>Chapter Six: Student Teachers' Developing Understanding of Pedagogical Uses of ICT.....</b>	<b>123</b>
6.1 Introduction .....	123
6.2 Pedagogy as a Practice of Incorporating On-going Assessment.....	125
6.2.1 Teachers Using ICT to Document and Share Children's Learning ...	125
6.2.2 Children Revisiting and Sharing Their Documented Learning.....	134

6.3 Pedagogy as a Knowledge-Based Practice .....	137
6.3.1 Games Supporting Learning .....	137
6.3.2 Concerns About The Use of Computer Games for Educational Purposes .....	139
6.3.3 Teachers Using the Internet to Support Children's Learning .....	140
6.4 Pedagogy as a Relational Practice.....	144
6.4.1 Building and Sustaining Relationships Between ECE Centres and Families .....	144
6.4.2 ICT and Building and Sustaining Relationships Between Teachers and Children.....	147
6.4.3 ICT Building and Sustaining Relationships Across a Range of Contexts .....	148
6.5 Chapter Summary.....	150
<b>Chapter Seven: Subjective Norms, Relational Trust, ICT Cultural Tools and Enjoyment.....</b>	<b>152</b>
7.1 Introduction .....	152
7.2 Subjective Norms .....	152
7.2.1 Hands-on Workshops .....	153
7.2.2 A Dedicated ICT Paper .....	159
7.3 Relational Trust.....	167
7.3.1 Trusting ICT Supports Learning .....	167
7.3.2 Trusting Children to Use ICT .....	173
7.3.3 Concerns About the Use of ICT .....	174
7.4 ICT Cultural Tools .....	180
7.4.1 ICT Cultural Tools as Learning Tools .....	180
7.4.2 Teachers' Responsibility to Engage with ICT .....	185
7.4.3 ICT Cultural Tools and Professional Development.....	187
7.4.4 Concerns.....	188
7.5 Enjoyment .....	190
7.6 Chapter Summary.....	192
<b>Chapter Eight: Discussing the Themes .....</b>	<b>194</b>
8.1 Introduction .....	194
8.2 The Pedagogical Use of ICT .....	194
8.2.1 Pedagogy as a Practice Incorporating On-going Assessment .....	195
8.2.2 Pedagogy as a Knowledge-Based Practice .....	198
8.2.3 Pedagogy as a Relational Practice.....	200
8.3 Subjective Norms, Relational Trust, ICT Cultural Tools and Enjoyment	202
8.3.1 Student Teacher Views on What They Would Have Liked to Learn	202
8.3.2 Teachers' Views: 'It's Just What We Do Here' .....	204
8.4 Relational Trust – Student Teacher Perspectives.....	205
8.4.1 Relational Trust – Teacher Perspectives .....	206
8.4.2 Concerns of the Role of ICT in ECE .....	208

8.5 ICT Cultural Tools – Student Teacher Perspectives .....	209
8.5.1 Learning Tools .....	209
8.5.2 Teachers’ Responsibility .....	209
8.5.3 ICT Cultural Tools and Professional Development .....	210
8.5.4 Concerns .....	210
8.6 ICT Cultural Tools – Teacher Perspectives .....	210
8.7 Enjoyment .....	211
8.8 Student Teachers and Teachers Sociocultural Views of ICT Use .....	211
8.9 Chapter Summary .....	212
<b>Chapter Nine: TEAM – A Model for Teacher Appropriation of ICT .....</b>	<b>215</b>
9.1 Introduction .....	215
9.2 A Sociocultural Framing for ICT Appropriation in ITE .....	216
9.3 Detailing the Elements of TEAM .....	218
9.3.1 The Early Childhood ITE, Curriculum, Policy and Assessment Context .....	219
9.3.2 Mediatlional Means and TEAM .....	220
9.4 Pedagogical Spaces and Places for the Appropriation of ICT .....	223
9.5 Understanding the Development of Effective Pedagogy .....	225
9.5.1 Pedagogy as a Practice Incorporating Ongoing Assessment .....	226
9.5.2 Pedagogy as a Knowledge-Based Practice .....	227
9.5.3 Pedagogy as a Relational Practice .....	228
9.6 Conclusion .....	228
9.7 Chapter Summary .....	229
<b>Chapter Ten: Conclusion and Implications .....</b>	<b>231</b>
10.1 Introduction .....	231
10.2 Reflecting on the Study .....	231
10.3 Contribution of this Study .....	233
10.4 Limitations of this Study .....	233
10.5 Implications for ITE Providers, Policy Makers and Practice .....	234
10.6 Implications for Research .....	236
10.7 Concluding Comments .....	236
<b>References .....</b>	<b>238</b>
<b>Appendices .....</b>	<b>259</b>



## List of Tables

Table 1 Stages and Descriptions of the Stages of Concern.....	53
Table 2 Description of CBAM's Levels of Use.....	54
Table 3 Compositions of Kindergarten Teacher Participants' Contexts.....	84
Table 4 Compositions of ECE Teacher Participants' Contexts .....	86
Table 5 Teacher Descriptions of ICT in/for Pedagogical Purposes .....	97
Table 6 ICT and Assessment.....	98
Table 7 ICT and Teaching as a Knowledge-Based Practice .....	104
Table 8 Using ICT to Build and Sustain Relationships .....	108
Table 9 Subjective Norms .....	112
Table 10 Relational Trust.....	115
Table 11 Student Teachers' Developing Pedagogy in Relation to ICT .....	124
Table 12 ICT and Assessment.....	125
Table 13 Pedagogy as Knowledge Based Practice .....	137
Table 14 ICT Building and Sustaining Relationships.....	144
Table 15 Subjective Norms-Hands on Workshops .....	153
Table 16 Subjective Norms-A Dedicated ICT Paper .....	159
Table 17 Relational Trust and ICT.....	167
Table 18 ICT Cultural Tools .....	180

## List of Figures

Figure 1 Innovation Configuration Map .....	52
Figure 2 Theory of Reasoned Action .....	57
Figure 3 SAMR.....	61
Figure 4 TPACK .....	64
Figure 5 TEAM.....	219

# **Chapter One: Introduction and Background**

## **1.1 Introduction**

Information and communication technology (ICT) is a widely accepted part of society. This has implications for initial teacher education (ITE) providers and education contexts, including early childhood education and care centres and kindergartens. My thesis explores the experiences and expectations early childhood student teachers have for ICT use in their ITE programme and developing teaching practice. It also explores practising teachers' use of ICT and views of how they came to learn and were supported in ICT use. This focus arose from a concern to understand these participants' perspectives as a way of informing ITE providers about how to foster purposeful appropriation and integration of ICT so that student teachers graduate confident in their use of ICT in their teaching practice.

## **1.2 Background**

The background to this research is written in two sections. Firstly, I have described how my interest in this research area came about, and secondly, I have outlined some international and New Zealand policy and practice background and reasons for the research being relevant today.

### **1.2.1 My Interest in the Research**

My interest in this research came about as a result of a one-year Flexible Learning Leaders in New Zealand (FLLinNZ) scholarship that I was privileged to win in July 2005. This was a New Zealand Tertiary Education Commission scholarship. The purpose of the FLLinNZ programme was to facilitate and enhance the provision of flexible learning in tertiary education organisations through establishing a national mentoring network and creating a pool of leaders who are committed to sharing their expertise nationally to improve excellence in e-learning. I used the FLLinNZ scholarship to explore innovative ways that ICT can be used in early childhood undergraduate ITE programmes.

My interest was further provoked by the literature I reviewed that indicated ICT is often not used to its fullest potential in educational settings, with many teachers using it without a clear pedagogical purpose (O'Hara, 2008; Prestridge, 2012; Thieman, 2008). Teachers in Aotearoa/New Zealand are confronted by ICT in

many aspects of their daily work; however, at the time of my scholarship, teachers had little opportunity to use ICT whilst gaining their teacher education qualification (Bolstad, 2004). One conclusion from this early Bolstad literature review was that many studies in ITE indicated that early childhood teachers supported the idea that teachers learning about ICT should have a strong theoretical foundation. In addition to highlighting the need for opportunities for theoretical learning about ICT, the review indicated that student teachers needed to see and experience meaningful uses of ICT in authentic early childhood educational settings (Bolstad, 2004).

### **1.2.2 International and New Zealand Policy and Practice Imperatives**

There are growing expectations that students will learn to live and work in an information-rich society as independent lifelong learners and that their ability to use technology in a range of ways will be important in this. Despite this, the adoption and implementation of ICT by ITE providers and teachers has been relatively slow (Kerckaert, Vanderlinde, & van Braak, 2015; Teo, 2009). Hence, there is pressure on ITE providers today to prepare student teachers with the theoretical understandings and hands-on experiences needed for them to be able to use ICT in learning and teaching (Chai & Lim, 2011; Haydn, 2014).

The preparation of student teachers to use technology in their teaching practice has been an ongoing challenge in many countries (Angeli & Valanides, 2009; Goktas, Yildirim, & Yildirim, 2009; Jung, 2005; Teo, 2011). Although many ITE providers are aware that ICT has the potential to transform education, it takes more than technology tools and infrastructure to bring about the change required to make this possible (Lambert & Gong, 2010). In a report to the New Zealand Ministry of Education Bolstad, Gilbert, McDowall, Bull, Boyd & Hipkins (2012) highlighted that a range of aspects still needed to be taken into account in relation to ICT use in and for education. These include teachers being able to understand the affordances of ICT tools along with their ability to support an innovative curriculum that responds to 21st century learning and learners. This potential signals the importance of ITE providers persisting in working to ensure their graduates are confident, competent users of ICT.

### **1.2.3 Sociocultural Views of Learning**

In New Zealand, the imperative for student teachers to learn about ICT use is contextualised for early childhood teachers by the curriculum and other policy documents. *Te Whāriki*, the early childhood curriculum, is underpinned by a sociocultural view of learning (Clark & Grey, 2010; Lee, Carr, Soutar, & Mitchell, 2013; Nuttall, 2013; Ritchie, 2010). Vygotsky (1980) is widely recognised as establishing the framework for a sociocultural view of learning. He argued that children are active partners in interactions with others, constructing knowledge, skills and attitudes through their participation in and contribution to these interactions. Building on this, sociocultural theory acknowledges that teaching is a social enterprise accomplished through social interaction and participation as those who are more knowledgeable and experienced guide and scaffold others to make sense of their experiences (Bell, 2012). The ideas and concepts that individuals develop are understood as influenced by their interactions with more experienced others (Wertsch, 1991; Yoon & Ardichvili, 2010).

Learning within a sociocultural frame is considered mediated by cultural activities, tools, artefacts and practices. Mediated action is a key feature of this theory, which posits the notion that learning involves the appropriation, and not just mastery, of cultural tools. Wertsch (1998) defines appropriation as “the process of taking something that belongs to others and making it your own” (p. 53). In this thesis, the notion of appropriation is used to refer to student teachers and teachers taking up and using ICT for their own pedagogical purposes.

Sociocultural perspectives of learning emphasise the social, situated and mediated nature of learning as a process that occurs through interactions between individuals, tools and the context (Wertsch, 1991), that is, learning is understood as both an individual and a collective process that is linked to the cultural contexts where it is taking place. Importantly, it is intertwined with and mediated by psychological tools, such as languages and symbols, and by physical tools, such as computers and documents.

Within a sociocultural view, appropriation is the term that encompasses the notion for individuals taking a tool and making it their own. Jayanandhan (2009) posits it involves individuals transforming their understanding of and responsibility for

activities through participation. Individuals appropriate the cultural tools such as language, processes, procedures and technologies that are attached to a particular practice. Rogoff (1995) posits appropriation of cultural tools is not the same as ‘mastery’ because it involves a form of internalisation. Rogoff argues that mastery implies being able to use or develop the skill to use a cultural tool, whereas appropriation refers to taking something, such as technology, and making it your own by adapting it for your own use. Carr and Lee (2012) talk about the complex ways in which children appropriate knowledge and make sense of their worlds when they state:

A curriculum document may set out a mandated pathway for the appropriation of subject-based knowledge, but for teachers *and* children, the acquisition of knowledge includes more than ‘mastery’. It includes making personal sense of it, making it one’s own. (p. 12)

In summary, this thesis argues that a sociocultural approach to the participatory appropriation of ICT into ITE is required, and that such an approach would need to have at least the following three features:

- It construes learning as situated in social relationships with others within a learning and caring community.
- Within the approach ICT would be seen as a cultural tool, one of the key mediational means for understanding in and across a number of cultural sites.
- The use of ICT will change an individual’s goals: learners make it their own in a range of embodied and affective-emotional ways.

It would explore the ways in which early childhood ITE providers could support and contribute to student teacher appropriation and understanding of the affordances of ICT for pedagogical uses when teaching and learning is viewed from a sociocultural perspective.

#### **1.2.4 A Model to Explain Student Teacher Appropriation of ICT**

There are a number of models that purport to explain the ways people appropriate ICT. In this thesis, I draw on and explore four of these models that have been prominent in the literature: the Concerns Based Adoption Model (CBAM),

developed to study the process of educational change by teachers and others assisting with the change (Straub, 2009); the Technology Acceptance Model (TAM), developed to understand why users accept or reject information technology (Davis, 1989); the Substitution Augmentation Modification Redefinition Model (SAMR), a continuum model developed to help educators visualise and understand how technology can transform traditional learning environments (Puentedura, 2012b); and the Technological Pedagogical Content Knowledge Model (TPACK), developed to provide a means to understand teachers' integration of technology into their teaching practice and the kinds of knowledge they would need to ensure they could do this effectively (Mishra & Koehler, 2006).

These models each have strengths in explaining the appropriation of ICT, but they do not explicitly address integration into ITE programmes for early childhood education where one of the goals is that student teachers learn how to use ICT for pedagogical purposes. More specifically, and important in the New Zealand context, they are not underpinned by a sociocultural view of learning.

This study seeks to address this gap in the literature. It develops a model, the Teacher Education ICT Appropriation Model (TEAM), based on themes that emerged from the student teacher and teacher data. The aim of developing this model was to provide an analytical tool to assist teacher educators in understanding how early childhood student teachers might be supported to appropriate and integrate ICT into their teaching practice. I next explain the research design I used to develop the model.

### **1.2.5 Research Design**

The study was guided by the following research questions:

- How do student teachers and teachers use ICT for pedagogical purposes?
- How do student teachers and teachers consider they are/can be supported to learn to use ICT?
- Taking into account the sociocultural orientation in New Zealand towards ECE curriculum design, what might be the nature of a model to facilitate student teacher and teacher appropriation of ICT for pedagogical purposes?

To address these questions, I collected and analysed student teacher data from one particular paper in the Bachelor of Teaching (Early Childhood) programme at the University of Waikato. This paper, TEPS212-08B (HAM/TGA) *Making Sense of the World*, was the only one in the degree where student teachers were asked to discuss ICT for teaching purposes. I also interviewed 33 early childhood teachers in the field to gain some insight into how these teachers had learned to use ICT and how they viewed it as a teaching tool in and for early childhood education. I analysed the data for themes about use and support for use, with particular reference to ideas within the Concerns Based Adoption Model (CBAM), the Technology Acceptance Model (TAM), the Substitution, Augmentation, Modification and Redefinition Model (SAMR) and the Technological Pedagogical Content Knowledge Model (TPACK), whilst being open to new possibilities. In this way, I was able to draw on these models to develop a model that was focused on factors that support the integration of ICT into teachers' pedagogical practice in ITE programmes from a sociocultural perspective.

My focus was on practice and theoretical understandings in anticipation that the thesis would have direct implications for my own teaching practice and, at the same time, extend the theory and guidance available to others who want to better understand and promote the pedagogical uses of ICT in early childhood teaching practice.

### **1.3 Definitions**

This section provides a definition of some of the key terms used throughout this thesis:

#### ***Affordance***

In this study, the term affordance refers to the possibilities for ICT to be used to enhance learning and social connections within early childhood contexts.

#### ***Appropriation***

Appropriation is a process whereby individuals take up and make use of resources, both cognitive and physical, for their own purposes and as part of their daily practice.



### ***Mediational means***

Within a sociocultural perspective of learning, mediational means are the tools and symbols that are used in the learning process (Wertsch, 1991).

### ***Pedagogy***

Pedagogy is used to refer to the combination of knowledge and skills required for effective teaching (Bell, 2012).

### ***Initial teacher education (ITE)***

Initial teacher education refers to the period when individuals are learning how to teach as part of a formal qualification programme. In the context of this study, it refers to a three-year Bachelor of Teaching degree (BTchg) early childhood programme. This degree is an undergraduate qualification leading to provisional registration as an early childhood teacher in New Zealand.

### ***Student teachers***

Student teachers in this study are students engaged in an initial teacher education programme.

### ***Teachers***

Teachers in this study are qualified individuals teaching in kindergartens and early childhood education and care centres.

### ***Subjective norms***

Subjective norms in this study encompass the extent that student teachers perceive learning about ICT should be part of their ITE programme. Subjective norms in relation to early childhood teachers encompass the extent they perceive ICT was an important aspect of their teaching practice.

### ***Relational trust***

Relational trust in this study refers to student teachers' and teachers' positive relationships with ICT.

### ***ICT cultural tools***

The term cultural tool was used by Vygotsky (1980) to describe the tools within a culture that play a role in learning. In this study, the term ICT cultural tools is used to refer to the ICT tools or applications used to support learning in an early childhood education context (Laffey & Espinosa, 2003).

### ***Enjoyment***

The notion of enjoyment in this study is linked with Csikszentmihalyi's (1991) description of flow as the mental state of a person who, when involved in an activity, is fully immersed in a feeling of energised focus, full involvement and enjoyment.

## **1.4 Thesis Structure**

This thesis is organised in the following way: Chapter Two provides an overview of ICT in teaching and teacher education internationally and nationally. It argues that, despite the pace of ICT development and its influence on education, there is a need to know, from a sociocultural perspective, what early childhood student teachers and teachers think would support them to appropriate and integrate ICT into their teaching practice.

Chapter Three examines four models that have been used to:

- provide tools and techniques for assessing and facilitating ICT use in educational contexts
- contribute an explanation of how people come to accept and use ICT
- offer theories on how ICT might impact on teaching and learning.

This chapter also highlights aspects of these models that may be relevant to the appropriation and integration of ICT into teaching practice. The chapter points to limitations in the available models, making the case for their refinement and/or development.

Chapter Four explains the research in terms of the methodology and design that was utilised. It justifies the use of an interpretive stance and employing qualitative analysis to generate, interpret and discuss rich data from the student teacher and teacher participants. The procedures for data collection and data analysis are explored in detail, and the ethical and trustworthiness considerations of this study are addressed.

Chapter Five reports on the findings from teacher data generated from interviews. Findings are supported with participants' verbatim quotes.

Chapters Six and Seven report the student teacher views taken from online discussions. The focus is on their perceptions of ICT in initial teacher education. As in Chapter Five, findings are supported with participants' verbatim quotes.

Chapter Eight contains my synthesis and discussion of the findings, comparing student teacher and teacher perspectives. The findings are revisited and reviewed in relation to the literature.

Chapter Nine sets out the model developed from the findings: the Teacher Education ICT Appropriation Model (TEAM). This model aims to address the gap between the current models of ICT integration and the context for ICT use in early childhood ITE programmes in New Zealand. It offers a model by which student teachers might be supported to appropriate and integrate ICT for pedagogical purposes when teaching, learning and assessment are understood from a sociocultural perspective.

Finally, Chapter Ten reviews the study as a whole. It summarises the study in terms of its stated research aims and process and reflects on the research questions. It outlines the contribution of this study to understanding how student teachers might be better supported to appropriate and integrate ICT for pedagogical purposes as part of early childhood ITE programmes. The chapter also identifies limitations associated with the scope of the study, discusses the implications of the research findings for ITE providers, student teachers, teachers and policy makers, and concludes with a postscript that describes why TEAM is relevant today.

## Chapter Two: Literature Review

### 2.1 Introduction

This study is focused on gaining a more in-depth understanding of how pre-service and in-service early childhood teachers use ICT for pedagogical purposes and how they learn to use it. I undertook an extensive search of databases, such as A+Education, informit, ERIC, EBSCO and ProQuest, and through the Internet search engine Google Scholar to locate published journal articles with respect to how early childhood teachers use ICT internationally and in New Zealand. I used key terms and phrases independently and in combination. For example, *how early childhood teachers use ICT*, *preschool teachers*, *elementary teachers*, *early childhood and ICT*, *preschool and ICT*, *assessment and ICT*, *documentation and ICT*. These searches indicated that, while there is literature on how early childhood teachers use ICT, there is a lack of literature specifically about how early childhood teachers learn to use ICT for pedagogical purposes or what might be helpful to support such learning, suggesting that this area of practice is under researched.

This chapter is divided into six sections. Section 2.2 discusses the multimodal nature of ICT and the influence of this on teaching and learning practice. In sections 2.3 and 2.4, the literature about government policies relating to ICT use in early childhood education, both nationally and internationally, is reviewed, and influences regarding teachers' preparation for the use of ICT are highlighted.

Section 2.5 presents and critiques the literature to do with how early childhood teachers use ICT in their teaching practice in New Zealand and internationally. There are many challenges to integrating technology into ITE programmes and it is essential to understand how teachers currently use ICT before unpacking ITE teacher preparation.

This is followed by section 2.6, which gives an overview of teacher preparation and ICT in ITE programmes and scopes the variables that affect teachers' integration of ICT into their practice. ITE providers are expected to prepare student teachers with theoretical and hands-on experiences that will enable them to use emerging technologies in their teaching practice. To gain an understanding of these factors and influences, this chapter also examines the situational,

institutional and dispositional variables that affect how initial teacher education providers integrate ICT into their programmes, including practicum.

Finally, section 2.7 synthesises the literature and provides a bridge into Chapter Three, where I explore four models that seek to explain how people learn to use ICT. Throughout the review, I foreground sociocultural interpretations of the various activities because, as explained in Chapter One, early childhood education in New Zealand (curriculum and assessment) and elsewhere is underpinned by sociocultural theory.

These sections are organised under the following headings:

- The Influence of the Multimodal Nature of ICT on Education
- ICT in Early Childhood Education International Policy
- ICT in Early Childhood Education Policy in New Zealand
- Early Childhood Teachers' Use of ICT for Pedagogical Purposes
- ICT in Initial Teacher Education.

## **2.2 The Influence of The Multimodal Nature of ICT on Education**

ICT provides support for multimodal ways of communicating, teaching and learning. This easy access to tools to produce, publish and share text, pictures and video is changing the face of education at all levels of the system, including early childhood education. Although considerable numbers of early childhood teachers are beginning to use ICT, many are only now beginning to ponder the significant ways in which the multimodal nature of ICT can enhance their own practice and their students' learning (Angeli & Valanides, 2013; Bailey & Blagojevic, 2014). The move towards multiple modes of communication, accelerated by the Internet, raises a number of issues; questions and challenges for educational institutions in relation to what kind of knowledge will be valid in the future (Ng, 2012; Richardson, 2010). As an early example, George and Shoos (1999) suggested that people would need to be ready, willing and able to take responsibility for ideas and to take action as both a producer and a reader of multimodal texts within both physical and virtual environments. More recently, Richardson (2010) has argued that, because of the changes ICT has brought to education, teachers have had to rethink the kinds of literacy that they consider important and how they might equip students with the skills to be more than readers and writers; students also

have become editors and collaborators. Gee (2003) described a set of practices that call on one or more modalities to communicate distinctive types of meanings as semiotic domains. These domains include a variety of forms that take on meaning, such as images, symbols, sounds, gestures and images. Gee (2003) argued that the constant change in today's modern, global, high-tech world impacts on semiotic domains, transforming traditional ways of knowing at a fast rate, and that people need to be ICT literate within these evolving domains to be able to operate effectively in their worlds. Semiotic domains are an inherent aspect of multimodality and act as a means of realisation or discourses that help shape the way individuals learn (Kress & Van Leeuwen, 2001). This study aims to explore how early childhood teachers learn to use ICT for pedagogical purposes and to understand to what extent they exploit its multimodality in their teaching practice.

Gilakjani, Ismail and Ahmadi (2011) contend that the multimodality of ICT provides ITE providers the opportunity to create rich learning environments for their student teachers, with these supported by the wide range of information modalities and resources available on the Internet. They suggest that, due to the ways advances in ICT provide a diversity of means to represent concepts and ideas, academics need to be mindful of the pedagogical purposes and usefulness of ICT in the activities they design and use to facilitate learning. The continued development of new multimodal ICT tools presents challenges to policy makers and ITE providers on how to rethink the way they deliver curriculum and what they expect of student teachers in regard to understanding, appropriating and integrating ICT into their teaching practice.

### **2.3 ICT in Early Childhood Education International Policy**

A number of international policy developments over recent years have focused on the development of early childhood education curricula. Many of these developments are distinguished by a sociocultural orientation to learning and highlight ICT as playing a valid and vital role in young children's learning. For example, the Australian early childhood curriculum, *Belonging, Being and Becoming: The Early Years Learning Framework for Australia*, sets out a clear orientation to learning as a sociocultural activity that relies on connections between family, community, culture and place as central to children's learning.

This curriculum has a learning outcome dedicated to learning technologies. Learning outcome five – Children are Effective Communicators – is elaborated as: “Children use information and communication technologies to access information, investigate ideas and represent their thinking” (Australian Department of Education, Employment and Workplace, 2009, p. 44).

The Department of Education in England published *The statutory framework for the early years foundation stage curriculum* (EYFS) in 2014 (Department of Education, 2014). This outlines all the standards that must be met by early childhood education providers in England. This framework articulates the importance of all children being able to participate in and experience learning that is engaging and will contribute to building successful lives. Sociocultural theory underpins the curriculum and is emphasised in the importance placed on relationships in learning. For example, one of the guiding principles states, “Children learn to be strong and independent through positive relationships” (DCSF, 2014, p. 6). One of the learning goals in this document highlights children’s use and understanding of ICT. It states, “Technology: children recognise that a range of technology is used in places such as homes and schools. They select and use technology for particular purposes” (DCSF, 2014, p. 12).

In Ireland, the National Council for Curriculum and Assessment (NCCA), the body responsible for creating the primary school curriculum, developed an early childhood curriculum framework called *Aistear* (National Council for Curriculum and Assessment, 2009). This curriculum is underpinned by a sociocultural view of learning as evidenced by four themes: Well-being, Identity and Belonging, Communicating and Exploring, and Thinking. These signal a view of learning as an integrated process that takes into account the influences of a child’s wider world. Within *Aistear*, there is an embedded expectation that teachers and children will use ICT to support and extend learning (National Council for Curriculum and Assessment, 2009).

The *Curriculum for Excellence* was first introduced in Scotland in 2006. It attempts to provide a coordinated approach to curriculum for the age range 3–18 years. The curriculum is positioned as a forward-looking, coherent curriculum that aims to provide for Scotland’s children and young people and is underpinned

by four overarching capacities: confident individuals, successful learners, effective contributors and responsible citizens. It has a sociocultural orientation in that it takes into account anticipated future needs for children to be successful learners and responsible citizens as these relate to economic, technological and social change. Within this curriculum, there is also a focus on appropriate and effective use of ICT (Education Scotland, 2009).

To reiterate, many policy documents now have a sociocultural theory orientation that reflects Vygotsky's (1980) view that learning and development involves social interaction and includes becoming a valued member of your community and wider society. Also inherent in each of the policies described above is the view that early childhood teachers will use ICT in ways that enhance and enrich children's learning. This has implications for ITE providers – they need to understand the implications of a sociocultural view of learning as well as how student teachers learn to use ICT and what might support this learning. These understandings are needed if ITE providers are to contribute to student teachers that graduate with the knowledge and understanding needed to use ICT for pedagogical purposes underpinned by a sociocultural view of learning. This study aims to elaborate on what factors teacher educators need to take into account to achieve this.

## **2.4 ICT in Early Childhood Education Policy in New Zealand**

New Zealand Government policies have endorsed a sociocultural view of curriculum and learning and the use of ICT in early childhood education (Carr, Lee, & Jones, 2004). They highlight the need for early childhood ITE providers to support student teachers to use ICT for pedagogical purposes (New Zealand Teachers Council, 2008). *Te Whāriki: The National Early Childhood Curriculum* (Ministry of Education, 1996) and a number of policies on ICT use are detailed in this section.

### **2.4.1 *Te Whāriki: The Early Childhood Curriculum***

The development of *Te Whāriki: The National Early Childhood Curriculum* (during the 1990s) signalled the beginning of a significant shift in how children and early childhood education were viewed in New Zealand (Nuttall, 2003). The curriculum shifted away from a focus on physical, intellectual, emotional and



social development to a sociocultural orientation towards learning. This sociocultural orientation is foregrounded in the following statement:

This curriculum emphasises the critical role of socially and culturally mediated learning and of reciprocal and responsive relationships for children with people, places and things. Children learn through collaboration with adults and peers, through guided participation and observations of others, as well as through individual exploration and reflection. (Ministry of Education, 1996, p. 9)

Smith (1996), a New Zealand early childhood researcher writing about sociocultural theory at the time the early childhood curriculum was being developed in New Zealand, argued that central to sociocultural theory is the notion that children develop and learn through interactions with others in their social and cultural environments. She suggested that these interactions might involve a range of people, including parents and extended family members, siblings, friends and other significant adults such as teachers. These interactions are recognised as involving cultural artefacts, such as books or toys, as well as the culturally specific practices in which a child engages at home, school and other community events.

Within *Te Whāriki*, (Ministry of Education, 1996) the metaphor of a whāriki (woven mat) that everyone can stand on is central to the curriculum design. Whakamana/Empowerment, Kotahitanga/Holistic Development, Whānau Tangata/Family and Community, and Ngā Hononga/Relationships are the four principles of the curriculum. These provide the framework for this whāriki for teachers to use to weave a curriculum for their context and children when combined with five strands: Well-Being, Belonging, Contribution, Communication and Exploration. *Te Whāriki* takes into account the importance of reciprocal relationships between teachers, learners and families and has been described as a curriculum, which promotes a pedagogy based on relationships (Clark & Grey, 2010). This orientation recognises the holistic nature of learning and acknowledges that education and care are integrated and learning, development and children's experiences are interrelated. It reflects developing connections between home and the early childhood service as an important aspect

of children's learning and supports sharing curriculum, learning aims and assessment with families. A sociocultural approach positions relationships as central and fundamental to creating and enhancing optimal learning and teaching environments for and with children, their families and teachers. The notion of learning through and with reciprocal and responsive relationships with people, places and things is woven throughout the curriculum, with ICT being encompassed within 'things' (Ministry of Education, 1996, p. 9).

This view of ICT is described in Book 20 of the *Kei Tua o te Pae* series (Ministry of Education, 2009a) as:

The *Te Whāriki* perspective is that children will participate in the symbol systems and technologies of ICT for personal, social and cultural purposes: for becoming confident and competent in culturally valued enterprises, expressing emotion, making connections across time and place, contributing their own abilities and viewpoints of community, communicating with others (including appreciating the ways in which available cultures communicate and represent), and making sense of their worlds.  
(p. 4)

Underpinning these views is the notion of learning as a socially and culturally mediated process that reflects the sociocultural nature of learning. The next subsections set out details of policy documents developed to support the implementation of the curriculum.

#### **2.4.2 Learning Stories: A Narrative Formative Assessment Framework**

As teachers worked to implement the curriculum, it soon became clear that *Te Whāriki* (Ministry of Education, 1996) would have to use a different model of assessment. Within *Te Whāriki*, children are positioned as capable and competent beings who actively participate in their own learning and development, making sense of their worlds through the development of "working theories about themselves and about the people, places and things in their lives" (Ministry of Education, 1996, p. 44). Assessment based on a predetermined list of skills did not reflect the sociocultural view of children as capable and competent learners. More specifically, it did not reflect the four principles, and therefore a different

set of criteria was needed. Learning stories, a new way of assessing children's learning, were developed in response to *Te Whāriki*. Learning stories are a narrative formative framework based on the notion of narratives that capture multiple voices, foreground the value of learning dispositions, acknowledge children's strengths and interests and make transparent the teacher's actions in teaching contexts (Carr, Hatherly, Lee, & Ramsey, 2003). These narrative assessments can include teacher observations, learning stories, transcripts, children's work, parent/whānau stories and children's comments as well as photographs or short video clips. In line with their formative focus, they generally include feedback and/or suggestions for next steps in a child's learning, along with suggestions for strategies for how this might be achieved. Carr (2001) makes it clear that the learning stories approach to assessment reflects a sociocultural orientation through its focus on the importance of relationships and understanding the contexts in which learning occurs. This narrative approach to assessment has had a significant influence on how children's learning and development is viewed in New Zealand. Teachers began to document learning using narratives and photographs with the goal of reflecting children's interests, ways of being and ways of knowing. Originally, much of this documentation was carried out using Polaroid or 35mm cameras, but as digital cameras became less costly and more accessible, they soon became the tool of choice (Simonsen et al., 2010). Today, many teachers use ICT, such as cameras, iPods, iPads and computers, to document learning stories in New Zealand; however, whilst there is a growing body of New Zealand-based research about teachers using ICT for purposes other than documentation to foster and extend children's learning (Carr et al., 2010; Hatherly & Chapman, 2013; Khoo, Merry, Nguyen, Bennett, & MacMillan, 2013; Ramsey, Breen, Sturm, Lee, & Carr, 2006a; Simonsen et al., 2010), there is limited literature about how student teachers and teachers learn to use ICT for such pedagogical purposes.

#### **2.4.3 Pathways to the Future: Ngā Huarahi Arataki – An Early Childhood Strategic Plan**

*Pathways to the Future: Ngā Huarahi Arataki* was a 10-year strategic plan for early childhood education developed by the Ministry of Education and launched in 2002 (Ministry of Education, 2002). This plan was designed to be a roadmap to strengthen the early childhood sector and was closely connected to *Te Whāriki*

(Ministry of Education, 1996). It was developed in consultation with the early childhood sector over a period of 15 months. The three goals for ECE in New Zealand that were set out in this document were to increase participation in quality ECE services, to improve the quality of ECE services and to promote collaborative relationships. The plan, purpose and vision for early childhood education aimed to provide a framework for further development of policies, goals and strategies for the early childhood sector. One of the goals of this strategic plan was to develop Centres of Innovation (COIs) that led to a focus on ICT by teachers and centres. Two of these COIs, Roskill South Kindergarten and Wadestown Kindergarten, had a focus on ICT use (Ramsey et al., 2006a; Simonsen et al., 2010).

#### **2.4.4 *Kei Tua o te Pae/Assessment for Learning***

The publication of *Kei Tua o te Pae/Assessment for Learning: Early Childhood Exemplars* (Ministry of Education, 2004) was a direct response to *Pathways to the Future: Ngā Huarahi Arataki* (Ministry of Education, 2002). The Ministry of Education, in partnership with the early childhood sector, developed this resource, which drew on research, sociocultural theory and formative literature. The completed resource consists of 20 books and was made available to all licensed and chartered early childhood services. It was supported by professional development (Carr, Lee, Jones, & Cahill, 2007). Book number 20 is about ICT and contains exemplars of teachers integrating ICT into their practice. Some show how teachers might use ICT to document children's learning by capturing episodes or moments of learning with digital images. Others show children revisiting their learning stories, talking about them with their teachers and building on their learning. Overall, these exemplars aimed to illustrate how assessment might be used to represent children's learning in ways that supported the ongoing development of this learning.

#### **2.4.5 Centres of Innovation**

Early childhood Centres of Innovation (COIs) was another initiative that came from *Pathways to the Future: Ngā Huarahi Arataki* (Ministry of Education, 2002). The first round of COIs was announced in 2002 at the same time as the official launch of the Pathways document. The COI programme commenced in

2003 and ran through to June 2009, at which time a change in government policy and budget cuts saw the initiative discontinued.

Six early childhood services were initially selected to undertake an action research contract over a period of three years, during which time the teachers were expected to:

- work with researchers to undertake action research related to their innovation in teaching and learning.
- open their doors to show others their innovations and share their research findings.

Roskill South Kindergarten, one of the COIs from the first round, had a particular focus on innovative ways of using ICT by integrating a range of ICT into the curriculum. The research that was carried out during their three-year contract had a significant influence on how children and teachers use ICT in early childhood settings within New Zealand (Meade, 2010). It illustrated that ICT-rich environments, supported by adults who are comfortable with the use of technology, can enrich children's learning. Their final report used activity theory, a version of sociocultural theory, as a framework to illustrate the positioning of ICT in this educational setting (Ramsey et al., 2006a). The findings in the COI report indicated that learning stories were the main vehicle for integrating ICT into teachers' practice.

Wadestown Kindergarten, another COI, undertook an action research project from 2006 to 2008. The aim of this project was to explore the nature and roles of different literacy modes in communicative competence and in shaping the ways in which children viewed and operated in the world. This project included an exploration of multimodal literacies, including the use of ICT. The findings from this project indicate that ICT played a role in supporting children's literacy development in a range of ways (Simonsen et al., 2010).

#### **2.4.6 Foundations for Discovery Framework**

As part of the 2005 Budget, the New Zealand Government announced a \$16 million package to support the development of ICT capability in the early childhood sector over a four-year period. As a result of this funding, the Ministry of Education launched a framework called Foundations for Discovery (Ministry of

Education, 2005a) to support early childhood teachers' development in their use of ICT. The focus of this policy was to support teachers to use ICT in ways that would enhance children's learning and provide a means for teachers to communicate about and reflect on that learning. It set out to assist the teachers in the early childhood sector to harness the potential of ICT technologies in a considered and planned way to support effective learning and teaching. It also aimed to support early childhood services to make informed decisions about investment in and use of ICT in early childhood education, be it for teaching, learning, administrative or information purposes. It also had the aim of developing leadership and capability within the early childhood sector in relation to ICT. This framework had a sociocultural orientation that was evident in the focus on the influence of ICT on family, community, children and teachers across a range of contexts as well as societal values and government policies.

To ensure teachers were able to access Foundations for Discovery in ways that would enhance their knowledge of ICT, the Ministry of Education initiated and funded a national three-year programme for teacher professional development called the Early Childhood Education Information and Communication Technologies Professional Learning (ECE ICT PL) programme. This was managed and facilitated by CORE Education (Core Education, n.d.). The programme began as a pilot and used a whole-centre professional development approach, with the intention of building teacher understanding of how ICT could contribute to children's learning experiences. Teachers in each centre chose a focus of investigation and used an action research approach to implement and evaluate change (Hatherly, Ham, & Evans, 2009). The programme facilitators supported teachers to understand and apply action research to unpack their pedagogy in relation to ICT use and supported them to gain ICT technical knowledge or know how. Hatherly, Ham and Evans (2009) noted in their synthesis report evaluation of this programme that ICT alone did not make a difference to teachers and children. They stated:

New technologies provide significant opportunities and affordances for learning and social connection in ECE settings, including that which would be impractical or impossible otherwise,

but they do not guarantee these outcomes independent of the pedagogical and social contexts within which they are used. (p. 4)

They further noted that children tended to engage in learning opportunities when teachers encouraged them to use ICT by themselves, or at least to have some control over which ICT tools they wanted to use, and recognised they would have their own purpose for how and what they wanted to use it for. The comprehensive project report contains many examples of children using ICT, which illustrate the teachers' growing understanding of children's capabilities with ICT up to the time the change in government policy saw the funding from the project discontinued and the project halted. The authors suggested that teachers gained confidence through their use of ICT through their involvement in professional development; however, much of this use appeared to be skills focused, independent of key social and pedagogical affordances.

#### **2.4.7 The Education Review Office/Te Tari Arotake Matauranga**

The Education Review Office (ERO) is a body that independently reviews and reports on the quality of education in schools and early childhood services in New Zealand. The focus of ERO's reviews in early childhood services is on the capacity of the service to promote positive learning outcomes, with the purpose of contributing to improved wellbeing and learning for all children. ICT has become embedded into the review process, which early childhood services are reviewed against. For example, the following quote is from a review undertaken in an early childhood setting during 2015. "Information communication technologies (ICT) have become a positive feature in the kindergarten. Teachers use ICT tools for communicating learning between children, parents and teachers" (Education Review Office, 2015, p. 3). The inclusion of ERO's review process signals that early childhood teachers have a responsibility to ensure they are using ICT in their teaching practice and further highlights the importance of ITE providers to include a focus on student teachers appropriating and integrating ICT into their teaching practice.

#### **2.4.8 Graduating Teacher Standards: Aotearoa New Zealand**

During 2007, the New Zealand Teachers Council introduced a set of Graduating Teacher Standards (New Zealand Teachers Council, 2008). These standards apply to teachers across all sectors – early childhood, primary and secondary. The

overall purpose of these standards is to highlight what graduating teachers will know, understand and be able to do and the dispositions they will have that are likely to make them effective teachers.

ITE providers are required to develop a graduate profile for each of their programmes that align with the Graduating Teacher Standards. From 2008, all teacher education providers were required to provide evidence to the New Zealand Teachers Council that all of their graduating student teachers met the Graduating Teacher Standards. Standard 4 – Graduating teachers use professional knowledge to plan for a safe, high quality teaching and learning environment – contains an explicit connection to teachers’ use of ICT:

d) demonstrate proficiency in oral and written language (Māori and/or English) in numeracy and in ICT relevant to their professional role (New Zealand Teachers Council, 2007)

The inclusion of ICT in these standards highlights the responsibility ITE providers have been charged with to ensure they provide opportunities for student teachers to become proficient users of ICT as a part of their ITE.

To sum up, each and all of the government policies outlined above have influenced the role of ICT in early childhood education in some way. Although some policies no longer exist due to budget constraints, others continue to foreground the important role ICT has in early childhood education. They also come with a clear implication for ITE providers that they have a responsibility to include meaningful opportunities for student teachers to engage with and learn how to use ICT for pedagogical purposes in their programmes. This study sets out to explain what the composition of these opportunities might be.

## **2.5 Early Childhood Teachers’ Use of ICT for Pedagogical Purposes**

There is a growing body of international literature on teacher use of ICT for pedagogical purposes in early childhood education. Currently, the main focus of this literature tends to be on assessment documentation of children’s learning. There are fewer studies on the wider use of ICT for pedagogical purposes. The first part of this section scopes international research into teacher use of ICT, and the second part focuses on use by New Zealand teachers.



### **2.5.1 Teachers Using ICT for Pedagogical Purposes: International Studies**

Research has shown that ICT has influenced how teachers document children's learning in early childhood settings through the way it allows them to capture and represent moments of children's learning that can be shared with the children and their families. ICT provides a means for teachers to create documentation in a range of ways that make their children's learning accessible (Masoumi, 2015; Sheridan & Samuelsson, 2003). This focus on documentation assessment of children's learning was present when I began my research and continues to be an important use of ICT by early childhood teachers. For example, the Children of the New Millennium research project, which took place in South Australia during 2002–2004, was a collaborative research project between the Department of Education and Children's Services of South Australia, the University of South Australia and the Australian Research Council. It used learning stories as a part of this process to document how children aged 4–8 years used ICT in their homes, early childhood education centres and schools. The development of a multi-literacies map, an observational tool that allowed teachers to explore children's learning with ICT, was one of the major aims of the study (University of South Australia & South Australian Department of Education and Children's Services, 2004). It was proposed that such a pedagogical tool would enable teachers to better understand and plan for technology use. The findings from this Australian study indicated that young children could use ICT confidently and enjoy engaging with some of the programmes that were available to them. However, it also revealed that the teachers found it difficult to critically analyse learning stories, particularly when it came to children's use of critical thinking. The report highlighted that teachers had difficulty in identifying and articulating how children built knowledge or new ideas from their involvement with ICT. It appears from the findings that teachers' use of ICT was mainly to capture and document children's learning and they did not use it as a tool to enrich and deepen children's learning by engaging them in deeper thinking and/or problem solving with ICT (University of South Australia & South Australian Department of Education and Children's Services, 2004).

Boardman (2007) cautioned that, while ICT had provided teachers with an essential mode to create documentation in a manner that allowed children

themselves to be involved in the assessment process, teachers were not using it to enhance children's learning. Buldu (2010) highlights the focus on the documentation process again, in a study that sought to investigate if kindergarten teachers in United Arab Emirates (UAE) valued the role pedagogical documentation might play as a mode of formative assessment in their teaching practice. Buldu (2010) defines pedagogical documentation as: "The process of pedagogical documentation involves recording children's learning experiences, analysing children's work products, and sharing these with the children through a documentation panel, that is, a visual representation or archive of children's learning that provokes reflection" (p. 1440). Findings from this study concluded that assessment approaches focused on the use of ICT to document children's learning processes, capture artefacts to support children's learning, inform teachers' curricular and pedagogical decisions and help parents become aware of their children's learning were preferred. These findings strengthen the case for the value of ICT in documenting and making visible children's learning.

Since I began this research, there has been a growing body of literature on the use of mobile devices in early childhood settings, in particular, the use of iPads. This is not surprising given the advances in ICT during this period. It is interesting, however, to note that, while there are some aspects emerging of how teachers are using iPads in their teaching practice, there appears to be a concern that ITE providers are not ensuring student teachers are gaining a sound understanding of possible pedagogical purposes for iPad use (Blackwell, 2013; Kucirkova, 2014). Other examples of iPad use by teachers also flag the need for teachers to gain a better understanding of the pedagogical affordances for such mobile devices to enable them to be used to foster children's learning (Blackwell, 2013; McManis & Gunnewig, 2012; Shifflet, Toledo, & Mattoon, 2012). Research on iPad use undertaken by Kucirkava (2014) indicated that it is critical for teachers to understand that pedagogy should drive the use of iPads if they are to truly make a difference to children's learning. She suggested that many of the benefits of iPads have not been fully realised or evaluated and argues that teachers need to understand the direct pedagogical applications to be able to use them to their full potential. Findings from research by Neumann and Neumann (2014) revealed tablets can foster emergent literacy when quality interactions between children

and adults occur. The Neumanns' research was on children's use of tablets in their homes and involved 109 children aged 3–5 years. Whilst there were a number of findings relating to children and their families, one of the implications for early childhood education was that early childhood teachers should adopt pedagogical approaches to the use of tablets that recognise and build on children's experiences from home. Neumann and Neumann (2014) posit that teacher education providers need to ensure that student teachers learn how to foster children's engagement with technologies such as iPads and suggest scaffolding student teacher engagement with and exploration of such devices can do this. More recently, Masoumi (2015), writing about his study in Sweden to identify how early childhood teachers use ICT for teaching, notes that six teachers from three preschools made considerable use of ICT for documentation purposes although there were also other examples for teachers' use of ICT. These included the use of an interactive whiteboard as a multimedia mode of support for children's literacy development, using iPad applications to support second-language acquisition and interactive games and videos as a way to "keep children busy" (p. 12).

In contrast to the above studies, which foreground the use of ICT to accomplish a range of tasks, there is evidence that teachers also focus on helping children to learn the skills required to use ICT. For example, a recent survey study by Kerckaert, Vanderlinde and van Braak (2015) in Flemish preschools found that teachers' most frequent use of ICT was for supporting children's basic ICT skills and attitudes. They argue their findings highlight the need for professional development for teachers to help them to shift the emphasis from teaching basic ICT skills to a focus on the affordances ICT offers to children's learning. The term 'affordance' was introduced by Gibson to describe:

... [what an environment] offers the animal, what it provides or furnishes, either for good or ill. The verb to afford is found in the dictionary, but the noun affordance is not. I have made it up. I mean by it something that refers to both the environment and the animal in a way that no existing term does. It implies the complementarity of the animal and the environment. (Gibson, 1977, p. 127)

Carr (2000) suggests the notion of affordances is a useful term when describing the relationship between a learner, technology and their context. She explains:

It refers to the perceived and actual properties of an object or artefact, those properties that determine just how it could *possibly* be used and how the technology facilitates or hinders learning of various kinds. (p. 62)

Therefore, an affordance is a relationship between an individual and an object, with the object perceived in relation to the needs of the individual. For example, a chair could be used for sitting, as an object to stand on to access something in a high cupboard or even as a weapon in an act of self-defence. In each case, the properties of the chair remain the same, but the opportunities provided by the chair differ according to the needs of the person involved. Furthermore, the same chair might afford different things to the same person at different times (Hammond, 2010). In this study, the term affordance refers to the way a person perceives a technology or software can be used and what it allows them to do or not do (Conole & Dyke, 2004). Kerckaert, Vanderlinde and van Braak (2015) argue that teachers have to understand the affordances of ICT before they can integrate it into their teaching practice. They point out that, whilst there is a growing body of evidence of the positive influences of ICT in early childhood, there is very little empirical research on how teachers learn to use ICT for pedagogical purposes in early childhood settings. To put it another way, the term affordances could be used to describe the possibilities or constraints that ICT has to offer for educational use (Cochrane, Narayan, & Oldfield, 2013; Conole & Dyke, 2004; Hammond, 2010; John & Sutherland, 2005; Tan, Lin, Chu, & Liu, 2012). I use the term affordances in this study to highlight the different ways student teachers and teachers can use ICT for pedagogical purposes.

### **2.5.2 Teacher Use of ICT for Pedagogical Purposes: New Zealand Studies**

There is a substantial body of literature on teacher use of ICT for pedagogical purposes in early childhood education in New Zealand. Currently, this literature is focused on teacher use of ICT to document learning and/or assessment learning stories, although there is research on teacher use of ICT for other teaching purposes. This section sets out findings from the two Centres of Innovation (COIs) Roskill South Kindergarten and Wadestown Kindergarten, mentioned

earlier, in relation to teacher use of ICT, including for documentation purposes. It then goes on to give an overview of early childhood teachers using ICT for pedagogical purposes.

In reviewing all six COI projects, Meade (2010) noted there was a strong reliance on the work of Carr (1998). Meade argued the prominence of Carr's work had influenced the use of ICT for documentation. Alongside this, research and development into the use of ICT at the Roskill South Kindergarten and Wadestown Kindergarten COIs, as mentioned earlier, has been particularly influential in the New Zealand scene. The foundation for the project work at Roskill South from 2003 to 2006 was the notion that "children learn through responsive reciprocal relationships with people, places and things" (Ministry of Education, 1996, p. 4). Learning was seen to be situated, and 'distributed' across people and places outside of the centre, and ICT was considered as one of the 'things' (Ramsey et al., 2006a, p. 4). Key features of the integration of ICT into the centre and what difference this made for teachers was a focus for this project. The integration of ICT in the centre was closely connected to the early childhood curriculum and learning stories, which was perceived to be a powerful combination to enhance learning. The findings revealed ICT made a positive contribution as another (predominantly visual) mode of communication and representation for young children who have not yet learned to read and write. Children also used it to develop their story-telling abilities. The final research report indicated that teachers developed their ICT knowledge and skill through their participation in the project. The report included many examples of teachers using ICT with children for purposes other than documentation such as making connections with their wider community, supporting children to do their own research using the Internet, using ICT to support children's imagination and building literacy skills. The report did not, however, include much specific information on how the teachers learned to use ICT through the project. However, within this report, teachers did mention, "we have begun to notice and recognise the features of multimodal learning, and to appreciate its power and significance" (p. 50).

Wadestown Kindergarten, the second COI, undertook a research project from 2006 to 2008. The aim of this research was to explore the nature and roles of

different multimodal literacies, including digital literacies in relation to children's communicative competence, and the ways in which multimodal literacies shape how children view and operate in the world. The use of digital images was a feature of the research findings. Teachers indicated that the inclusion of digital images in children's documentation, such as learning stories, enabled children to read stories that they had featured in or were interested in, which contributed to extending children's interests and conversations about aspects of events captured in the images. This research yielded evidence of a range of multimodal literacies, including ICT as a mode of communication and representation. Implications for teachers from this research included the need for teachers to be able to articulate the learning in their written documentation and to become more familiar with the affordances of different modes of literacy, including digital literacies (Simonsen et al., 2010). Taken together, the findings from the two COIs illustrate teachers using ICT for a range of purposes, including assessment documentation; however, neither study provides specific examples of how the teachers learned to make use of ICT in these ways. Meade (2010), in her review of all six COIs, noted there was surprisingly little evidence in the COI reports about how teachers learned to use ICT to achieve this. Outside of these COIs, in publications, there is a broad range of literature of teachers' use of ICT in ECE settings. More recently, Carr and Lee (2012) wrote about a collection of learning stories that contribute to the construction of children's identities as learners. Digital images are used in all documentation gathered to illustrate a wide range of examples of experiences and ideas that contribute to the notion of learner identities. Teachers have also used documentation to support children's transitions to schools (Hartley, 2012; Hartley, Rogers, Smith, & Lovatt, 2014; Peters, Hartley, Rogers, Smith, & Carr, 2009a, 2009b; Ramsey et al., 2006a). There is also a developing body of literature that contains evidence of early childhood teachers using ICT for pedagogical purposes other than documentation. *Kei Tua o te Pae/Assessment for Learning: Early Childhood Exemplars* (section 2.4.4) all contain examples of documentation that teachers have created using ICT, particularly Book 20, which is focused on the use of ICT by teachers and children. These exemplars have been captured by the teachers using ICT and documented in a learning story format to represent the learning that was occurring. The exemplars contain narratives that show children and teachers using ICT for a range of purposes, including children researching

using the Internet, teachers and children co-publishing children's stories in books developed with PowerPoint, digital images of children capturing digital images of their early childhood centre environment, which later became a learning story, and digital images of children at play being captured by teachers and represented through learning stories to share with families.

The small research project I was involved in, mentioned earlier in this chapter, explored how two teachers used iPads to support and extend children's relationships within and outside an early childhood centre in New Zealand. The research involved collaborations with two early childhood teachers and children at the centre to obtain perspectives of teachers, young children and their parents/caregivers regarding iPad adoption and use. The findings highlighted the potential for teachers' use of iPads to support and further develop young children's relationships with people, places and objects within their immediate contexts. It was evident that such use must be underpinned with a clear pedagogical purpose, informed by a relational pedagogy perspective. These findings have implications for ITE providers around how they ensure student teachers are supported to use mobile devices, such as iPads, to create meaningful and relevant teaching and learning experiences for and with young children (Khoo, Merry, Bennett, & MacMillan, 2015; Khoo et al., 2013).

A New Zealand author, Hatherly (2009), argued that e-books are a valid form of literacy learning. She reported teachers at a kindergarten trialled creating e-books with some of the 4-year-olds. They found that the computer technology provided children with a means to visualise their work through another medium, which allowed them to make adjustments or modifications to their work and add this to their developing story. The teachers indicated that this process involved a level of deep thinking by the children and suggested that children using a digital camera and computer to create the e-books highlighted two aspects of this. These were "thinking goes from gathering to processing to applying" and "making connections between concrete and abstract" (p. 9). Hatherly noted that this process would not have occurred without the teachers understanding the potential of ICT to contribute to children's powerful learning experiences.

A later study undertaken by Hatherly and Chapman (2013) focused on how teachers used ICT for learning purposes, in particular, on teachers' use of iPads to support literacy. They claim that teachers' use of iPads as a tool can contribute to young children's motivation to engage with literacy learning. They undertook a small research project in an education and care centre that catered for 30 children to explore how literacy learning opportunities could be engaging for boys by using iPads. The study was based on the premise that one of the key dispositions to early literacy learning was self-motivation. Baseline data collected using time sampling and anecdotal observations highlighted during the day that girls engaged with books and often sought opportunities to "read" books for their own pleasure. However, teachers indicated that they were concerned that some of the boys did not have the same interest. There were 19 boys on the roll at the time, and a group of eight boys became the focus for their project. The findings revealed teachers used a balance of intentional teaching and child-led approaches to working with iPads. This had contributed to increased interest by the boys to access paper picture books more frequently for their own pleasure, sometimes in combination with iPads, as learning opportunities arose. Hatherly and Chapman (2013) indicated that a key point from this small research project was that the teachers appeared to have a clear pedagogical purpose for the use of iPads to support the boys' development literacy learning, which resulted in positive outcomes for the children in relation to strengthening their interest in reading. They indicate that this outcome would not have been possible through the technology alone, as it required teachers who put purpose before technology.

In summary, it is interesting that, while ICT has become more commonplace in early childhood education, the use of ICT for documentation appears to be a dominant feature in both international and New Zealand literature. Whilst there is a body of literature about teachers using ICT for pedagogical purposes other than documentation, concerns around teachers' understanding of the wider pedagogical uses of technology are evident in the literature. This highlights the need for teacher professional learning more generally and, more specifically, the need for ITE providers to support student teachers to learn how to use ICT in innovative ways in their teaching practice.



## **2.6 ICT in Initial Teacher Education**

Initial teacher education is complex, but teachers could reasonably be expected to begin learning how to use ICT for pedagogical purposes during their teacher education. This section provides an overview of some of the complexities involved in initial teacher education (ITE) with a particular focus on how ITE providers prepare student teachers to use ICT for pedagogical purposes. First, I explore the influence of sociocultural views of learning on ITE programmes, then the responsibilities of ITE providers to ensure their student teachers are prepared to use ICT in their teaching practice before I go on to review student teacher conceptions and beliefs about ICT use.

### **2.6.1 Sociocultural Views and Initial Teacher Education**

Sociocultural views of learning are prominent in the literature about teacher learning and ITE (Bell, 2012; P. Kelly, 2006; Smidt, 2009). For example, Cheng (2005), writing about sociocultural views of learning in ITE programmes, describes learning about teaching as a process of “socialisation or enculturation, leading to shared knowledge through human interactions” (p. 349). She argues that, within the context of an ITE programme, student teacher learning is shaped by social interactions with lecturers and peers. Cheng further asserts that, within a sociocultural view of learning, ITE includes the notion of lecturers as change agents who socialise the student teachers into the culture of teaching. She suggests that this process involves the use of tools and signs, which Werstch (1991) referred to as “mediational means” (p. 48).

Kelly (2006), in describing a sociocultural view of teacher learning, posits that ITE providers should provide opportunities for student teachers to learn and develop “within a complex web of distributed knowing and collaborative learning” (p. 517). He asserts that it is important for student teachers to have opportunities to work together to develop their ideas and critically reflect on their learning.

Johnson (2007) argues that student teacher learning occurs through participation in sociocultural activities and experiences, which in turn mediates learning through the socially constructed symbolic artefacts or tools that are created and used within ITE programmes. Such artefacts include physical tools (such as ICT tools and text books) and symbolic tools (such as language and pedagogical

content knowledge) that are culturally constructed, used and modified over time. Johnson explains appropriation (section 1.2.3) in the context of teacher education as:

... the process through which a person's activity is initially mediated by other people or cultural artefacts but later comes to be controlled by the person as he or she appropriates and reconstructs resources to regulate his or her own activities. For example, a novice teacher's activities may be initially regulated by a physical tool such as a teacher's guide, but later come under her control as she internalizes certain pedagogical resources (time management, knowledge of students' abilities, pedagogical content knowledge, etc.) that enable her to teach concepts and/or skills in ways that are more appropriate for a particular group of students in a particular instructional context. (p. 177)

Johnson (2007) further contends that the use of sociocultural views of learning with ITE programmes enables us to recognise the interconnectedness of the cognitive and social aspects of learning. She states:

It opens up the possibility to trace how teachers come to know what they know, how different concepts in teachers' thinking develop and how this internal activity transforms teachers' understandings of themselves as teachers, their teaching practices and the nature of their students' learning. (p. 178)

Peck, Gallucci, Sloan and Lippincott (2009), writing about sociocultural theory and change within ITE programmes, described sociocultural views of learning as "the functional interdependence of individual and collective learning processes, and include particular attention to the process of 'mediation' of learning through the appropriation and transformation of conceptual and material tools" (p. 19). They contend that the notion of learning through participation from a sociocultural perspective foregrounds how learning can be understood as a socially negotiated process of change in the ways individuals participate in cultural practices. By this, they mean sociocultural views prioritise the interrelationships of the individual and collective process of learning, with

specific consideration of the role mediation plays in this.

Bell (2012), in theorising teaching as a sociocultural practice, asserts that, when teaching is positioned as a sociocultural practice, the emphasis is on creating an understanding of how human thinking and action takes into account the fundamental relationship between mind and action and individuals' social, cultural and institutional contexts. Bell states, "... to understand thinking and the practice of teachers and students teaching and learning in classrooms, we need to take into account the sociocultural contexts in which the teaching and learning are occurring, and the relationships between mind and action" (p. 1). Bell used a jigsaw metaphor to describe nine key elements she considered form the foundation of sociocultural teaching and learning – embodied practice, relational practice, social practice, caring practice, political practice, cultural practice, emotional practice, ethical practice and spatial practice. From Bell's perspective, these elements all interact with each other and foreground the complexities of sociocultural views of learning.

More recently, Hökkä and Eteläpelto (2014) discussed sociocultural views in relation to the pressure on teacher education providers around the world to make changes to meet the demands and challenges of 21st century learners. They argued, "It is clear that in a rapidly changing and increasingly knowledge-dependent world, teacher education must develop to respond to the challenges of the 21st century" (p. 48). They contend that this will require lecturers to work together and to build a shared understanding as part of developing new work practices and curricula that transform their educational organisation and support the introduction of educational innovations.

Kelly (2015), employing a sociocultural lens, locates learning as a process that involves social relationships with others within learning communities. She asserts that the cultural tools in use within such communities are at the centre of learning. Tools such as computers and software help to mediate or transform thought and communication into learning. Kelly further noted that it is through participation that collaborative interaction and interpersonal engagement is promoted and changes in individual activities and goals occur. Kelly describes this process as "participatory appropriation" and posits that, through this process of developing

new understandings, “learning is appropriated rather than merely utilised” (p. 32).

Some scholars have focused directly on ICT as part of a sociocultural view of ITE. For example, Laffey (2004), writing about ICT use in early childhood ITE, makes the distinction between appropriation and mastery. He defines mastery as the know how that student teachers exhibit in relation to the use of ICT within their teacher education programme. For example, they know how to use ICT to create their assignments and to access support services within the university context. He states that appropriation refers to their “making the use of technology their own, so that they see a role for their use of technology in other courses, as well as in their planning for future teaching” (p. 362). In other words, mastering a tool involves gaining the skills required to use it, whereas appropriation of the tool goes beyond that and involves developing the knowledge and competence to use it for your own purposes, which may be beyond those for which a tool was originally designed. Similarly, Hamid, Waycott, Kurnia and Chang (2014) described appropriation of ICT within ITE programmes as involving “users integrating new technologies into activities and using tools in ways that are sometimes disparate from the uses the designers originally intended for” (p. 307).

Sociocultural views have influenced policy and the design of ITE programmes within New Zealand. According to Kane et al. (2005), the conceptual frameworks that support the design of ITE early childhood programmes highlight the beliefs and understandings of what is involved in becoming a teacher. These frameworks in turn highlight the importance of relationships, which resonates with sociocultural views of learning. Kane et al. further notes that the early childhood curriculum has influenced the sociocultural orientation design of these programmes. They state:

Te Whāriki advocates for interactions between children and adults that are reciprocal and responsive and these principles are identified explicitly in some conceptual frameworks as guiding teacher-educator-student interactions as a model for teachers’ work with children and their families. (p. 56)

Stephenson and Rio (2009) commented on the development of the Graduating Teacher Standards mentioned earlier and indicated that there was a shift to a

sociocultural view of learning expressed in this policy. They stated, “the standards outline professional values and relationships, and teachers are required to demonstrate an understanding of what this means for them as teachers, in building relationships with students, parents, colleagues, and the community” (p. 161).

Ritchie (2010) describes the sociocultural influence of *Te Whāriki* as having changed how teaching is viewed in early childhood settings. She suggests teachers are now viewed as facilitators of learning within the sociocultural context of each early childhood educational setting. She further contends that this teaching approach recognises both the socially constructed nature and co-constructive process of the knowledge involved in teaching and learning. She argues that this change to how teaching is viewed within the early childhood sector needs to be reflected in early childhood ITE programmes. She states, “Teacher education and professional development providers have a key responsibility to instil within their graduates and participants a strong ability to deliver the sociocultural early childhood curriculum” (p. 4). By this statement, Ritchie appears to be challenging early childhood ITE providers to facilitate learning using sociocultural principles.

The literature indicates sociocultural views of learning appear to have influenced the design and implementation of early childhood ITE programmes, particularly within New Zealand. I drew on this sociocultural influence in considering the need for and development of a new model to support ITE providers’ understanding of how student teachers might be supported to appropriate and integrate ICT into their teaching practice.

In summary, a sociocultural approach to participatory appropriation of ICT into ITE has at least three features, which I use as reference points in this study:

- It construes learning as situated in social relationships with others within learning and caring communities.
- ICT is seen as a cultural tool, one of the key mediational means for understanding across a number of cultural sites (for example, a university campus and an ECE centre); however its use has ethical, political and community-building aspects that may be different from other mediational tools (activities, books, conversations).

- The use of ICT will change an individual's goals: learners make it their own in a range of embodied and affective-emotional ways.

### **2.6.2 The Responsibilities of Initial Education Providers**

Section 2.6.1 set out an acknowledgement in the literature that preparation of student teachers to use ICT for pedagogical purpose is a complex process and that responsibility for this resides with ITE providers. This aspect is discussed in relation to the complexities and responsibilities of teacher educators and the influence of teacher education provider knowledge.

#### ***Complexities and responsibilities***

Over 10 years ago, Jones (2003) argued that, whilst preparing student teachers to use ICT is complex and challenging, ITE providers hold future teachers' technology use for educational purposes in their hands and therefore must take their role in this seriously. More recently, Teo, Lee and Chai (2008) acknowledged the complexities involved in preparing student teachers to use ICT, but they argued that it was the ITE providers' role to ensure that their student teachers graduated as teachers who were willing to embrace ICT and able to integrate it into the curriculum and their teaching practice. They stated:

While it is important to ensure that teachers are able to use technology in the curriculum, the groundwork must be laid at the pre-service teacher's level. In the course of training, pre-service teachers should be provided with tools and experiences that will be used regularly in their future jobs as a teacher as teaching has become a highly complex activity. (p. 138)

These views were later supported by Morgan (2009), who commented that ITE providers need to move away from just using traditional modes of teaching to ensure that the content of their programmes is designed to include opportunities for student teachers to learn about ICT in ways that are engaging and will enhance their learning. Sutton (2011) suggests that, given there has been an emphasis on the need for student teachers to gain an understanding of the affordances of ICT in relation to teaching and learning, one could expect ITE providers to ensure their programmes provide access to the tools, support and time that student teachers need to learn how to integrate ICT into their teaching practice. However, this is often not the case, as Sutton states:

Teacher educators may believe that they provide all of the necessary training so that their graduates go out into the world with the best 21st century skills possible, but study after study has shown that teachers do not feel adequately prepared to integrate technology into their classroom instruction ... (p. 39)

Brun and Hinostroza (2014) concur with the views expressed above. Their study in Chile to ascertain the use of ICT within ITE programmes found that, while more lecturers and student teachers are developing a range of ICT-related skills, the knowledge about ICT for pedagogical purposes is not being transferred into innovative teaching practice. They state, “However, the use of technologies still seems to remain bounded to a set of basic teaching and learning activities, whereas the more advanced and complex pedagogical activities are significantly less frequent” (p. 236).

Overall, it is evident in the literature that an understanding of and action on how student teachers appropriate and integrate ICT into teaching practice by ITE providers is viewed as essential if student teachers are to gain the knowledge and skills required to use ICT effectively in their teaching. To enable ICT tools to be used to their full potential, student teachers need to understand their affordances and how to create opportunities for their use as part of their teaching practice. However, this can only become a reality when student teachers are competent and confident with their use of ICT (Donnelly, McGarr, & O’Reilly, 2011; Ertmer, 2005; Jung, 2005; Katic, 2008; Sutton, 2011).

ITE providers need to ensure that ICT is embedded into their programmes is highlighted by Parette, Quesenberry and Blum (2010). They posit that this should be done in ways that reflect lecturers’ understandings of meaningful developmentally and culturally appropriate uses of technology in ITE programmes with the aim to support student teachers’ use of ICT in their teaching practice. They further argue that teachers could not be expected to use ICT in their teaching until ITE providers change their practices to reflect the influence of ICT on 21st century learners. Larkin, Jamieson-Proctor and Finger (2012a) noted that ITE providers ideally should ensure their student teachers are aware of the intersection between ICT and pedagogy and argue that many providers do not prepare student teachers adequately to use ICT for pedagogical purposes. Haydn

(2014) wrote about the importance of student teachers graduating with the skills and knowledge to use ICT in their teaching practice to enhance teaching and learning. He argued that, even though there has been a significant investment in ICT within ITE, there were still difficulties that needed to be addressed. He stated:

In spite of substantial investment in both equipment and training, it has proved more difficult than envisaged to train teachers so that they are all adept and accomplished users of information and communications technology (ICT). Recent reports by the Office for Standards in Education (Ofsted) in England note that there are still substantial variations in the extent to which new teachers are able to use new technology effectively in their teaching. (p. 455)

Recently, Aslan and Zhu (2015), writing about ITE programmes and teacher preparation, argued that ITE providers must recognise the importance of their role in supporting student teachers to integrate ICT into their teaching practice. They further argued that student teachers should experience rich ICT learning environments, which would then contribute to them gaining the skills and knowledge they will require to use ICT in their teaching practice.

Turning to work from New Zealand, Bolstad (2004), in her literature review of the role and potential of ICT in early childhood education, concluded that early childhood ITE providers' programmes should include learning about ICT that has a strong theoretical basis. She argued that it was important to embed student teachers' learning about ICT into the context of their understanding about children's learning and development. She suggests it is important for student teachers to understand how contemporary theories about learning and development can be linked to ICT use and what pedagogical practices might support this. In addition to having opportunities to develop sound theoretical and pedagogical knowledge of ICT, Bolstad suggested that student teachers needed to see and experience meaningful uses of ICT in authentic early childhood educational settings. Overall, the Bolstad review indicated that the ICT use should be grounded in an understanding of the purposes, practices and social context of early childhood settings, which is consistent with a sociocultural orientation to the effective use of ICT in early childhood education.



### ***Relational Trust***

There is a body of literature about the nature relational trust in professional learning communities. Bryck and Schneider (2002) acknowledge there are a number of conceptualisations of the notion of relational trust, however in the context of professional learning communities they highlight three specific concepts of trust - organic, contractual and relational trust. They describe each of these concepts as follows. Organic trust is based on the notion of a total trust in the beliefs and rules of the organisation. With an understanding of organisational culture, of the way things are done in a particular organisation, organic trust is established and built. This form of trust is seen in teachers' understanding of the school vision and trusting how it is demonstrated throughout the school in behaviour and the levels of authority present in the school's day-to-day operation. Bryck and Schneider (2002) conceptualise contractual trust as a form of trust that relates to performance or to expected outcomes when contractual agreements are entered into. This kind of trust is common in the business sector and is often the basis of financial agreements. Finally, Bryck and Schneider describe relational trust as a form of social trust that sits outside of organic or contractual trust. They describe relational trust as embodied in the interpersonal and social exchanges that take place within a community such as a school. These exchanges might include principal to teacher, principal to parent, teacher to teacher, teacher to student, or teacher to parents exchanges. Respect, competence, personal regard for others, and integrity are four aspects that form the basis of relational trust in the educational context.

Mason and Lefrere (2003) suggest that trust is seen as an important component of the processes of collaboration and knowledge sharing in e-learning. For technologies to work and be embraced by individuals they must be trusted and validated in the context that they are used. Mason and Lefrere contend that the relational nature of trust enables individuals to take risks when exploring the use of technology. This includes a sense of trust in relation to privacy and security and to understanding the affordances and limitations of the technology that people engage with. Mason and Lefrere (2003) further state, "most important of all, trust cannot be decreed, or designed, only designed for" (p. 265). This notion of designing for relational trust to develop in relation to individual's use of

technology in educational contexts suggest curriculum designers need to take this account when planning for technology use with programmes.

Palvia (2009) argues that beliefs influence the development of trust. He goes on to assert that trusting beliefs about ICT use is what determines the foundation of trust, and therefore both beliefs and trust must be taken into account when considering individuals' adoption and use of ICT. Palvia also argues that relationships are a very important element of trust and therefore relational trust needs to be present for the adoption of ICT to occur. When writing about the context of e-commerce and online technology Palvia posits that trusting relationships impact on users intentional use and continual engagement with technology.

Cranston (2011) when describing relational trust in the context of school communities suggests relational trust influences the development of collaboration and the willingness of teachers to embrace change and on-going professional growth. He posits that relational trust is the “glue the that binds a professional learning community” (p.59).

Kuriyan and Kitner (2010) and Smith (2010) posit that whilst trust is a complex concept that is often broadly defined in the literature it is an under researched area in the context of ICT use. They argue that the social aspects of trust and ICT use are often overlooked. These writers contend that social trust represents the relationships individuals and institutions have in technology, which includes the reliability and trustworthiness of the technology, and safety aspects such as an awareness of cyber bullying.

Given the literature reviewed above relational trust in technology is a concept that ITE providers could usefully consider when developing their teacher education programmes. Relational trust with technology can involve professional learning communities and includes individuals developing a trusting relationship the technology they use. Seen this way relational trust also takes into account an understanding of negative aspects of ICT use, for example cyber bullying.

### ***The Influence of Teacher Education Provider Knowledge***

Teacher educators or lecturers in ITE programmes need to be able to use ICT with their student teachers in ways that will enhance student teachers' understanding of

how to use it for pedagogical purposes. This has been highlighted by a number of authors. Thieman (2008) claims the lack of ITE providers' knowledge needs to be addressed so that effective modelling of educational technologies can become commonplace within their programmes. Manning and Carpenter (2008) contend that ITE programmes are still seen by many as a barrier to student teachers gaining the knowledge and skills required to integrate technology into their teaching practice effectively. They state, "Few teachers are adequately prepared to use technology themselves or to help students use technology in the classroom" (p. 48). Manning and Carpenter (2008) argue that these issues must be addressed to ensure that student teachers are prepared to use ICT effectively in their teaching practice. Goldstein et al. (2011) maintain many ITE programmes do not expose student teachers to innovative teaching methods because most lecturers use ICT at a basic level and therefore are not preparing student teachers sufficiently to integrate ICT into their teaching practice. Johnson et al. (2013) detailed a range of concerns around the need for ITE providers to understand the trends and challenges that new technologies bring whilst embracing them as tools for learning. Their report concluded that many lecturers are limiting their student teachers because they are not supporting them to use ICT across the curriculum areas. This doctoral study aims to address these issues by providing a model that will support ITE providers and lecturers to understand how student teachers appropriate and integrate ICT into their teaching practice. This understanding can then be used by lecturers to gain insight into how they can use ICT in innovative ways to help student teachers' use of ICT for pedagogical purposes.

### **2.6.3 Student Teacher Conceptions and Beliefs About ICT Use**

Student teacher conceptions of, beliefs about and knowledge of ICT affordances are known to influence student teachers' appropriation of ICT for pedagogical purposes (Akin, 2013; Ertmer, 2005; Katic, 2008; Larkin, Jamieson-Proctor, & Finger, 2012b; Teo, Chai, Hung, & Lee, 2008). Katic (2008), for example, suggests conceptions of the role of technology in education can have a powerful influence on student teachers, in particular, how (and what) they elect to learn and how (and what) they choose to use ICT in their teaching practice. Katic also posits that student teachers' general conceptions of teaching and learning are influential, and technology may or may not be woven into these conceptions. Katic cautions it

should not be taken as a given that ICT is involved in these conceptions. Gao, Choy, Wong and Wu (2011) hold a similar view. They argue that the conceptions already held by student teachers when they enter ITE will influence their views of ICT in education and impact on their understanding of its potential to build on already existing teaching approaches. They contend, therefore, that it is important that student teachers have opportunities during the programme to unpack and explore these views.

These views on teacher knowledge provide an insight into aspects that should be taken into account when considering teacher preparation by ITE providers. Along with these ideas, there is an indication that the complexities of learning processes resonate with sociocultural views that recognise the important role that students' own experiences contribute to their learning (Fisher, Higgins, & Loveless, 2006; Gao et al., 2011; Shulman, 1987). It is important to appreciate the complexities involved in how teacher educators might develop their conceptions, beliefs and understanding of ICT use. My motivation to develop a model was influenced by my own appreciation of the complexities and challenges teacher educators may face in this process (section 1.2.1).

#### **2.6.4. Strategies that Contribute to Student Teacher Knowledge**

This section gives an overview of a number of strategies that have been found to contribute to student teacher knowledge in relation to using ICT for pedagogical purposes. Firstly, it introduces the idea of learning about, with and in ICT and the shift to learning about, with and through ICT. It then goes on to describe modelling, critical reflection and the practicum experience as pivotal influences that can contribute to student teacher knowledge in relation to ICT use for pedagogical purposes.

##### ***Student Teachers Learning With, In and About***

The notion that student teachers and teachers need to learn about, with and through ICT is not new. In 1995, Brown argued that there was a tripartite relationship between what he called learning *with* ICT across curriculum areas, learning specific knowledge *in* this domain and learning *about* the relationship between this area of technology and society (Brown, 1995). He described these concepts as dimensions where student teachers learned particular aspects of ICT. For example, learning *with* ICT is about student teachers using ICT to learn across

the curriculum in support of and to extend their teaching. Learning *in* ICT relates to student teachers becoming more competent and knowledgeable in the use of ICT. Learning *about* ICT involves student teachers learning about the relationships between ICT and society. Put another way, it is about students gaining a broad insight into the beliefs, values and ideologies surrounding ICT and understanding implications such as who is advantaged or disadvantaged by its use.

Pearson (2003) built on Brown's (1995) work and drew attention to the need for ITE providers to consider placing emphasis on student teachers having opportunities for learning *with* ICT. He argued that the notion of learning *with* ICT should play a significant role in the way teacher education courses were designed, implemented and assessed, as this would contribute to student teachers' understanding of how to use ICT for pedagogical purposes. He states, "With greater experience of learning *with* new technology, beginning teachers should be better placed to integrate ICT into their own teaching and bring about pedagogical changes in schools that have been anticipated for so long" (p. 54).

Pearson (2003), writing about the focus at that time in Australia to support beginning teachers' use of ICT to enhance their teaching practice, noted a need to place more emphasis on learning *with* rather than *about* ICT. He argued that, for student teachers' use of ICT to be meaningful, there must be space for their learning *with* the use of ICT. By this, he meant that ITE programme designers should take into account time for student teachers to engage *with*, learn *with* and experience ICT as a part of their assignment work. He also signalled that ITE providers should ensure their programmes have opportunities for student teachers to explore how ICT can support traditional as well as new and different ways of learning.

More recently, Earl and Forbes (2012) redefined the concepts of *with*, *in* and *about*, as outlined by Brown (1995), to learning *about*, *with* and *through* ICT. Earl and Forbes (2012) illustrate their view of learning *about* ICT as being to do with learning how to create PowerPoint presentations, use software programs and so on as well as learning about the context and influence ICT can have on people's lives and how ICT is a part of our work lives and communication. They explain that

learning *with* ICT in an education context is using ICT to supplement and complement teachers' usual ways of teaching and learning. Earl and Forbes suggest that this includes using ICT alongside other teaching strategies as another choice or experience for students to engage with. Finally, they describe learning *through* as learning that would not be possible without the use of ICT. The examples of this they suggest include those of mobile learning and distance learning where ICT has made collaborative learning across time and space possible.

The description of learning *with*, *in* and *about* ICT by Brown (1995) and Pearson (2003) and the more recent descriptions of learning *about*, *with* and *through* ICT articulated by Earl and Forbes (2012) were formed on the premise that ITE providers need to provide opportunities for student teachers to develop personal and pedagogical understandings of the relationships between these aspects for them to be able to integrate ICT successfully into their teaching practice. These scholars agree there needs to be more emphasis placed on the notion of learning *through* ICT and that, ideally, ITE providers would ensure their programmes have opportunities for student teachers to explore how ICT can support traditional as well as new and different ways of learning.

### ***Modelling the Use of ICT for Pedagogical Purposes***

The modelling of ICT for pedagogical purposes within ITE programmes and student practicum placements is highlighted in the literature as a strategy that contributes to student teachers' understanding of how to use ICT. Chen (2010) contends it is teacher education lecturer's responsibility to model ICT use in their teaching, as this will play a critical part in the student teachers developing ICT efficacy. Chen also asserts that student-centred modelling of ICT is important during student teacher practicum experiences because both experiences contribute to student teachers' motivation to use ICT in student-centred ways. Chen (2010) established that student teachers were more inclined to use ICT as pedagogical tools during their practicum experiences if ICT was promoted and modelled in their ITE programmes. In addition, it has been shown that students' understandings of the affordances of ICT are developed through modelling by lecturers in campus-based programmes (Akin, 2013; Ertmer, 2005; Katic, 2008; Larkin et al., 2012a; Teo, Chai, et al., 2008). Findings from a five-year

longitudinal study by Thieman (2008) highlighted that “teachers tend to use the technologies they were taught” (p. 356). During Thieman’s study, student teachers were taught how to integrate technology in four areas: planning and designing effective lessons, maximising student learning, facilitating assessment and enhancing productivity and professional practice. By the completion of the study, 85% of the participants had used technology as a teaching tool during their practicum experiences, and they used the tools they had learned about in their ITE programme thereby highlighting the value of modelling and experiencing ICT use for teaching purposes in ITE programme environments. Supporting this position, Cheng, Cheng and Tang (2010) state, “The quality of teacher education programmes can be improved only if the teacher educators help student teachers to identify the gap between teaching and theory and continually facilitate them in connecting their learnt theory and practice” (p. 102). Further endorsing this point, Sutton (2011) maintains that the relevance of ICT in education will only become apparent to student teachers if ITE provider lecturers model it in their content areas.

### ***Critical Reflection on the Use of ICT for Pedagogical Purposes***

Opportunities for student teachers to reflect critically on their existing and perceived views on the role of ICT in education is emphasised in the literature as another strategy that contributes to student teacher understanding of ICT use for pedagogical purposes (Chai, Koh, & Tsai, 2011; Gao et al., 2011; Hammond et al., 2009). Gao, Tan, Wang, Wong and Choy (2011) argue that reflection plays a critical role in the construction of teacher knowledge bases. Furthermore, they state, “We recommend that teacher preparation programs could engage pre-service teachers to use ICT to enhance student learning, and reflect on the impact of their own experiences on their student learning” (p. 1010). Providing space within ITE programmes for student teachers to reflect on and change (if needed) their underlying beliefs is considered a critical component in the construction of knowledge (Chai & Lim, 2011; Gao et al., 2011). Duncan and Barnett (2009) claim that student teachers bring their own underlying pedagogical beliefs that influence their adoption of ICT in their developing teaching practice. Opportunities for students to engage in reflective conversations were emphasised by Duncan and Barnett (2009); they also assert, “We cannot over-emphasize the

value of reflective dialogue to guide practice around teaching in higher education” (p. 373). They go on to suggest ITE programmes should be taking the lead in ensuring that their graduate teachers are equipped to use a range of ICT in their teaching practice. For this to become a reality, they argue that ITE providers must ensure their lecturers are using effective pedagogy that includes the promotion of critical thinking and encourages reflective interactions with other students, lecturers, technology and content.

### ***Student Teachers’ Practicum Experience with ICT***

Opportunities for student teachers to apply theory to practice have been a part of many ITE programmes for some time. Smith and Lev-Ari (2005) state, “There seems to be high agreement among educational theorists that the practical part is a strong and valued component of the education of teachers” (p. 292). This apprenticeship approach involves student teachers spending time in schools or early childhood centres to test and put into practice their developing pedagogical understandings and theories, learned under the supervision of an associate/mentor teacher. These practicum experiences also allow student teachers to observe and learn from other teachers in the classroom or early childhood centre (Buitink, 2009; K. Smith & Lev-Ari, 2005). Associate/mentor teachers can influence student teachers’ meaningful use of ICT in their developing teaching practice if they are using technology in ways that are pedagogically sound in their own teaching practice (Pamuk & Thompson, 2009). For instance, Lambert and Gong (2010) assert that practicum experiences enable student teachers to observe and participate in meaningful opportunities that allow them to experience learning in action, thus having an important influence on their developing pedagogies, including the use of ICT. When practicum experiences include the effective use of ICT and student teachers are encouraged to take a hands-on approach, they can learn by using technology in authentic ways that reflect the context that they are in (Hixon & So, 2009; Mueller, Wood, Willoughby, Ross, & Specht, 2008). Authentic experiences during practicum contribute to the preparation of student teachers’ future teaching practice by enabling them to incorporate their theoretical knowledge into the curriculum (Chai & Lim, 2011; Sutton, 2011). Such experiences may also allow student teachers to observe teachers using a range of ICT tools (Mueller et al., 2008), which may influence how they will use ICT in



their classrooms in the future. Buitink (2009) suggests the types of practicum experiences and their associate teachers' level of support can either positively, or negatively influence student teachers' attitudes and dispositions towards ICT. However, some others argue that a supportive associate teacher/mentor is not enough. For example, Starkey (2010) maintains that student teachers need to be placed with an associate teacher/mentor who has sound pedagogical content knowledge. This will ensure discussions and practice focus on strengthening the student teachers' learning within the curriculum in order to explore pedagogical content knowledge that can be incorporated with the technological knowledge they gain in ITE programmes, otherwise this will remain disconnected and not become an integral part of their teaching practice. Despite the high profile of ICT in education today, for many ITE providers, ICT does not appear to feature highly in their programmes. As a result, student teachers can be placed in practicum environments where there is very little or no support for ICT (Chen, 2010; Sutton, 2011). Access to technology may differ between practicum environments, and associate teacher/mentor teachers often have very different ICT knowledge and skills, with some using very little ICT in their teaching practice. As a result of these variations, some student teachers may not feel it is appropriate to use ICT whilst they are on practicum because they are unsure of their associate teacher/mentor's views of ICT and how they will assess and evaluate the student teachers' use of it (Gao et al., 2011).

Given the four key strategies outlined above, understanding the notion of learning about, learning with and learning through ICT use combined with opportunities for modelling and space for critical reflection within ITE programmes are important aspects to consider in relation to student teacher knowledge. These, along with the combination of opportunities for student teachers to experience using ICT both within the campus-based aspects of their ITE programme and during practicum, may contribute to student teachers' knowledge about how to use ICT for pedagogical purposes in their teaching practice. In this study, these aspects are important, as they provides a basis of understanding how students experience learning and can increase their knowledge and therefore can inform how a model to support increased ICT appropriation can be developed.

## **2.7 Chapter Summary**

This chapter has reviewed literature on the influence of government policies on the use of ICT in early childhood education, including ITE programmes. The chapter set out how early childhood teachers use ICT in their teaching practice, both internationally and within New Zealand. The review of the literature discovered teacher use was dominated by the use of ICT for documentation purposes, such as documenting learning stories in the New Zealand context. However, the use of ICT for other pedagogical purposes was revealed. These purposes included the use of ICT to support children's literacy skills and supporting relationships across different contexts.

The review highlighted the notion that student teacher learning occurs through their participation with and through ICT tools as part of activities that include practicum and teacher educator modelling and support for critical reflection. The responsibilities and role of ITE providers in preparing student teachers to understand how they might use ICT in their teaching was explored, including some of the complexities involved in teacher educators ensuring student teachers understand how to appropriate and integrate ICT into their teaching practice.

Within the New Zealand context and more generally, the early childhood curriculum has a sociocultural orientation, and it was noted that this orientation is reflected in a number of policies and ITE programme designs. Concepts from the sociocultural view of learning that featured in the literature review of current practice included the importance of relationships and the social and relational nature of learning and recognition of the importance of context and the role of the cultural tools within a particular context. Teacher educator and student teacher beliefs about ICT use and its role within an ITE programme were also discussed as influential. A sociocultural orientation highlighted that student teacher learning occurs through the use of ICT tools within the various experiences offered within an ITE programme. It also highlights the difference between mastery and appropriation – appropriation in the sense of making an ICT tool one's own is the goal.

To reiterate, a sociocultural approach to participatory appropriation of ICT into ITE has at least three features:

- It is consistent with a view of learning as situated in social relationships with others within a learning and caring community. Spaces within the design of ITE programmes are supportive of a relational approach to learning and community building.
- ICT is seen as a cultural tool, one of the key mediational means for understanding in a number of cultural sites (for example, ITE and an ECE centre); its use has ethical, political and community building aspects that may be different from other mediational tools (activities, books, conversations). For example, the multimodal nature of ICT is seen as offering a range of ways to document and share information, to communicate with others and to provide opportunities to extend learning.
- The use of ICT will change an individual's goals: learners make it their own in a range of embodied and affective-emotional ways. In other words, when individuals understand the affordances of ICT they adapt and use it for their own purposes.

The literature review indicated that, although research has been carried out on the teaching and learning of ICT in ITE, there is a paucity of research on how ITE providers might design a programme that supports early childhood student teachers to appropriate and integrate ICT into their teaching for pedagogical purposes. The next chapter reviews literature about four models that have been used to understand and support the integration of ICT in a range of educational contexts. It explores their strengths and weaknesses in relation to their potential as a model that might inform ITE providers' understanding and support of student teacher appropriation and integration of ICT into their teaching practice for pedagogical purposes.

## **Chapter Three: Four Models**

### **3.1 Introduction**

The previous chapter has established the value and importance of ICT to be incorporated into early childhood initial teacher education programmes. It also highlighted the influence of sociocultural views of learning in relation to ICT use, both generally and more specifically, in policy and practice within the early childhood sector in New Zealand. While there are numerous models and variations of models to explain aspects of technology adoption and use, four models have featured consistently in the literature over time and across a range of contexts. These are the focus of this chapter. They are the:

- Concerns Based Adoption Model (CBAM) (Hall, 1977; Hall & Hord, 1987; Straub, 2009)
- Technology Acceptance Model (TAM) (Bagozzi, 1992; Venkatesh & Bala, 2008)
- Substitution, Augmentation, Modification and Redefinition Model (SAMR) (Puentedura, 2012b)
- Technological Pedagogical Content Knowledge Model (TPACK) (Koehler, Mishra, & Yahya, 2007; Mishra & Koehler, 2006; Shulman, 1987).

I describe these models in the following sections, highlighting their strengths and weaknesses in relation to understandings of how student teachers appropriate and integrate ICT into their teaching practice within their programmes.

### **3.2 Concerns Based Adoption Model (CBAM)**

The Concerns Based Adoption Model, more widely known as CBAM, is considered to be one of the most vigorous and empirically grounded theoretical models about the implementation of educational innovations. This model does not have a specific focus on integrating ICT, rather its focus is on describing how innovations can be implemented. It arose from educational change research during the 1970s and 1980s and has been adopted and used extensively to study the change implementation process of teachers and others assisting the process of change (Straub, 2009). CBAM attempts to describe the process an individual actually experiences during the adoption of innovation. Drawing on Fuller's

(1969) early work, Hall and Loucks developed CBAM to describe the concerns that professionals may have about a new innovation. Hall, Rutherford and George (1988) broadly define concerns as “the composite representation of feelings, preoccupations, thoughts, and considerations given to a particular task” (p. 3). Important to this study, CBAM does not describe the *whys* of innovation adoption. CBAM is, however, built on particular assumptions about change.

### ***3.2.1 Assumptions About Educational Change***

Within the context of educational innovation, CBAM is based on the premise that teachers move through different stages of concern depending on what uncertainties they have whilst being involved in a particular innovation. CBAM was developed on the following assumptions about the change process as its foundation (Anderson, 1997; Hord & Hall, 2001; Straub, 2009):

- Change is a process, not an event.
- Change is accomplished by individuals.
- Change is a highly personal experience.
- Change involves developmental growth in feelings and skills.
- Change can be facilitated by interventions directed towards individuals, innovations and contexts involved.

### ***3.2.2 Assumption About Innovations***

Underlying CBAM is the assumption that innovations must fit within individuals’ beliefs and perceptions. More specifically, the very notion of acceptance explicit in the management stage of CBAM implies a framework of beliefs and principles into which each individual must integrate new innovation. If this does not occur, the innovation will not be accepted. Individuals’ existing perceptions and beliefs appear integral to how they interact with any proposed changes or the adoption of innovation in CBAM (Marzano, Zaffron, Zraik, & Robbins, 1995). The assumption that change is not a static process, but rather it involves teachers’ ongoing personal experiences, is inherent in this model. The expectation of the extent of change has to be matched to the needs and concerns expressed by the individuals involved in the change process. CBAM was designed to identify these needs and has been used in a range of contexts where teachers may face many changes in their pedagogical approaches, particularly in relation to ICT (Bagozzi, 1992). CBAM endeavours to understand the connections between teachers’

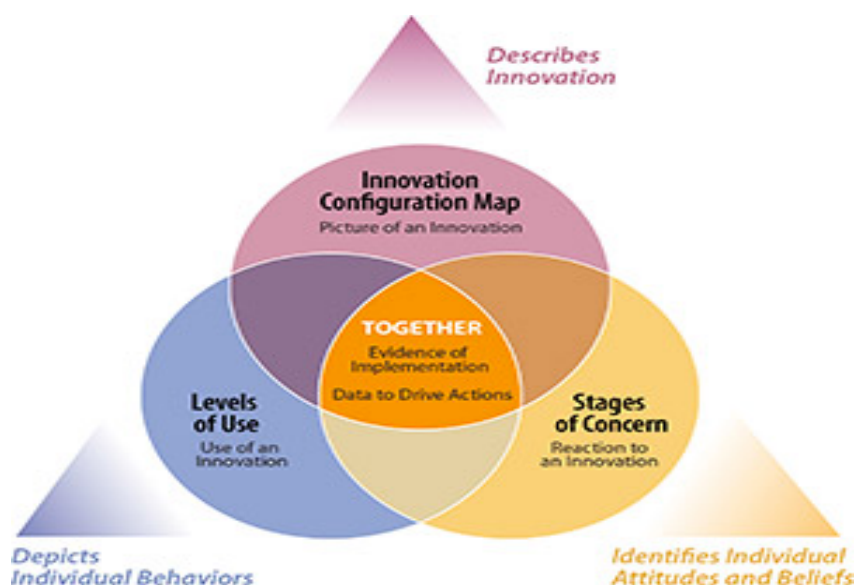
thinking and actions as they struggle to adapt to these changes. It can be used to capture the processes individuals experience as they work through engaging with new technology, appropriating and integrating it into their teaching practice (Anderson, 1997; Lefebvre, Deaudelin, & Loiselle, 2006; Wu, 2002).

### ***3.2.3 The Three Diagnostic Dimensions***

CBAM was designed as an analysis tool (Hall & Hord, 1987). It has three diagnostic dimensions intended to help leaders and facilitators understand and support individuals to successfully implement change in educational programmes. These diagnostic dimensions are innovation configurations, stages of concern and levels of use.

### ***3.2.4 Innovation Configurations Map***

The innovation configuration concept was developed to enable the identification of patterns of innovation. It recognises that teachers seldom implement the same innovation identically because teachers alter their practice – in this study, use of ICT – to fit their particular context and beliefs, including the needs of their students (Anderson, 1997; Christou, Eliophotou-Menon, & Philippou, 2004; Straub, 2009). The innovation configuration map (see diagram below) provides a clear picture of what constitutes high-quality implementation. It serves as an exemplar to guide and focus change efforts.



***Figure 1 Innovation Configuration Map***

Source: <http://www.sedl.org/cbam/>

### ***3.2.5 Stages of Concern***

The effective use of technology in educational contexts is often measured by how well teachers are executing it. This does not take into account the motivations and feelings of the person charged with implementing the innovation, for example, a lecturer in ITE. On the other hand, the stages of concern were developed to take account of people's developing responses. The seven stages of concern are awareness, informational, personal, management, consequences, collaboration and refocusing. Hall and Hord (1987) posit that people within an organisation will fall into one of these seven stages of concern, and individuals will have different concerns about technology depending upon which stage they are in. For example, people in the personal stage will want to know how using an innovation will affect them, while those in the collaboration stage will want to know how they can collaborate with others to maximise the innovation's potential. A brief description of each stage is given in Table 1.

***Table 1 Stages and Descriptions of the Stages of Concern***

<i>Stage</i>	<i>Name</i>	<i>Description of stage</i>
Stage 0	Awareness	Teachers have little awareness of the innovation and are not likely to be concerned about it.
Stage 1	Informational	Teachers are seeking an understanding of the innovation itself.
Stage 2	Personal	Teachers begin to express concerns about their ability to meet challenging expectations.
Stage 3	Management	Teachers focus on innovation.
Stage 4	Consequences	Teachers express concerns about the impact of the innovation on their students or families served.
Stage 5	Collaboration	Teachers begin to seek out relationships that will assist them in implementing the innovation.
Stage 6	Refocusing	Teachers express an interest in adapting the innovation or considering alternative innovations.

Source: (Hall, 1977).

### ***3.2.6 Levels of Use***

Whereas the stages of concern describe attitudes and concerns, the levels of use construct provides a model for leaders and facilitators to use to understand the behavioural implementation of an innovation, such as the use of ICT in teaching, which is the focus of this study. The levels of use are based around the recognition that teachers use ICT in a variety of ways, ranging from simply thinking about using it to using it in a very mechanical way and on to using it in innovative ways

that maximise its potential to enhance teaching and learning (Hord & Hall, 2001). The eight levels of use in CBAM are non-use, orientation, preparation, mechanical, routine, refinement, integration and renewal. A brief description of each stage is given in Table 2.

***Table 2 Description of CBAM's Levels of Use.***

<i>Level of use</i>	<i>Description of level</i>
Non-use	Not using or seeking to use the innovation.
Orientation	Working to understand costs and benefits of innovation.
Preparation	Working towards first implementation.
Mechanical	Working to implement innovation.
Routine	Use is comfortable and unchanging.
Refinement	Use is changing to increase effectiveness.
Integration	Use is developing with user's ideas and collaborations with other users.
Renewal	User makes major changes in innovation and/or explores alternative practices.

Source: (Hall, 1977).

A 'levels of use' interview tool can be used to help determine how well staff, both individually and collectively, are using an innovative programme (Hord & Hall, 2001). When combined with the innovation configuration map and first-hand observations, this interview information can help staff effectively implement a new programme. By identifying issues, it is possible to problem solve and achieve high-quality programme implementation. Change requires a shift in one's attitudes and beliefs along with the gaining of new skills, with increased individual competency and comfort in the change process as staff shift from personal concerns with change to a focus on achievement of programme outcomes (Hall & Hord, 2011; Hall, Wallace, & Dossett, 1973).

### ***3.2.7 Strengths and Limitations of CBAM***

CBAM acknowledges the concerns and feelings that can be associated with new innovations and thus gives voice to the powerful emotions change can evoke. The three diagnostic dimensions of CBAM and accompanying tools potentially provide tools and methods to enable the assessment of stages of concern and the uptake of innovations so that individuals can be provided with support appropriate to their concerns and hence ensure they are successful in their endeavours (Christou et al., 2004; Straub, 2009). Leaders/facilitators of CBAM can use these



tools to negotiate change and to provide concrete supports and resources to assist teachers and to evaluate the continuing progress of change (Hall & Hord, 2011; Hall et al., 1973).

However, a number of possible limitations of this model have been identified in the literature. For example, while CBAM leaders'/facilitators are potentially able to observe the components of teaching practice, it is more challenging to predict and understand the experiences of teachers (Roach, Kratochwill, & Frank, 2009). Another limitation of this model is the inherent assumption that change is a process facilitated by leaders'/facilitators who are in a position to disseminate the adoption of change to students. It pays little attention to the students in the model other than in the 'consequences' stage of teacher concerns. The focus is on the leader/facilitator or lecturer as the initiator of the change, which then filters down to the teachers/students. This positions students/teachers as adopters rather than agents of change. It raises a number of challenges for a more student-centred pedagogical shift in teacher education as it leaves little space for students' voices to be heard. It also raises a number of challenges for a more empowering oriented pedagogical shift in teacher education as it leaves little space for teachers' voices to be heard. Straub (2009) states, "By ignoring teachers' possible preferences for an innovation, this model sells teachers short by portraying them as resistant luddites" (p. 636). CBAM claims to be a client-centred model; however, with the focus of change being weighted towards the leader(s)/facilitators' ability to engage the change process, it can be perceived as a top-down approach to innovation adoption. CBAM requires the leader(s)/facilitators to obtain accurate quantitative data detailing concerns from teachers. The accuracy and reliability of the data collected can be seen as an issue in validity of CBAM analysis, and therefore there is a perception that the reliance on such accuracy may be perceived as limiting the potential use of CBAM (Elahi & Yu, 2009). Brzycki and Dudt (2005) argue there is still an issue with the integration of ICT in education, and many barriers remain. They posit that, even though there have been a number of models developed, including CBAM, integration of ICT in teacher education is spasmodic, and there are still pockets of resistance towards its use by teachers. CBAM has been used widely in educational settings, particularly schools, to understand the process of implementing educational innovation, including ICT.

The primary focus of this model is to gain insight into teachers' concerns about new educational innovations and possible barriers to the adoption of ICT.

### **3.3 Technology Acceptance Model (TAM)**

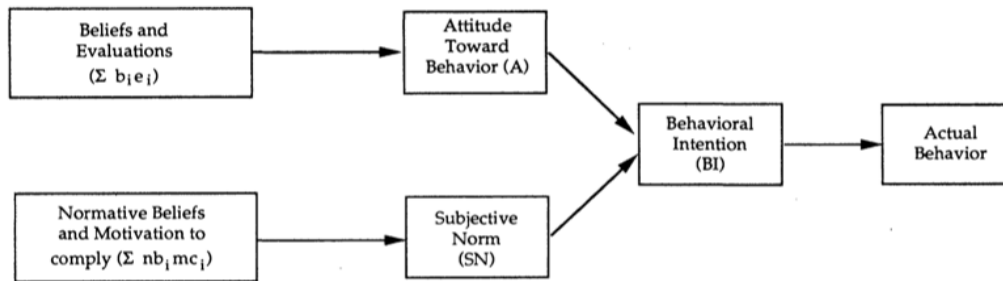
The second model that I explored was the Technology Acceptance Model (TAM). Rather than the focus being on the kind of adoption environment required for change as underpinned in CBAM, this model deals with particular types of ICT and seeks to understand why users accept or reject ICT. Davis (1989) developed the Technology Acceptance Model (TAM). It was developed originally as an information systems theory to explain how people come to accept and use technology. TAM is used to anticipate the trustworthiness and acceptability of an ICT tool or system, such as online banking, and to determine if any changes to the system are required in order to make it acceptable to users. This model argues that the acceptability of an ICT system is determined by two main factors: perceived usefulness and perceived ease of use. TAM is now used in educational contexts to highlight the interconnected relationship between external and internal variables that interact to influence a teacher's acceptance and integration of technology into their teaching practice. Davis asserted that, when individuals are trying to decide if they will use technology, they will be influenced by their perception of its usefulness and how easy it is to use. The perceived usefulness and ease of use are interconnected and ultimately influence the individual's attitude towards and intention to use a specific tool (Chau & Hu, 2002; Davis, 1989).

TAM is built on Fishbein and Ajzen's (1977) adaptation of the Theory of Reasoned Action, which proposes that actions are affected by behavioural intentions, which in turn are influenced by attitudes towards the action being taken and the subjective norms in play at the time. For example, a teacher might intend using ICT as a teaching tool with young children; however, their attitude towards this act will be influenced by their perception of the value of ICT for children. This behavioural intention will be influenced by the expectations and beliefs of others about the value of ICT as a teaching tool in the early childhood setting. These two concepts described by Chiou (1998), in the following terms:

The first component, attitude toward the act, is a function of the perceived consequences people associate with behaviour. The second component, subjective norm, is a function of beliefs about

the expectations of important referent others, and his/her motivation to comply with these referents. (p. 298)

Figure 2 below gives a pictorial illustration of these ideas.



**Figure 2 Theory of Reasoned Action**

Source: Davis, Bagozzi and Warshaw (1989).

The primary purpose of TAM is to provide an insight into the external variables, such as beliefs, including trust, attitudes and intentions that impact on an individual's adoption of technology systems. Fundamental in this model are the concepts of perceived usefulness and perceived ease of use. Perceived usefulness is characterised as the extent to which a person believes that using technology will enhance their job performance, and perceived ease of use is characterised as the extent to which a person considers the ease of using ICT. TAM suggests that system use is directly determined by behavioural intentions of the user, which in turn are influenced by the user's attitude towards using the system as well as the perceived usefulness of the system. Attitudes and perceived usefulness are also affected by perceived ease of use. A person's predominant belief in the ease of engaging with technology has been shown to be a strong marker for an individual's on-going use of technology (Legris, Ingham, & Collette, 2003; Venkatesh, 2006; Venkatesh & Bala, 2008). Inherent in this model is the notion that, if an ICT system is hard to use, it is more than likely individuals will not consider it useful, which will influence the individual's behavioural intention to use (or not to use) the system (Legris et al., 2003; Wu & Chen, 2005). TAM also assumes that perceived usefulness and perceived ease of use will be influenced by such external variables as the design characteristics of a system (Venkatesh & Bala, 2008).

In summary, this model claims that an individual's behaviour is a direct result of their attitudes towards the expectations of a particular behaviour, and the social norms relating to that behaviour, and maintains behavioural intention. Combined with perceived usefulness and perceived ease of use, it can be used to predict or explain a person carrying out a conscious act, for example, choosing to use a particular technology (Ajzen & Fishbein, 1980; Chau & Hu, 2002).

### ***3.3.1 Strengths and Limitations of TAM***

Marangunić and Granić (2015) contend there is a credible body of work undertaken using TAM since it was developed more than a quarter of a century ago and argue this clearly indicates its popularity in the research field of technology acceptance. Originating from the psychological Theory of Reasoned Action, TAM has emerged to become the key model in understanding the predictors of human behaviour towards potential acceptance or rejection of a technology. The strength of the model is confirmed by numerous studies emphasising its broad applicability to various technologies.

TAM has been used in a wide range of contexts that involve individuals using technology in their work and home life, including the introduction of telemedicine and e-commerce. For example, Chau and Hu (2002) used TAM to examine physicians' acceptance of telemedicine. Chau and Hu describe telemedicine as, "... the use of IT to support healthcare services and activities via electronic transmission of information or expertise among geographically dispersed parties, including physicians and patients, in order to improve service effectiveness and resource allocation/utilization efficiently" (p. 298). Their research involved 38 physicians who represented 10 medical specialties or subspecialty areas in Hong Kong. Their overall findings indicated that TAM was a relevant model to gain an insight into individual physicians' decisions about technology use. TAM provided them with a model to explore how health professionals used technology. Findings highlighted subtle differences in their respective technology acceptance decision-making, which impacted on their uptake of technology.

Pavlou (2003) used TAM to capture consumer acceptance of e-commerce technology. TAM appeared to be a useful model as e-commerce is technology driven. This research involved testing data from two empirical studies: the first, an exploratory study comprised of three experiential scenarios with 103 students; the

second, a confirmatory study used a sample of 155 online consumers. The findings highlighted the concepts of perceived usefulness and perceived ease of use in TAM were fundamental drivers of e-commerce acceptance. Pavlou indicated that these concepts were particularly important when considering the intentions of users of online transactions and could help developers of e-commerce systems to ensure they would gain user buy-in or acceptance of their particular system.

TAM's systemic approach is becoming popular in some educational contexts to determine adoption of instructional mobile technology by lecturers and students. Huang, Lin and Chuang (2007) argue that TAM works effectively in terms of determining adoption of mobile learning by students. Their study involved 313 undergraduate and graduate students in two Taiwan universities in an online survey. The findings showed that perceived usefulness and perceived ease of use are key determinants of user perception of mobile learning. TAM's generalisability across a wide range of technologies and contexts adds to its strength and validity as a model for analysing systems and gaining insight into user uptake of technology.

Although there is acknowledgement in the literature, some researchers are beginning to use TAM within educational contexts. Teo, Wong and Chai (2008) point out that TAM has been used extensively within business organisations, and there has been very little research undertaken on its use in education. They suggest that TAM is more relevant to business contexts due to the difference between the general technology users in such contexts and that of the use of technology by teachers.

Straub (2009) contends that TAM fails to capture the influences of technological change on relationships with teachers and students. One of the most prominent criticisms of TAM is that there is no opportunity to acknowledge individual difference in the adoption process; rather, it provides a universal approach to understanding how individuals engage with technology (Teo, Chai, et al., 2008; Van den Berg, 1993). For instance, the original TAM does not recognise the possible influence of gender, age or prior experience or many other characteristics

that may influence attitudes towards technology and the intention to use it (Legris et al., 2003; Straub, 2009).

Mathieson's (1991) criticism of TAM was that, although it is easy to use, it generates only very general data on user options in IT systems. She also highlighted that TAM does not make any explicit connections to social variables, which are purported to be important as they can capture other aspects that are not included in the key concepts of perceived usefulness and perceived ease of use, such as people using a particular system as a way of impressing their co-workers and thus being perceived as sophisticated users of technology.

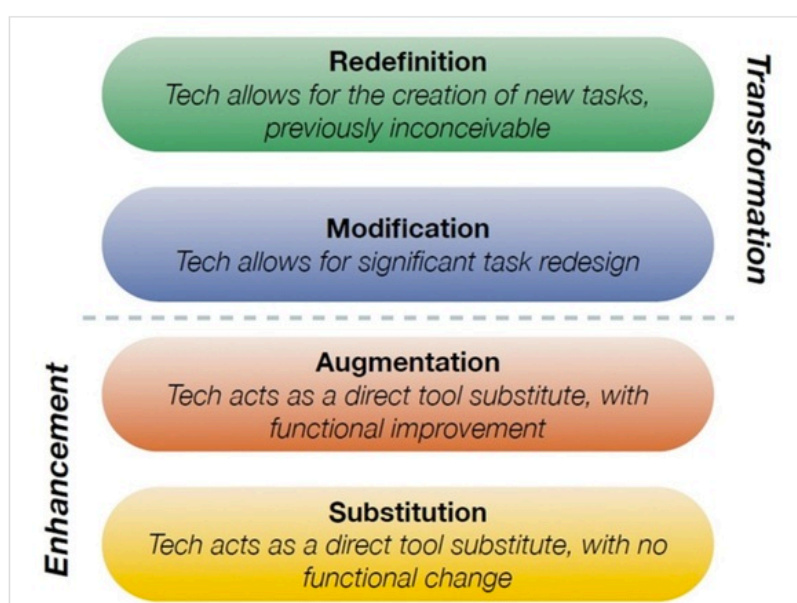
### **3.4 Substitution, Augmentation, Modification and Redefinition Model (SAMR)**

The third model I reviewed is the Substitution, Augmentation, Modification and Redefinition Model (SAMR). It is a pedagogical model that was designed to support teachers to engage with and integrate technology into their teaching practice, whatever their level of expertise (Jude, Kajura, & Birevu, 2014). Created by Dr Ruben Puentedura in 2006, it explains the use of ICT (including social media and web technologies) across four key levels of engagement:

- *Substitution*: utilising resources that perform the same task as one previously done manually. This could be a computer being used in place of typewriters to produce documents but with no significant change to the product.
- *Augmentation*: resources essentially perform the same task but with increased/additional value. This could be the case when computers are used to replace typewriters but with considerably more functionality, such as cut and paste, spell checking and so on.
- *Modification*: allows for significant redesign of tasks. This allows for significant technological task redesign, such as processes integrated with email, spreadsheets and graphing packages.
- *Redefinition*: allows for the creation of new previously inconceivable experiences and the creation of new tasks that would not be possible without technology, for example, Facebook, Skype, Snapchat and virtual worlds.

Puentedura (2006) argues that the adoption of technology can follow this continuum of four levels from the lowest use of ICT through to the highest and most involved use. Within this model, substitution and augmentation are considered to contribute to the enhancement of the process of teaching and learning whereas modification and redefinition are thought to contribute to transformation of teaching and learning with technology used to enhance innovation (Chou, Block, & Jesness, 2012; Oostveen, Muirhead, & Goodman, 2011; Puentedura, 2012b).

Puentedura (2012a) claims that, when teachers are operating at the redefinition level, they are able to facilitate new educational experiences that draw on the power of digital technologies to link learners with new experiences, opportunities and networks. In other words, experiences afforded to students at the redefinition level connect them with the tools and knowledge they need to enable them to be successful in today's society.



**Figure 3 SAMR**

Source: (Puentedura, 2006).

SAMR provides a platform to enable people to see how technology might impact teaching and learning. It also illustrates a progression many new users of educational technology will follow as they develop their use of technology for teaching and learning. As people progress up through the levels, ICT becomes more important to them in their context, whilst at the same time, it becomes

woven invisibly into routine and later innovative aspects of teaching and learning. However, progression across the levels depends on users' knowledge of technology integration and the resources to enable them to explore and move through the levels (Puentedura, 2006).

#### ***3.4.1 Strengths and Limitations of SAMR***

A number of studies have provided evidence that SAMR can be used to guide interventions designed to enhance innovative use of technology. During 2013, Makerere University in Kampala, Uganda, implemented SAMR as a part of a mixed research approach to try and gain an insight into issues that were hindering the integration of ICT into their programmes. SAMR was considered a possible intervention that might help shift the use of ICT from a basic level to a pedagogical transformative level (Jude et al., 2014). The research was carried out using a mixed research methodology involving qualitative and quantitative approaches and was undertaken across four colleges within the university. The data collection comprised of a questionnaire, interviews, focus group discussions, observations, and project blog and documentary analysis. These data-collection tools were designed to encompass SAMR. The sample size of 600 was made up of 150 participants (50 academic staff and 100 students) per college. The summary of the findings of this research revealed a number of factors, including recommendations of the importance of an infrastructure that supported the use of a wide range of ICT by lecturers and that a university-wide policy on the use of ICT should be in place to ensure the pedagogical integration is prioritised. Another area where SAMR has strengths is in the use of mobile technology in education. Recent studies outlined by Bailey and Blagojevic (2014), Chou et al. (2012) and Oostveen et al. (2011) suggest SAMR has the potential to contribute to the understanding of affordances of mobile technology to transform education experiences. They maintain the model has the capacity to influence teachers' pedagogical use of technology, enabling them to use ICT, particularly mobile devices, in innovative ways with students to engage them in meaningful learning opportunities. Bailey and Blagojevis (2014) contend SAMR offers an accessible way for teachers to gain an insight into the range and variety of affordances of use of ICT, including iPads, digital cameras, iPods and laptop computers. They state that the use of ICT will be dependent on the context and learning experiences



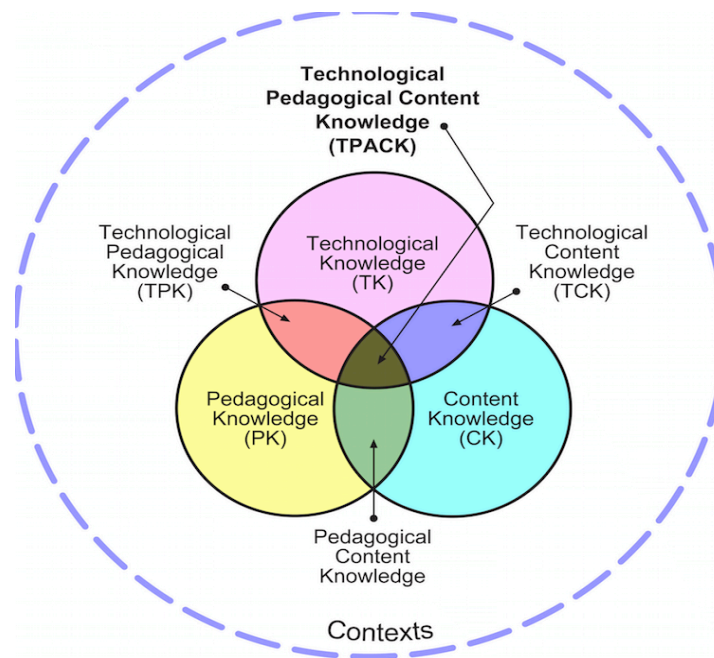
teachers want to create. Maclaren, Singamemmi and Wilson (2012) reported on findings from a pilot project that explored the use of digital pen-enabled technologies. The project involved staff in the AUT School of Engineering who concluded that SAMR proved a useful model to evaluate the introduction of this new technology against the levels of proposed use described by Puentedura. They found that staff primarily used technology in the substituting or augmenting levels, which highlighted that further work was required to explore how ICT could be used for the transformation of learning. These studies suggest that SAMR's strength is in its simplistic yet useful levels of adoption of ICT, which can be applied in a range of ways. However, the lack of empirical research or theory underpinning this model has led to some questions about its substance.

### **3.5 Technological Pedagogical Content Knowledge Model (TPACK)**

The fourth model I reviewed was the Technological Pedagogical Content Knowledge Model (TPACK), this model was created by Koehler and Mishra (2006). It builds on Shulman's (1986, 1987) descriptions of pedagogical content knowledge to describe how teachers' understanding of educational technologies and pedagogical content knowledge interact with one another to produce effective teaching with technology. To gain an insight into TPACK, it is helpful to examine its background in relation to pedagogical content knowledge. Shulman (1986) introduced pedagogical content knowledge in response to a need for a more coherent theoretical model concerning what teachers should know and be able to do, including what content knowledge they needed and how this knowledge was related to good teaching practice. Shulman claimed pedagogical content knowledge extended beyond simply knowing the content alone. Specifically, Shulman developed the notion of pedagogical content knowledge to describe the relationship between the amount and organisation of knowledge of a particular subject matter (content) and knowledge related to how to teach that content (pedagogy).

Koehler and Mishra extended Shulman's work to include technology as a fourth key component in the model, thereby creating the notion of technological pedagogical content knowledge. TPACK assumes technological knowledge, pedagogical knowledge and content knowledge to be the three sources of teacher knowledge for ICT integration. TPACK, as described in the literature, involves an

understanding of the complexity of relationships among students, teachers, content, technologies, practices and tools (Archambault & Barnett, 2010; Benton-Borghi, 2013; Koehler et al., 2007; Mishra & Koehler, 2006; Pamuk, 2012). Four types of ICT integration knowledge can be derived from the interconnections in the model: pedagogical content knowledge, technological pedagogical knowledge, technological content knowledge and TPACK. The model accentuates the importance of supporting teachers to make connections between their technological knowledge, pedagogical knowledge and content knowledge because these connections define their competency with the integration of ICT into their teaching practice (Koh, Chai, & Tsai, 2012).



**Figure 4 TPACK**

Source: <http://tpack.org>

Mishra and Koehler's (2006) illustration of TPACK proposes pedagogical knowledge and content knowledge are related, with their area of overlap being termed as pedagogical content knowledge. In addition to pedagogical content knowledge, the areas of overlap between technological knowledge, pedagogical content knowledge and content knowledge contribute to the establishment of technological pedagogical knowledge, technological content knowledge and TPACK. These seven TPACK concepts describe the body of knowledge teachers need for technology integration, which are defined as follows:

- Technological knowledge – knowledge of technology tools.
- Pedagogical knowledge – knowledge of teaching methods.
- Content knowledge – knowledge of subject matter.
- Technological content knowledge – knowledge of subject matter representation with technology.
- Technological pedagogical knowledge – knowledge of using technology to implement different teaching methods.
- Pedagogical content knowledge – knowledge of teaching methods with respect to subject matter content.
- Technological pedagogical content knowledge – knowledge of using technology to implement teaching methods for different types of subject matter content.

Benson and Ward (2013) describe TPACK as a model compiled of discrete domains that instructors, such as lecturers or teachers, use to understand the principles of content, pedagogical and technological knowledge. In other words, lecturers and teachers understand the subject matter that they teach (content knowledge). They apply their pedagogical knowledge or ways of teaching when they consider how their students learn, ways to engage their students in the process and relevant ways to assess their learning. Lastly, lecturers and teachers draw on their technological knowledge when they use technology tools in their teaching practice.

### ***3.5.1 Strengths and Limitations of TPACK***

TPACK has emerged as a popular model in education as it provides a basis for analysing the types of teacher knowledge required to ensure teachers are able to integrate technology into their practice. Brantley-Dias and Ertmer (2013) stated, “When technological pedagogical content knowledge (TPACK) arrived on the scene as a new way to talk about the knowledge base teachers needed to use technology effectively in the classroom teacher educators were quick to embrace it” (p. 105). The main strengths of TPACK appear to be the understanding of teacher types of knowledge and that of ease of uptake.

Although TPACK appears to have had a positive influence on the understanding of teacher knowledge and integration of technology in education contexts, there

have been concerns raised about its complexities and lack of literature on its practical application (Abbitt, 2011; Angeli & Valanides, 2009; Brantley-Dias & Ertmer, 2013; Chai et al., 2011). Another aspect of concern is around the ability to measure the impact of this model. Abbitt (2011) argues that there are ongoing challenges for TPACK in relation to ITE. For example, there are complexities in accurately measuring the technological pedagogical content knowledge of student teachers in a range of ways that reflect the influence of teacher knowledge on their actual teaching. This raises concerns around the encompassing challenges of efficiency, reliability and validity of the measurement interventions. This issue of measurement is also noted by Koh, Chai and Tasi (2012), who assert that, although there have been a number of survey tools developed for the purpose of measurement, they have tended to be small sample sizes, which are hard to generalise. They suggest the complexity of TPACK as a theoretical model requires further development and research to validate its position in education. Archambault and Barnett (2010) argue lack of clarity in TPACK hinders its effectiveness for the integration of technology into teaching practice. While they appear to support the focus on subject matter content in the model when considering the effective use of technology, they suggest there are difficulties in measuring each of the constructs in the model. For example, the main focus on the three major areas of teaching – content, pedagogy and technology – does not take into account the interaction or the direction of the relationship between and among these domains. The lack of understanding about these interconnections makes it challenging for TPACK to be seen as an effective model.

Another limitation of TPACK appears to be the lack of practical application. The focus is on what teachers need to know when using technology in their teaching practice and does not take into account how teachers can achieve this. Harris et al. (2009) contend:

TPACK is a model for teacher knowledge, and as such, it may be helpful to those planning professional development for teachers by illuminating what teachers need to know about technology, pedagogy, and content and their interrelationships. The TPACK model does not specify how this should be accomplished;

recognizing that there are many possible approaches to knowledge development of this type. (p. 403)

While TPACK posits to provide a model to describe how teachers' understandings of pedagogical content knowledge interact with each other to produce effective teaching, the literature is raising a number of limitations. The complexities of this model and its focus on what types of knowledge teachers require to use ICT effectively in their teaching practice, rather than how to use technology, appears to hinder teachers' ability to integrate technology into their teaching practice (Harris et al., 2009). These limitations of complexity, lack of application and inability to measure mean that TPACK does not address the need for a model that can support student teachers to learn how they appropriate ICT to use in their teaching practice.

### **3.6 The Four Models and Sociocultural Views of Learning**

CBAM, TAM, SAMR and TPACK were each developed for different and particular purposes. Each has its own strengths and weaknesses as previously discussed. Important in this study, these models do not purport to have a sociocultural orientation, and therefore, they are not congruent with the sociocultural view of learning that underpins early childhood education in New Zealand. In the following section, I explore some of the key aspects of these models that indicate why they do not reflect a sociocultural view of learning. I kept in mind the sociocultural framing of this doctoral study, using the three reference points as highlighted in Chapter Two (section 2.6.1) to guide my exploration of the models.

#### ***CBAM***

CBAM was developed to help educational leaders to understand how individuals cope with change processes. It focuses on individual adoption of innovation or technology with the aim of gaining insight into individual concerns and behaviours towards it. CBAM primarily functions as a top-down model in which the leader/facilitator is positioned as a key change agent (Hall, 1987; Roach et al., 2009). This emphasis does not take into account the social and collaborative nature of learning that underpins sociocultural views of learning (Wertsch, del Río, & Alvarez, 1995). It does not acknowledge the particular roles and contexts of the individuals who will be implementing an innovation or new technology.

This view does not take into account learning that is situated within the cultural context of each individual. This is not congruent with the importance attributed to context and community in sociocultural theory (Wertsch, 1991). In summary, the model is not prompted by a sociocultural view of learning; rather, it has a strong theoretical basis in change processes and innovation (Straub, 2009).

### ***TAM***

TAM is used widely to explore user uptake of technology with a particular focus on trusting systems, such as those used for e-commerce and online shopping. The emphasis on individual decision making around the use of such systems based on perceived ease of use and perceived usefulness makes this model very helpful for system designers to consider when developing or evaluating systems of use (Straub, 2009). However, TAM does not have a sociocultural orientation, for example, it does not take into account individual differences nor acknowledge that perceived ease of use and perceived usefulness of a product or system is influenced by the beliefs and attitudes held by individuals and the communities to which they belong. As Karahanna, Agarwal and Angst (2006) explain, TAM does not take into account the compatibility and appropriateness of the context that ICT will be used in. Furthermore, they suggest TAM does not encompass wider ideas about beliefs that influence learning other than ease of use. They argue the values and beliefs of different contexts and organisational settings can potentially influence work practices and social relationships and that these should be taken into account when thinking about how to support individuals to use ICT. Similarly, McCoy, Everard and Jones (2005) suggest that TAM does not signal that corporations or education providers need to take into account what the appropriate ways of ICT use are in their cultural context when trying to understand and take into consideration factors that influence the use of new technologies. Penz (2006) points out that, while there has been a lot of research undertaken about the effectiveness of TAM, most of this does not take into account the influence of social context on learning. Overall, the arguments made by these authors signal that TAM does not have a sociocultural orientation; however, it is important to remember that the intent of TAM is not to address teacher adoption of ICT; rather, it is information systems focused (Straub, 2009; Yu, Ha, Choi, & Rho, 2005).

### ***SAMR***

SAMR aims to provide a clear model for the levels of adaption/adoption of technology. The simplicity of this model appears to be a contributing factor to its popularity, but a lack of robust research and theory is coming to be seen as an issue as more technology users access this model (Klapdor, 2013; Siostrom, 2014). Moreover, the paucity of empirical research into this model makes it hard to draw any valid conclusion about whether there is any influence from a sociocultural view of learning inherent within it. Green (2014), when writing about the validity of SAMR, commented:

The SAMR model seems to have come out of Puentedura's experience but not his research. No peer-reviewed papers on this model have been authored and published by Puentedura; he has not published any results of the decade of study he claims to have conducted. (p. 38)

This lack of research and publications makes it difficult to gain an insight into how this model is viewed by others in this arena. Therefore, I can only make a professional judgment based on the model and the limited information about it in regard to sociocultural theory. Due to its design and structure of levels of use, it does not appear to have a sociocultural orientation.

### ***TPACK***

Mirsha and Koehler (2006) developed TPACK to understand and describe the kinds of knowledge teachers require to use ICT effectively for pedagogical purposes. There is no doubt that TPACK is highly regarded in teacher education contexts. Brantley-Dias and Ertmer (2013) describe it as a model that was developed to provide a means for teacher educators to talk about the integration of technology and the types of knowledge teachers need to ensure they can do this effectively. While TPACK does not advocate a sociocultural view of learning, it interprets technology integration as a complex multidimensional process that requires a sound understanding of the reciprocal nature of the relationships between the three knowledge constructs of pedagogy, content and technology (Pamuk, 2012; Straub, 2009).

### **3.7 Looking Across the Models**

Although CBAM, TAM, SAMR and TPACK are each worthy in their own right, none of them fully address how individuals, such as student teachers, appropriate and integrate ICT into their teaching practice nor do they take into account sociocultural views of learning. These models focus on individuals' concerns to do with educational change; processes, systems and the ease of use of technology; progression in levels of use; and the pedagogical knowledge teachers need to use ICT. Because of this, they do not provide a platform for ITE providers to use to guide action to ensure student teachers appropriate and integrate ICT into their everyday teaching practice. Nonetheless, they have a contribution to make in understanding some of the complexities involved in how ITE providers might support student teachers to appropriate and integrate ICT into their teaching practice.

There is, however, a gap in relation to understanding how to promote ICT in early childhood initial teacher education in New Zealand and other countries with curricula with a sociocultural foundation reflective of learning as a socially and culturally mediated process.

This doctoral study responds to this gap. It focuses in on the following question:

Taking into account the sociocultural orientation in New Zealand towards ECE curriculum design, what might be the nature of a model to facilitate student teacher and teacher appropriation of ICT for pedagogical purposes?

The next chapter discusses the study's methodology and research design. The characteristics of qualitative research are discussed, and an interpretive stance is taken. The participants are identified, the research methods are described and the data analysis is explained. Finally, the trustworthiness of the investigative procedures relevant to this research are discussed.



## **Chapter Four: Research Methodology and Design**

### **4.1 Introduction**

The primary aim of this doctoral thesis was to explore the experiences and expectations early childhood student teachers have for ICT use in their ITE programme and developing teaching practice. It also aimed to explore practising early childhood teachers' use of ICT for pedagogical purposes and their views of how they came to learn and were supported in ICT use.

This chapter describes the processes I used to investigate the focus of this study, and describes the theoretical and epistemological underpinnings of this research and their influences on its design and implementation. The range of methodologies and methods used in educational research are discussed with an emphasis on the interpretive paradigm used in this research. This paradigm is explored in more depth through the examination of multiple perspectives, multiple data generation methods, data analysis, issues of trustworthiness and ethical considerations. The chapter concludes with a summary of the main points of the chapter.

### **4.2 Paradigms in Educational Research**

A paradigm is a systematic way of thinking about the world, about knowledge and about doing research. It is viewed as a “net that contains the researcher’s ontological, epistemological and methodological premises” (Denzin & Lincoln, 2003, p. 33). A paradigm presumes consistent positions on ontology, epistemology, the stance of the researcher and what counts as truth. Bassey (2000) describes a research paradigm as a network of articulated ideas relating to the nature of the world as well as the objectives of research. When it is followed by a researcher, it shapes their thinking, providing a foundation for their research actions. Research paradigms prescribe not only how research should be done but also what should be studied and how results should be interpreted (Bryman, 2001). There are three commonly cited research paradigms, which each reflects different ontological and epistemological positions. These are the positivist, critical theory and interpretive paradigms (Cohen, Manion, & Morrison, 2007; Patton, 2002).

The positivist paradigm involves analysis and recording of social interactions through the use of quantitative data summarised in the form of statistics. This approach posits that knowledge is only valid and reliable if it is produced through scientific methods. The positivist paradigm does not acknowledge the researcher's motives, intentions, values and models of understanding, as they are not considered to be verifiable scientifically and are therefore regarded as social fiction (Denzin & Lincoln, 2009).

Critical theory is used to contribute to the emancipation of the oppressed or to understand some forms of exploitation (Cohen et al., 2007; Denzin & Lincoln, 2009). Critical theory can provide a significant insight into how social knowledge is produced, linking research to social structural contexts. Willis (2007) describes critical theory as a paradigm that focuses on "how the sociocultural world of human beings operates – that is, in a context where there is typically oppression and use of power to privilege one group over another" (p. 260).

An interpretive paradigm is founded on the notion that people socially and symbolically construct their own realities to make sense of their worlds (Cohen et al., 2007; Patton, 2002). It acknowledges that there are many different social realities because of the variations in human experiences and that human behaviour is influenced by context and the variables within it. Davidson and Tolich (2003) describe this paradigm as "... the systematic analysis of socially meaningful action through the direct and detailed observations of people in their natural settings in order to arrive at understandings and interpretations of how people create and maintain their social worlds" (p. 26). Thus, the interpretive paradigm focuses on the interpersonal construction of meanings in an individual's own local context. The interpretive researcher seeks to understand participants' experiences by gaining insight into their subjective realities through processes that allow participants to express their understandings, meanings and motivations (Cohen et al., 2007; Denzin & Lincoln, 2009; Patton, 2002). This study falls within the interpretive paradigm.

#### **4.3 Interpretative Research**

A key task of an interpretive researcher is to understand the multiple realities of the different individuals in a specific context. Participants are regarded as helping to construct 'reality' with the researcher. This joint construction of meanings and

actions is continuously negotiated and influenced by the research context. There is a need to understand different situations and contexts through both researcher and participant eyes, particularly as reality is viewed as multi-layered and complex (Cohen et al., 2007; Denzin & Lincoln, 2009; Patton, 2002).

An interpretive approach involves a process of deliberate inquiry and is conducted in natural real-world settings. This approach employs multiple data-collection methods that allow a range of perspectives to be sought. An interpretive framing of the research process allows for the use of both open-ended but rigorous questions to help scope ideas in order to gain a rich understanding. During the study, researcher and participant perceptions and understandings of events may change the focus of inquiry as well as the methods used for data collection. Tentative assertions are developed through continually constructing and reconstructing sets of meanings, which serve to inform further data collection and analysis. Themes are compared with further data for confirmation, negation or modification to yield insight and understanding of people's behaviour (Cohen et al., 2007; Denzin & Lincoln, 2009; Patton, 2002). An interpretive approach involves a process of deliberate inquiry and is conducted in natural real-world settings. Typically, this approach employs multiple data-collection methods to allow a range of perspectives to be sought. Those working within an interpretive frame tend to favour interviews and participant observation as data-collection methods.

In conclusion, an interpretive qualitative research approach focuses on participants' perspectives and meanings, is naturalistic, generates data and presents findings as rich descriptions and tends to analyse data inductively. To reiterate, this approach has been adopted for this study because it allowed me to value the voices of the teacher and student teacher participants and to gather and present a rich perspective on how teachers and student teachers learned about and used ICT in their teaching practice.

#### **4.3.1 Case Study within Interpretive Research**

Case study research has its roots in the broader field of social sciences, in particular, ethnographic studies and anthropology. Although case studies are typically considered to be qualitative studies, they are not necessarily only

qualitative, and quantitative data generation methods may also be appropriate (Punch, 2009).

The focus of case studies is on a bounded system or unit. For example, in educational studies, a case could be an individual student, a group of students, a class, a department or an early childhood educational setting. Haigh (2000) describes a case study as an acceptable strategy for informing educational policy and practice. It is also the preferred strategy when attempting to find answers to how, what and why questions (Punch, 2009).

In order for a case study to provide valid research data, it is critical that the collection of information is undertaken in a planned and structured manner. All relevant processes and variables need to be investigated and understood. It takes advantage of collecting data within the participants' natural settings so as to maximise the validity of the information. This in-depth focus provides opportunities for the researcher to investigate and report on dynamic and changing events and relationships. The strength of a case study is the focused capture of the key features in more detail that may be missed with other methods, for example, surveys (Bassey, 2000; Cohen et al., 2007).

Stake (2006) outlines three types of case studies – intrinsic, instrumental and collective. An intrinsic case study involves exploration of one particular case for its own sake, where there is no expectation that the results will have implications for other case studies. An instrumental case study involves using a case study to gain insight into a particular phenomenon where there is also an explicit expectation that learning can be used to generate or to develop theory. In this case, there is likely to be a question or a set of predetermined criteria being explored and tested. Case studies become collective when a number of instrumental case studies are used to make comparisons in relation to a particular issue or phenomenon.

For the purposes of this study, I have engaged in an instrumental case study approach to gain an insight into a particular area of interest to me, that is, how early childhood student teachers and teachers appropriate and integrate ICT into their teaching practice.

#### **4.3.2 Data-gathering Methods**

Data-gathering methods refer to the techniques and tools a researcher uses to collect data or gain insight into the world of the research participants. Within an interpretive paradigm, people are viewed as intentional participants in the activities of their communities, and all their perspectives on events or situations are of interest. There is an expectation that the researcher will attend to their multiple realities and interpret or reflect the research context from the multiple viewpoints of the different participants/participant groups (Cohen et al., 2007).

Multiple data-generation methods are available to the interpretive researcher and are often used to increase the credibility or trustworthiness and ‘interpretability’ of data generated from multiple sources. A different method reveals different aspects of reality, and no method is completely neutral or without restrictions (Cohen et al., 2007). Hence, the use of only one method of data collection can render a study less credible. Interpretive qualitative research increases in credibility and robustness through the use of multiple data-generation methods. While it is acknowledged that both the participants and researcher influence the data-collection process by bringing their own history and experiences to the process, ultimately, how the research evolves and is documented is the decision of the researcher.

#### ***Interviews***

An interview is a conversation between the interviewer and interviewee (or group of interviewees) with a particular purpose in mind (Cohen et al., 2007). Interviews enable participants to express their views and discuss their situations or interpretations from their perspectives. Participants can use natural language to express themselves so that in-depth information may be gathered directly from them in their own words. Interviews are based on the view that knowledge is constructed between participants so that the data is generated rather than collected. The interview can reveal rich materials, although it is subjective, time consuming and often difficult to classify and analyse the responses. Interviews have various purposes, such as enabling the researcher to explore the motivations and explanations for participants’ behaviour, which are often hard to observe directly (Punch, 2009).

In qualitative and interpretive studies, interviews can vary according to the context and purpose of the interviews from unstructured through to semi-structured to highly structured approaches (Cohen et al., 2007; Patton, 2002). An unstructured or informal conversation interview is the most open-ended interview approach, and participants often direct such an interview. It offers the researcher maximum flexibility to explore all appropriate information. Unstructured interviews are used to gain an in-depth insight into the participant's experiences and interpretations in their own terms. This type of interview consists of the form of a conversation between the interviewer and the interviewee with an unstructured focus on the interviewee's perception of themselves, their context and experiences. Unstructured interviews can generate data that will contribute to the researcher's understanding of complexities of human behaviour without imposing any prior categorisations that might limit the breadth of inquiry (Burns, 2000; Punch, 2009).

Semi-structured interviews are based on a set of predetermined (more or less structured) questions from the researcher but permit some flexibility in the order or wording of the questions across a number of participants (Denzin & Lincoln, 2009). This can help ensure systematic data is collected and also allows exploration of individual perspectives or new insights as they arise. The data generated from such interviews can be comprehensive, although the flexibility in the focus can lead to diversity in responses and foci and, again, make data analysis challenging. However, this approach allows for a balance that maximises the collection of data that can be analysed in a comparative manner across participants (Cohen et al., 2007; Patton, 2002).

Structured interviews comprise a set of pre-established questions, and there is little opportunity for variation in the interviewee response. In this interview style, all interviewees receive the same questions in a standardised format. Due to the highly structured and standardised format of this form of interview, the approach is considered to be similar to a quantitative data-collection tool (Punch, 2009).

This study utilised semi-structured individual and group interviews as they allowed the flexibility required for open dialogue about key issues while still providing a framework for systematic data collection. The value of the process

was enhanced by the use of open-ended questions followed by probes to maximise the depth of responses from participants. This allowed the interviewees some flexibility and the interviewer some control.

### ***Online Discussion Data***

Marra (2006) describes online discussions as providing a text-based forum that provides researchers with a range of opportunities to potentially make the contributors' learning and thinking visible. An advantage of online discussion posts is that they are in a written format. Therefore, no transcribing is needed, and what is written in them is original to the person who posted the contribution (Sullivan, 2003). Such discussion data can be analysed through a range of methods (De Wever, Schellens, Valcke, & Van Keer, 2006; Marra, 2006). However, Janssens and Kraft (2012) caution that research, which relies on the collection of self-reported data by self-selected participants, has methodological limitations, including selection bias and information bias. They argue that when researchers are aware of and acknowledge these limitations in their work, self-report is a useful and valid mode of data collection. The online discussion data in this study was analysed using thematic analysis based on the work of Brauan and Clarke (2006).

### **4.3.3 Data Analysis**

Data analysis is used to find patterns or themes in data. Data analysis is a time-consuming and highly challenging task, especially qualitative analysis. The challenges include making sense of a volume of data, reducing the volume of information to a manageable size and format, identifying significant patterns and themes and constructing a framework to interpret and encapsulate the essence of what the data is about (Punch, 2009).

Data analysis is generally understood as an ongoing activity, with results from early data collection and analysis guiding subsequent data-collection efforts. There are several stages in qualitative analysis required in this study, including the generation of meanings, classifying and ordering these meanings and then interpreting them. Themes and notions from the supporting literature may assist in this process (Cohen et al., 2007). Interpretation of the data is intended to capture the authentic meanings behind the patterns and themes, offering significance to

particular outcomes and group patterns within an analytic framework (Patton, 2002).

There are a number of different kinds of analysis including content analysis, narrative analysis, discourse analysis and thematic analysis (Cohen et al., 2007; Punch, 2009). Thematic analysis is often used in qualitative research to gain an understanding of the data and participant perspectives. Braun and Clarke (2006) describe thematic analysis as "... a method for identifying, analysing and reporting patterns (themes) within data" (p. 79). However, despite its wide use, there tends to be little agreement on what it is and how you go about using it (Braun & Clarke, 2006). Braun and Clarke (2006) challenge the notion of 'emerging themes', a term sometimes used in the literature (Burns, 2000; Cohen et al., 2007; Creswell, 2008) to describe a thematic approach, and argue it is not about researchers passively discovering themes emerging from the data. Rather, they posit it is an interactive process in which the researcher has views and notions about the topic and that matching those ideas to the data is an analytical exercise. Both inductive and deductive approaches can be used to analyse themes in qualitative data. When using an inductive approach, the researcher moves from the observations, through generalisation to theory generation. Alternatively, a deductive approach moves from the general principle of the theory (hypothesis) to the particular observation to see if the observed data fits with the prediction of the theory. An inductive approach is the most common method used in thematic analysis; however, although deductive theory is usually undertaken in quantitative studies, it has a place in qualitative research when used to test already established themes against a model or hypothesis. An inductive thematic analysis was used in this study. The analysis included a deductive aspect in that the researcher took account of ideas and concepts from the literature reviewed in Chapter Two and Chapter Three. Particular attention was paid to the themes across and the gaps in the models outlined in Chapter Three when these were considered from a sociocultural point of view (section 3.6).

Ezzy (2002) argued that both inductive and deductive methods of theory generation are valid approaches to use in qualitative data analysis processes. He stated: "The task of the grounded theorist is to allow deductions from pre-existing theory to suggest specific research problems and foci, but the researcher must not



allow this pre-existing theory to constrain what is noticed” (p. 12). Inductive analysis is more open-ended and exploratory whilst deductive analysis tends to be narrow in nature and is concerned with testing or confirming hypotheses. Most qualitative research involves both inductive and deductive processes in some aspects. Punch (2009) posits that, while inductive analysis is central in qualitative research, deductive processes are also required as this allows for interpreting and analysing meanings (inductive) and for theorising (deductive).

#### **4.3.4 Ensuring Trustworthiness**

Trustworthiness refers to the ‘goodness’ or quality of the research and includes credibility, transferability and confirmability. It involves establishing credibility or confidence in the truth of the findings (transferability). This means that the findings have applicability in other contexts or that the findings are consistent and could be repeated. Confirmability is based on the degree of neutrality, or the extent to which the findings of a study are shaped by the participants, and not influenced by researcher bias, motivation or interest (Lincoln & Guba, 1985).

Triangulation is a method used to establish credibility. The term triangulation is used when two or more methods of data collection and/or sources of data are used in a research project (Cohen et al., 2007). The use of triangulation has the potential to increase the trustworthiness of the investigation in a qualitative study. It can provide rich detail about the complexities of human behaviour through data gathered from more than one perspective and can involve data collected both qualitatively and quantitatively. The power of triangulation as a validity measure lies in its ability to reduce the subjectivity of the data, researcher or method that may be present (Cohen et al., 2007). The method allows the cross-checking of data from different sources and the assessment of the credibility of individual accounts, resulting in a convergence upon interpretation of the human events being investigated. Qualitative studies that use triangulation yield different sets of data, but if there is a high degree of convergence or correlation between data gathered from the different methods, the researcher can have greater confidence in the data’s ability to give a credible picture of the situation. Equally, inconsistent and contradictory outcomes of triangulation should not be discounted because they do arise out of different perspectives of the same event. They may, in fact,

ultimately provide deeper understanding of the issues being studied (Cohen et al., 2007). Triangulation, or the integrative use of multiple sources of data, allows the display of multiple, refracted realities as it helps the researcher to “map out, or explain more fully, the richness and complexity of human behaviour by studying it from more than one standpoint” (Cohen et al., 2007, p. 112). It can also reduce researcher bias, respondent bias and reactivity. However, different data sources cannot always be expected to yield essentially the same results, and inconsistencies in the findings can offer a chance for deeper insights rather than being viewed as a weakness of the research credibility (Patton, 2002).

The notion of thick description is used in relation to establishing transferability in qualitative research. Lincoln and Guba (1985) described “thick description” as a way of achieving a type of external validity. By describing a phenomenon in sufficient detail, researchers can begin to evaluate the extent to which the conclusions drawn are transferable to other times, contexts, situations and people. In qualitative research, the sample selection is more often purposeful than random, so the reader needs to decide if they apply to their own situation. The researcher must provide the rich data or a “thick description necessary to enable someone interested in making a transfer to reach a conclusion about whether transfer can be contemplated as a possibility” (Guba & Lincoln, 1989, p. 316). In this sense, a highly detailed description of the context for the research and of the data itself, often including extensive segments of verbatim transcript in the case of interview data, are provided by the researcher to enhance internal validity, which shifts judgements about validity from the researcher to the reader. The trustworthiness of a study depends on the eyes of the reader, and therefore the researcher can only persuade the reader that this is worthwhile research through careful use of techniques that check the validity and reliability of the methods used to generate the data for the research (Denzin & Lincoln, 2009; Guba & Lincoln, 1989).

External audits can also be used to establish confirmability within qualitative research. Lincoln and Guba (1985) posit that external audits involve having a researcher not involved in the research process examine both the process and outcome of the research study. The purpose is to evaluate the accuracy and

evaluate whether or not the findings, interpretations and conclusions are supported by the data (Lincoln & Guba, 1985).

#### **4.3.5 Ethical Considerations**

Ethical considerations are important in educational research, as it involves human participants and the meanings constructed for the research arises out of the trust and rapport developed between the researcher and the participants (Creswell, 2008). Cohen, Manion and Morrison (2007) suggest that all researchers of human behaviour must be aware of and take into account moral and ethical issues that pervade their work. They believe researchers have obligations to act in the best interests of all people involved in or affected by the investigations and ensure that no harm is caused. This requires investigators to act ethically and with respect and is about the attitude they bring into the field and to the interpretations they make. Ethical concerns will often place researchers in dilemma situations. Typically, in such situations, a balance must be struck between the demands placed on them as professionals to pursue the truth and the potential threat of their work on the rights and values of their research subjects (Cohen et al., 2007). The main ethical concerns in qualitative research include access to participants, gaining informed consent and avoiding deception, the right to privacy and confidentiality, and protection from harm (Burns, 2000). Researchers using a qualitative approach understand that they may be faced with a range of ethical issues that can be extremely complex and subtle. Therefore, they need to take into account the ethical consideration of a range of factors, including voluntary participation, informed consent, confidentiality and the storage and use of data (Burns, 2000; Creswell, 2008; Punch, 2009) Voluntary participation requires the researcher to gain informed consent from all participants in the study. “The principle of informed consent arises from the subject’s right to freedom and self-determination” (Cohen et al., 2007, p. 51). This means that participants have the right to understand the purpose of the research and what was required of them. They also have the right to accept, decline or even opt out of participating in the research study. In addition, participant confidentiality and anonymity must be maintained. The researcher must take responsibility to ensure the participants come to no harm and to keep all research data confidential. Participants’ responses to questions, interview data, questionnaires and so on must remain

confidential and anonymous to ensure they cannot be identifiable to readers of the research. Participants must have a clear understanding of how the data might be used. Balancing the participants' right to privacy and the public's right to know research findings can create tension if the purpose and usefulness of the outcomes are not clearly established (Cohen et al., 2007; Punch, 2009).

#### **4.3.6 Conclusion: Research Methodology and Design**

The methodology identified for this study is built around two qualitative research approaches. Firstly, an interpretive paradigm is identified as the appropriate approach for this study because it allows the researcher to capture a breadth and richness of the participants' real-life experiences in their own contexts. The emphasis in an interpretive approach is on developing an understanding of the experiences and perspectives of the individual participants in order to gain a clear insight into the phenomenon being studied.

Case study inquiry is a second approach to qualitative research. Using a case study allows the researcher to define the unit of analysis, which may or may not involve theory generation. It allows for description of the participants' perceptions in an attempt to highlight significant factors to gain a better understanding of interesting educational phenomena (Punch, 2009). Multiple settings can be included in case studies, which allow for the collection of rich data that can reflect each of these contexts (Stake, 2006).

A key aspect of qualitative research methodology is the trustworthiness and ethical considerations afforded to each of the participants. It is important that all participants feel that they are fully informed and understand any possible ethical issues that might arise during the study. A significant underlying issue that can arise in qualitative educational research is the potential for the researcher to know some of the participants. This raises implications for access, consent, confidentiality, anonymity, conflicts and authority that must be given careful consideration in the research approach. The appropriate methodology and approaches have been outlined for this study; the next section details the methods used in its specific design.

## **4.4 Research Design for this Study**

This section outlines the research processes used in this study. It details each of the methods used for data gathering and the strategies used to analyse the data and report the findings. An interpretive research approach was chosen for this study as it sits well with sociocultural theoretical understandings of learning that focus on learners' experiences in the social, cultural and material environments they are interacting in and with.

### **4.4.1 The Research Process**

To achieve my research aims, I carried out a two-phase in-depth case study involving teachers in 10 early childhood settings and student teachers in an undergraduate paper in a Bachelor of Teaching ECE ITE programme. Teachers were interviewed, and data in the form of an online discussion was collected from student teachers.

### **4.4.2 Teacher Participants**

Teacher participants were drawn from five kindergartens and five early childhood education and care centres. The process was as follows:

#### ***Kindergarten Teachers***

The Waikato Kindergarten Association (WKA) supports many of the University of Waikato's student teachers in teacher education programmes to undertake teaching practicums within their kindergartens. Hence, I knew and already had a relationship with many of the teachers in these local kindergartens. I approached the Chief Executive Officer of the Waikato Kindergarten Association to seek permission to interview teachers in four kindergartens. These kindergartens were selected randomly from a list of possible kindergartens that I had been given permission to approach.

The teachers in all four of the first WKA kindergartens I approached agreed to participate in the study. To help provide a potentially different perspective, I also approached the owner of a private kindergarten, where the university places student teachers on practicum, to seek permission to interview the teachers who were employed there. These teachers also agreed to be participants in this study.

In three of the kindergartens, the teaching teams opted for individual teacher interviews. In two kindergartens, they chose for their teaching teams to be interviewed in a group.

The interviews were approximately 45 minutes in duration and were digitally recorded. They all took place in the kindergartens after the sessions had finished. All transcripts were sent back to the participants to check for any inaccuracies or misrepresentation of their voices.

Table 3 summarises the compositions of the kindergarten teacher participants and their contexts.

***Table 3 Compositions of Kindergarten Teacher Participants' Contexts***

<i>Kindergarten participants</i>	<i>Gender</i>	<i>Private/Association</i>	<i>Individual/group interview</i>
<b>Kindergarten (1)</b>			
Teacher (TAE)	F	Association	Group
Teacher (TZ)	F	Association	Group
Teacher (TAE)	F	Association	Group
<b>Kindergarten (2)</b>			
Teacher (TU)	F	Private	Individual
Teacher (TC)	M	Private	Individual
Teacher (TAG)	F	Private	Individual
<b>Kindergarten (3)</b>			
Teacher (TH)	F	Association	Individual
Teacher (TJ)	F	Association	Individual
Teacher (TM)	F	Association	Individual
Teacher (TQ)	F	Association	Individual
<b>Kindergarten (4)</b>			
Teacher (TX)	F	Association	Group
Teacher (TN)	F	Association	Group
Teacher (TE)	F	Association	Group
Teacher (TAH)	M	Association	Group
<b>Kindergarten (5)</b>			
Teacher (TK)	F	Association	Group
Teacher (TL)	F	Association	Group
Teacher (TW)	F	Association	Group

### ***Early Childhood Education Teachers***

The five early childhood education and care centres that participated in this process were chosen from a random sample of early childhood services in Hamilton. The one element they had in common was that they all supported the University of Waikato student teachers on their teaching practicums.

I approached the management of each early childhood centre independently as they do not have an umbrella organisation such as the Waikato Kindergarten Association. Each early childhood centre manager asked for an indication from teachers who might like to be a part of this study; I then approached the teachers who indicated an interest and invited them to participate. I then arranged interviews at times that were convenient to them. These interviews all took place in the early childhood services and were approximately 45 minutes in duration. I used the same process of recording the interviews digitally and sending back their transcripts for checking as I did with the kindergarten teachers.

Table 4 summarises the compositions of the early childhood education and care teacher participants' contexts.

**Table 4 Compositions of ECE Teacher Participants' Contexts**

<i>ECE participants</i>	<i>Gender</i>	<i>Private/community/kindergarten association/institution</i>	<i>Individual/group interview</i>
<b>Centre (1)</b>			
Teacher (TR)	F	<i>Ktn/assn.</i>	Individual
Teacher (TS)	F	<i>Ktn/assn.</i>	Individual
Teacher (TT)	F	<i>Ktn/assn.</i>	Individual
<b>Centre (2)</b>			
Teacher (TD)	F	Ins	Individual
Teacher (TI)	F	Ins	Individual
<b>Centre (3)</b>			
Teacher (TV)	F	Pri	Individual
Teacher (TO)	F	Pri	Individual
Teacher (TY)	F	Pri	Individual
<b>Centre (4)</b>			
Teacher (TAC)	F	Com	Individual
Teacher (TF)	F	Com	Individual
Teacher (TAF)	F	Com	Individual
<b>Centre (5)</b>			
Teacher (TA)	M	Com	Individual
Teacher (TB)	F	Com	Individual
Teacher (TG)	F	Com	Individual
Teacher (TAB)	F	Com	Individual
Teacher (TAD)	F	Com	Individual

#### **4.4.3 Student Teacher Participants**

To collect the student teacher data from online conversations from a paper in the Bachelor of Teaching degree, I approached the Chair of the Department of Professional Studies in Education to ask permission to speak with the paper coordinator to seek access to the student teachers in one of the tutorial sessions. The selected paper was a compulsory second-year paper that was offered partially online on the Hamilton and Tauranga campuses. It was made up of weekly face-to-face tutorials on each campus and a weekly online discussion. The learning outcomes of the paper were the same in the two years of data collection – 2008 and 2009. These learning outcomes are listed below.



### *Learning Outcomes/ Ngā Whāinga Paetae*

- Students will explore their own implicit theories about learning and will be introduced to alternatives.
- Students will be encouraged to articulate clear goals for young children in early childhood care and education.
- Students will develop a wide range of strategies for assisting infants, toddlers and young children to make sense of their world, with particular emphasis on the contexts of mathematics and technology.
- Students will develop an understanding of the adult's role in children's learning through the theme of "empowerment" of children (a curriculum guiding principle).

Once I had gained permission from the Chair of the Department, I met with the student teachers in their classes, outlined the research process and asked if they would give me permission to collect their conversations in response to questions in the paper about ICT and teacher education. There were 59 student teachers enrolled in the paper in 2008, 40 on the Hamilton campus and 19 in Tauranga. Eighty-six were enrolled in 2009, 62 on the Hamilton campus and 24 in Tauranga. All student teachers gave consent for me to access their online discussions in weeks four and six of the paper during both years.

#### **4.4.4 Data Collection**

The data collection was undertaken in three phases. The first phase involved interviewing teachers in five early childhood centres and five kindergartens. The second and third phases involved accessing student teacher online discussion posts. The process I undertook is as follows.

##### ***Early Childhood Teacher Data Collection***

The teacher data collection was in the form of semi-structured interviews. I chose semi-structured interviews because this allowed the participants' perspectives to come through clearly and not be dominated by a structure and focus imposed by me as the researcher. This approach also supported teachers to use language with which they were comfortable and that related to their own contexts. The interviews were conducted in each early childhood setting at times convenient to the teachers and lasted between 45 minutes to one hour. Three kindergarten

teachers in one kindergarten chose individual interviews, and all of the teachers in the other four kindergartens preferred group interviews. All early childhood education and care teachers chose individual interviews. The interview questions are attached in Appendix H. All transcripts were returned to the participants for any corrections; however, all participants allowed their transcripts to be used without amendments.

### ***Student Teacher Data Collection***

The second and third-phase sources of data were student teacher self-report data, comments drawn from online contributions to two online discussions in 2008 (phase two) and 2009 (phase three). The online discussions from a particular topic within a specific course were collected, with student consent. The discussion topics already existed and were not created specifically for the study. These discussions were in response to the following questions, which were the same in both years. Although these were pre-set questions for student teachers to discuss within particular paper they were considered relevant to this study because they focused on student teachers' perceptions about the use of ICT in early childhood education, their developing philosophies around such use, and how they were/or could be supported within the degree programme. These online discussion questions were open-ended and therefore allowed the complexity of a single idea or phenomenon to emerge from the student teachers perspectives. This paper had an online weekly discussion forum and was the only paper that explored the use of ICT as one of the topics. The data generated from these discussions were relevant to this study because my aim was to try and gain an insight into how student teachers thought about and learned to use ICT for pedagogical purposes.

### ***Question One***

By now all of you have been on placement and may have experienced ICT in one form or another. Some of you will have begun to read some of the articles on ICT and seen the video about ICT in early childhood settings as a part of this paper.

Given these experiences, how does ICT fit with your own vision and philosophy of teaching? What are some of the things children

might be learning when they are involved in everyday technology?  
Use the readings and draw on your previous experiences on placements and your E1 practicum to inform your discussion.

### ***Question Two***

Now that you have been on practicum and may have had the opportunity to see ICT in action, and maybe even used it yourself, what experiences, learning and skill acquisition do you think could be provided during this three-year programme to enable you to be confident in the use of ICT as a beginning teacher?

#### **4.4.5 Thematic Data Analysis**

I used thematic analysis to systemically analyse the study data. This process was essential to identify the significant features inherent within the data (Creswell, 2008). Through a process of ongoing reading, sifting, grouping and regrouping of the data, themes were identified that allowed me to gain an understanding of the salient features of the participants' experiences and their contexts (Braun & Clarke, 2006). I used both inductive and deductive reasoning to locate and identify themes in the data. I drew on the work of Ezzy (2002), who argued that, when undertaking data analysis, "the researcher should enter into an ongoing simultaneous process of deduction and induction, of theory building, testing and rebuilding" (p. 10).

In this study, I approached the thematic analysis with some themes in mind (a deductive analysis approach); these were derived from the literature in Chapter Two and Three. At the same time, I was open to any new themes or ideas that emerged from my reading of the data (inductive). Whilst undertaking the deductive thematic analysis I kept in mind the three sociocultural points (See section 2.6.1), and the ideas within the models set out in Chapter Three.

#### ***Teachers' Interviews: Thematic Analysis***

Inductive thematic analysis was employed for the teacher interview data. While this process is a widely used method for qualitative analysis, Braun and Clarke (2006) point out that thematic analysis is often described in a vague manner and is an under-theorised tool. However, they argue that because thematic analysis is not wedded to any pre-existing theoretical framework, it is a flexible tool, which

allows the researcher to identify themes or patterns in the data. Creswell (2008) argued that identifying themes allows the complexity and depth of storytelling to emerge, which adds insight to understanding individual experiences. However, themes are ultimately determined by the researcher's judgment as they are reshaped as the analysis proceeds (Punch, 2009).

Thematic analysis focused teacher beliefs about and use of ICT in their teaching practice. While the interview questions provided some structure to the interview conversations (see Appendix H) the following aspects from the literature reviewed in Chapters Two and Three provided a lens for the thematic analysis and interpretation: the relational nature of learning, learning as a socially and culturally mediated process, and ICT cultural tools as mediating learning within a context. To analyse the teachers' perspectives, I read and reread the transcripts. The data were initially chunked into topics relating to different beliefs and practices and then patterns and ideas within these were colour coded on the hard copies of the data. In this way, coding involved "the process of segmenting and labelling text to form descriptions and broad themes in the data" (Creswell, 2008). Finally, categories were noted and the number of teacher comments on each theme were counted and checked off accordingly. In this way, a thematic analysis of the teacher data enabled me to capture their perspectives, similarities and differences. As the analysis proceeded, I identified five themes in the data: the nature of ICT use as part of pedagogy, subjective norms, relational trust, and ICT as a cultural tool. These are explained below.

The nature of ICT use as part of pedagogy was the strongest theme in the data. Aspects were identified in the first instance by focusing on practices identified in the literature review – See section 2.5. Of these assessment was the main one. Student teacher and practicing teacher commentary construed the use of ICT for the documentation of learning and assessment for learning was a key aspect in teacher pedagogical use of ICT. Other aspects of pedagogy raised by the interviewees included building and sustaining relationships, children's literacy learning, supporting inquiry learning, emergent curriculum and using ICT for research purposes.

Subjective Norms was the second strongest theme identified in the data. The notion of subjective norms, as used in this study, was drawn from Fishbein and Ajzen's (1977) Theory of Reasoned Action, (See section 3.3). Subjective norms are "the perceived social pressure to perform or not to perform" as particular the behavior (Ajzen, 1991, p. 188). The theme of subjective norms was identified in teacher commentary about use of ICT as 'custom and practice' in their contexts (See section 5.3). For student teachers, subjective norms were categorised from comments that reflected their view of 'what we would have liked to learn', in particular them developing an understanding of the pedagogical affordances of technology and/or a desire to learn about these (See section 7.2).

The theme relational trust is defined in this study as a positive three-way relationship between technology, teaching and learning (See section 2.6.2) Comments were categorised as relational trust when teachers included mention of them trusting technology supported teaching and learning (See section 5.4) and student teacher comments included mention of trusting the technology they used in their ITE programme would contribute to their developing pedagogical practice (See section 7.3). This theme featured as the third strongest theme in the data.

The theme 'ICT cultural tools' describes software applications of technology and the Internet that teachers used in their teaching practice and student teachers used in their ITE programme (See sections 5.5 and 7.3).

The theme of enjoyment was identified when a teacher or student teacher mentioned a sustained interest in the use of ICT in their teaching, including their describing a sense of fun and enjoyment whilst using ICT tools (See sections 5.6 and 7.5)

### ***Student Teacher Online Data: Thematic Analysis***

Inductive/deductive thematic analysis was also used for the student teacher online data. I employed the same process as outlined above for the teacher data. That is, I employed the same colour-coding process that I used for the teacher interview data set, coding by topic and developing categories and then building a cumulative list of categories with subthemes. Some of the student teacher postings were counted in more than one category when a particular student teacher commented more than once on the same idea. Hence, counts represent the number

of contributions and not the number of student teachers making a point. As the analysis proceeded, the same five themes that were identified in the teacher data were evident in the student teacher data set: pedagogy, subjective norms, relational trust, ICT cultural tools and enjoyment.

Using the categories identified in both data sets as a tentative structure, I returned to each data set, extracting quotes from participants for illustrative purposes, and began to look for relationships (Braun & Clarke, 2006; Creswell, 2008). The resulting reports and analysis are presented in the following chapters. I did not undertake interviews with student teachers as the phase one student teachers had graduated by the time the data was analysed.

#### **4.4.6 Trustworthiness of this Study**

Criteria for ensuring the trustworthiness in qualitative research studies are subject to debate (Lincoln & Guba, 1985). One problem is that qualitative research does not fit traditional models; so acceptable criteria for evaluating it are still evolving (Denzin & Lincoln, 2003). Aspects of trustworthiness include credibility, transferability and confirmability. In order to ensure these aspects are evident in the research design, I used the practice of triangulation (Cohen et al., 2007). The data I gathered from semi-structured interviews and online discussions allowed me to collect different perspectives from the participants. By using different methods of gathering data, I triangulated the complexities of the participants' contexts. This triangulation process contributed to closely representing participants' voices. This method also enabled me to gain some insight into the participants' worlds and allowed me to be mindful of my own subjectivity during the analysis process. I have described the participants' involvement and their contexts in a transparent manner, which contributes to the trustworthiness and reliability of this study.

#### **4.4.7 Ethical Considerations for this Study**

Ethical principles require careful consideration in any research setting, particularly in qualitative research where not only the subject matter is involved in ethical issues but also the methods and procedures used (Punch, 2009). Qualitative researchers acknowledge that moral and ethical issues encountered can be extremely complex and subtle. A number of factors need to be considered, including voluntary participation, informed consent, confidentiality and the

storage and use of data (Burns, 2000; Cohen et al., 2007; Punch, 2009). In this study, it is important that the student teachers' voices are heard, particularly through the online data, and I took into account that technology can sometimes mask these voices (Marra, 2006). Whilst undertaking this research, I was always transparent about the online data-collection process to ensure that the participants felt their work was protected and valued. Stake (2006) suggests that a lot of research undertaken in education contexts has multiple purposes, which include an interest in both processes and outcomes. This research appears to fall into this category, as I was interested in determining the views of the student teachers and early childhood teachers as well as the processes that produce these outcomes. For this reason, a multi-method approach was used that included both interviews and the online data. The University of Waikato places a high priority on ethical considerations in research, and any human research undertaken at the University of Waikato must have approval from its Human Research Ethics Committee. This requires a formal written application that outlines how key ethical and legal issues, such as those raised in this paper, were to be addressed in the proposed research project. This process was completed before the study began.

The large number of early childhood settings in Hamilton and the surrounding areas decreased the potential for the early childhood settings and teachers participating in the study to be identified. The possibilities of risk were minimised by ensuring information was not used that may allow identification of the respondents. Information such as participants' names, addresses and the names and locations of the early childhood settings in which they taught remained confidential. The manner in which the findings from the teacher interviews were reported ensured that confidentiality was maximised. For example, I assigned codes in place of the participants' names to protect their identities.

### ***My Role as the Researcher***

I was not a lecturer in the paper that is the focus of the study at the time; however, I was aware that I would be one of the lecturers in at least one third-year paper that the student teachers would undertake the year following the data collection. I did not foresee any issues with this, but I was very clear with the student teachers about my different roles in both situations. Although I was not in a position of assessing the student teachers during the course of the data generation, I would be

in a position of assessing the student teachers in papers later in their degree. This issue had been addressed, as the assessment process was always undertaken as part of a team. Although I was a member of the department in which this study took place, the department had clear processes for the moderation of marking. We worked collegially to enhance our teaching and assessment, and I saw this study as an extension of this process.

### ***Informed Consent – Teacher Interviews***

I began the process of gaining informed consent from the participants by contacting the teachers via a letter, which included an information sheet explaining the nature of the study and what their participation would involve (Appendices D E and G). The researcher and chief supervisors' contact details were also provided. I felt a direct approach was appropriate because I had already contacted their association leader or centre manger seeking permission to approach the teachers who had indicated an interest (Appendices B and C). Written consent was obtained from each participant. The information letter that contained the consent form explained that participation was voluntary and that the participants could withdraw from the study at any time up until I had returned their interview summaries for checking.

### ***Informed Consent - Student Teacher Online Discussion Posts***

I used a similar process for the obtaining of informed consent from the early childhood student teachers. First, I approached the Chair of the Department that the paper was offered in (Appendix A) to seek permission from the paper coordinator to approach the students in class regarding accessing their online conversations as a form of data and to invite them to participate in possible follow up interviews. As soon as this approval was given, I asked the lecturers teaching the paper on the Hamilton and Tauranga campuses if I could take 15 minutes at the beginning of a class to talk with the student teachers to give them an overview of the study and invite them to participate. I left an information letter (Appendix G) and a letter of invitation including consent form (Appendix F) with them and an envelope, which was collected by their lecturers at the end of the class and returned to me.



### ***Confidentiality, Anonymity and Privacy***

The large number of early childhood settings in Hamilton and the surrounding areas decreased the potential for the early childhood settings and teachers participating in the study to be identified. The possibilities of risk were minimised by ensuring information was not used that may allow identification of the respondents.

Online discussions can also serve as a source of data. Eynon, Fry and Schroeder (2008) posit that advancements in the use of online technology have provided researchers with opportunities to use online forums as a data source. However, they caution that ethics relating to the ease in which a third party, such as a researcher, can access and reuse data outside of the original context must be taken into account at all times. Online discussion is a normal class activity in this particular paper. Weekly discussion topics are available for the student teachers to work in small groups online, and each group is able to read other groups' contributions. These discussions relate to a topic within the paper and therefore did not have the same potential for ethical implications as questions designed specifically by the researcher. To ensure the student teachers' voices were presented in a confidential manner, numerical codes were used in reporting of online discussion data.

The data were treated in a way that protected the anonymity and privacy of the teachers and student teachers, early childhood centres and kindergartens in this study. The names of the participants were changed using numerical and alphabetical codes. The transcribed digital interview recordings were stored in a locked cupboard in my home. The consent forms and transcripts were stored separately in a locked filing cabinet. Data will be kept for at least eight years and then it will be destroyed. The data stored in my personal computer can only be accessed with a password known only to me.

### ***Minimisation of Risk from Harm***

To minimise the potential for harm, all participants were treated with respect and consideration throughout the research process. I was aware that some early childhood teachers using ICT in their practice might have limitations. Any identified limitations were presented in a sensitive manner, as the focus of the

research was to build on teachers' current thinking and understanding of theories of the use of ICT for teaching and learning.

I was also aware that the research had the potential to expose that student teachers' use of ICT in their own learning might be limited. Therefore, I was mindful that some student teachers could perceive the findings of this study as failure on their part to learn particular skills in relation to ICT. I mitigated these possibilities by assuring them of the significant contribution they were making to the understanding of the nature of ICT in their learning and of the wider educational implications for this in-depth study. I raised these issues for discussion when I met with them in class so they were aware of such consequences prior to obtaining their informed consent for access to their online data.

The next chapter reports on the teacher findings from the data generated from the semi-structured interviews. Findings are supported by participants' verbatim quotes that communicate their perspectives in authentic voices.

# Chapter Five: Teacher Understandings of the Uses of ICT

## 5.1 Introduction

This chapter reports the findings generated via interviews with 33 early childhood teachers. I used a thematic approach to mine the data. The themes of pedagogy, subjective norms, relational trust, ICT cultural tools and enjoyment emerged from this analysis. The use of verbatim quotations is intended to respect the authenticity of participants' voices and to portray participant perspectives in rich detail. For protection of identities, the teachers' names are coded alphabetically, for example Teacher A (TA), Teacher B (TB) and so on.

## 5.2 Teacher Pedagogy in Relation to ICT

In this study teacher commentary construed pedagogy as a knowledge-based practice that involves the use of on-going assessment. Consistent with Te Whāriki, teacher comments indicated they viewed pedagogy as underpinned by reciprocal relationships between teachers, children and families. The data contained evidence that teachers valued pedagogical practices that included a range of multimodal approaches. It also indicated that ICT is an accepted and expected aspect of early childhood education in Aotearoa/New Zealand today.

All of the 33 teachers interviewed mentioned ICT in relation to their pedagogy, with a total of 126 comments over all the interviews. Themes in the teacher commentaries on their pedagogical uses of ICT in teaching and learning included:

- Pedagogy as a Practice of Incorporating On-going Assessment
- Pedagogy as a Knowledge-Based Practice
- Pedagogy as a Relational Practice

Table 5 contains the contribution counts for each of these themes.

***Table 5 Teacher Descriptions of ICT in/for Pedagogical Purposes***

<i>Pedagogical uses of ICT</i>	<i>Count</i>
Pedagogy as a practice incorporating on-going assessment	61
Pedagogy as a knowledge-based practice	47
Pedagogy as a relational practice	18
Total number of contributions	126

### 5.2.1 Pedagogy as a Practice Incorporating On-going Assessment

The strongest mentions in the data of ICT use were about assessment and documentation of children's learning, with 61 mentions. Learning stories have been a preferred form of assessment in early childhood education in New Zealand since 1998. Although learning stories dominated the means of assessment described in the teacher data, a variety of approaches to how this narrative documentation was captured were mentioned. These included:

- teachers using ICT to document and share children's learning stories
- children directing the documentation of their learning
- children assessing their own learning
- children and teachers revisiting learning

The teachers emphasised that it was the ease of use and the ability to create attractive, and engaging documentation that contributed to their use of ICT for assessment documentation and learning review purposes.

Table 6 contains the contribution counts for these themes

***Table 6 ICT and Assessment***

<i>ICT and assessment themes</i>	<i>Count</i>
Teachers using ICT to document and share children's learning	23
Children directing the documentation of their learning	16
Children assessing their own learning	3
Children and teachers revisiting documented learning	8
Attractive, engaging and fast documentation	11
Total number of contributions	61

#### ***Teachers Using ICT to Document and Share Children's Learning***

Twenty-three of the 61 teacher responses about ICT and assessment in this study spoke of the contribution ICT played in their teaching practice when they were documenting learning stories as a narrative form of assessment. The following four examples are representative of these views.

TA described ICT as a tool he used to create and save assessments. He commented, "As a work tool, I use it for writing up and saving learning stories, saving photos, using the photos to share with children and families". TA further

indicated that he used ICT primarily for documenting and sharing children's learning.

In a similar way, TB indicated that her main use of ICT was for documentation purposes. She remarked, "I use ICT to create learning stories to contribute to the children's portfolios and for wall displays. That would be the main purpose" (TB).

TC described the range of ICTs he used to document children's learning. He commented:

I use ICT for my production of assessment work, a computer for learning stories and a digital camera is used for learning stories. I use that quite a lot. I think it really does add value to learning stories to have some visuals. It also becomes a useful tool to share with family/whānau who you share the stories with. (TC)

In the above comment, TC indicated ICTs allowed the inclusion of images and was a useful tool for sharing learning stories with families.

TD indicated that ICT was used as a regular part of her teaching practice. She commented:

I use it all the time. I use it to record, take photographs – that's digital cameras – to take their everyday participation activities linking to what we are looking for, with the individual child or children, in regards to their portfolio. (TD)

In the above comment, TD implied she used ICT regularly for documentation purposes in a wide variety of contexts and situations.

### ***Children Directing the Documentation of their Learning***

Sixteen of the 61 teacher responses indicated that children used ICT as a means to direct their own assessment documentation. They said the children did this in a range of ways from asking a teacher to take a photograph of them involved in something that they wanted documented through to a child creating their own video. Their examples focused on times when children independently, without teachers prompting, requested ICT be used to document their learning.

Twelve of these 16 teacher comments were about children taking charge of the images that were used in their documentation by using the camera to capture what

they wanted documented of themselves. The following examples encapsulate this use. TD described how, in her early childhood service, children took control of their own assessment documentation through using the digital camera. She indicated that the images the children captured contributed to their assessment documentation and reflected children's individual views of learning. Her comment illustrates children in charge of their own documentation. She said:

The children have their own camera too, which they frequently use and then they see their learning from their perspective. They'll say, 'We want to take a photo of ...', whatever it is they were engaged in. They'll go out and take photos of that learning from their perspective ... to document that learning. (TD)

TE mentioned children's ownership of documentation when she said, "... the children are beginning to document their own learning, so it's totally theirs. They own it". This set of teacher comments indicated that children were able to maximise the affordances of ICT to capture learning that was important and of interest to them whilst at the same time ensuring their own voices were present in the documentation that was shared with families.

### ***Children Documenting and Editing the Documentation of their Learning***

Three of the 61 teacher responses described the ways that children used ICT to evaluate and edit their documentation. The teachers indicated that ICT allowed the children to review the photographs they had taken, and if they were not satisfied, they were able to delete them and retake them. Some children assessed their own documentation via a blog site, while others edited their photographs on the camera before they were inserted into their learning stories. The following two examples are indicative of these views. TH described how children directed and then were able to edit the documentation of their learning on a blog site. TH commented, "Often the children will ask us if they can take a photo of something and put it up on to their blog site, and if they are not happy with it, they will take it again". TH's further comments implied that she viewed children directing the taking of photographs and what documentation they were happy to share on the blog site as assessment actions. The technology made it possible for the children to easily edit the content until they were comfortable with it before it was made available to families.

TI explained how children had become familiar with using a digital camera to capture photographs and could edit the images if they were not happy with them. She commented, “Some children have learned about reviewing their photos on the digital camera, which button to push to review the photo and see what they have and if they want to change it” (TI). TI indicated that the affordances of digital cameras enabled children to control the images that represented their learning by editing until they were happy with what has been captured.

### ***Children and Teachers Revisiting Learning***

Seven of the 61 teacher responses mentioned how ICT enabled them to create artefacts through which children and teachers could revisit earlier learning. They implied that this helped children to develop understanding by drawing on previous knowledge, exploring alternative views and developing expertise. They spoke of children revisiting blog sites, books that had been created with a teacher, photos from centre outings and their own portfolios that contained a range of artefacts representing their learning. The following three examples are illustrative of this.

TI described how children were able to access the kindergarten blog site over time. She commented, “The children like to go back and look on the kindergarten blog and revisit things we’ve done like the St John’s Ambulance visit and things like that” (TI). In this comment TI implied that the blog site provided a platform for children to revisit and discuss events that had occurred outside of the early childhood setting. She inferred that this served as a legitimate means for supporting children’s meaning making.

The value of being able to revisit what is authentic and relevant to children is inherent in TB’s comment. She remarked, “We use these photo learning stories to revisit learning with the children that’s real and happening here and now” (TB). In commenting further TB indicated that the digital images in the learning stories provided an effective means for children to revisit their learning while it was fresh in their minds. TB considered technology played a crucial role in creating portfolios that children were able and keen to revisit, “... just watching [the children] read their folders and revisiting them, and if [the teachers] hadn’t had that technology to record everything, they wouldn’t be able to do that” (TB). In this comment, TB makes it clear that teachers were drawing on the new possibilities that ICT afforded them.

### ***Attractive, Engaging and Fast Documentation***

Seven of the 61 teacher responses made reference to ways in which ICT use to create learning stories meant these were attractive and engaging to readers (children and families) whilst four made mention of how ICT use meant the process of documentation was could be accomplished quickly. The benefits of ICT use discussed included the layout of documentation, the use of borders, of digital images and of different coloured fonts to highlight aspects of learning within the documentation. The following examples encapsulate these aspects.

The value attributed to creating appealing documentation is evident in TK's comment on behalf of the other three members of the teaching team in her early childhood service. She commented:

We use [ICT] for learning stories by typing out a learning story, inserting photographs, finding borders, finding pictures through the Internet. We like playing around with our own borders and shapes and things, changing colours, cropping and resizing photos, linking photos in a series to make them appealing. (TK)

TL described how she used the Internet to enhance the layout of her assessment documentation to build on children's interests and engage them in further learning. She thought that, by accessing images from the Internet that were relevant to the context of the stories and making them interesting by using colours and shapes, children would interact with the content of their stories at a deeper level. She said:

... say the child is working with a truck, and I find something on the Internet like a clip art of a truck, and I try to make it go from big down to small, just so I can bring in that aspect of ... something like that into the learning story as well so they can perhaps look at their learning story and their photos and hopefully take it a little bit further with ... or count the different shapes that go around the outside or something. (TL)

In the above comment, TL indicated that ICT provided her with a means to create assessment documentation that connected the learning documented to other



aspects, such as shape, counting and mathematical thinking, thus extending the learning opportunity.

TN mentioned access to a computer allowed her to quickly and easily document children's learning as follows:

I think when you are using the computer and understanding how to use it, you can do it quick; I can type three or four learning stories within an hour. (TN)

Overall, assessment featured strongly in the teacher data as a pedagogical practice that was usefully supported by a variety of ICT tools. In particular the data demonstrated teacher use of ICT to document and share children's learning. This use of ICT provided a means to actively involve children in their own learning as participants in the assessment of their learning because of its ease of use and the immediate and attractive way it was able to document learning. The number and proportion of teacher comments about this use suggests that ICT played an important part in the assessment pedagogy of these teachers.

### **5.2.2 Pedagogy as a Knowledge-Based Practice**

The notion of pedagogy as a knowledge-based practice is based on the understanding that teaching involves knowledge of curriculum and of pedagogy. It is the combination of curriculum and pedagogical knowledge that allows teachers to support and extend children's learning. There were 47 teacher responses that mentioned aspects of teacher use of ICT that reflected an understanding of pedagogy as knowledge-based practice. The knowledge-based practices they described included:

- Using ICT as a literacy tool for name recognition
- Using ICT to create books
- Using ICT to support an emergent curriculum
- Using Google and YouTube for research to support children's learning
- Using ICT to research aspects of their teaching practice

Table 7 contains the contribution counts for these themes.

***Table 7 ICT and Teaching as a Knowledge-Based Practice***

<i>ICT and knowledge-based practice themes</i>	<i>Count</i>
Using ICT as a literacy tool for name recognition	9
Using ICT to create books	5
Using ICT to support an emergent curriculum	10
Using Google and YouTube for research to support children's learning	21
Using ICT to research aspects of their teaching practice	2
Total number of contributions	<b>47</b>

***Using ICT as a Literacy tool for name recognition***

The use of ICT to support name recognition was mentioned in nine of the 47 teacher responses. The creation of digital photographs with name labels appeared to be one of the ways teachers used ICT to support name recognition. TS described how she, with other teachers in her early childhood service, created photograph name labels with the children that were intended to support children's literacy learning. Named photographs were placed in a number of areas in the ECE service environment such as in the painting area so children could use these as a guide to help them write their names on their paintings. TH described how, in her ECE service, children use a computer in a range of ways for literacy development, including creating nametags and writing letters. She said:

We've got another computer that is set up in the environment for literacy. It runs the programme Microsoft Word so it's where they create their nametags ... they have been using that for letters and with cards for the alphabet, and writing their name. (TH)

In the above comment, TH indicated that computer use afforded teachers a range of ways to support children's literacy learning implying that they had a valid place in early childhood education to support and extend this kind of learning.

***Using ICT to Create Books as Another Mode of Literacy***

Five of the 47 teacher responses indicated that ICT contributed to children's literacy development within their teaching practice through the creation of books as a way to engage children's literacy learning. Sometimes these creations were teacher authored, others involved children in the creation process. The content of

these books varied, with some having connections to recent trips, whilst others were about favourite stories that were recreated with the children. The following two examples are representative of the way teachers used ICT to create books to support literacy.

TT described how she used ICT to create stories about events or trips that the children were involved in. She commented, “We’ve just recently had a trip to the Hamilton Gardens, and we’re just in the process of making [a] storybook using the digital images”. TJ explained how she often read a favourite book to children and then together they used ICT to recreate it using their own images and text. She described this process as follows:

I use [ICT] to make books with the children, for example, we recently did *Wombat Stew*, so we took photos as we were going through the process, and then we collated them and put them into a book with the children who were then able to revisit it. (TJ)

TJ implied that this collaborative process supported children’s literacy learning through the production process and when the children revisited the story by reading the book.

### ***ICT and Support for an Emergent Curriculum***

Teacher use of ICT to support emergent curriculum was another aspect of pedagogy as knowledge based practice. Emergent curricula arise naturally from adult-child interactions and from situations that are ‘teachable moments’ that connect learning with children’s experiences and prior learning. An emergent curriculum includes and responds to children’s interests rather than focusing on a narrow, individual or calendar-driven curriculum. An emergent curriculum is process rather than product driven, and it is typically implemented after an idea or interest area emerges from a child or a group of children. Examples extracted from the data highlighted the role ICT can play in supporting the notion of emergent curriculum with 10 of the 47 teacher responses including mention that ICT supported emergent curriculum as follows.

TC spoke of how ICT supported children’s emerging interests and ideas. He commented:

... a child who came in [to the centre] and confused me completely in the afternoon session, where he'd been chatting to Mum, and Mum said, "He's really wanting to know how King Arthur died", and so we went and discovered it. We talked about it at mat time with his peers, and off we went and Googled it and found out the myth or legend, or not, of King Arthur and how he died. That was a real emergent thing, one of my best examples to date in teaching, of real pure emergent stuff. (TC)

In the above comment, TC implied that ICT played a useful role in supporting the exploration of the child's interest in King Arthur and in co-constructing an emergent curriculum for his peers.

TAB summed up her perspective of ICT in relation to emergent curriculum in the following remark, "So basically, it's really applying [ICT] as [ideas] emerge from the children and use it to pursue these ideas and extend their current knowledge" (TAB). We can see here that it is the capacity to pursue and build on children's ideas that make ICT a useful tool for teachers within an emergent curriculum.

### ***Teachers Using Google for Research to Support Children's Learning***

Twenty-one of the 47 teacher responses mentioned using Google to research and extend children's learning. They indicated that the search engine Google was their preferred tool as it allowed them to access information quickly. The following two examples illustrate how teachers used Google with children to explore and extend their ideas.

TZ described using Google for researching ideas with children to extend on a topic of interest. She commented:

We often Google search things here with the children, for example, we will take a group of children who are doing a particular topic, like we were doing bugs [at the moment], and extend on that topic, and they Google search on the computer for new information. (TZ)

In the above comment, TZ indicated that Google provided the teachers with an easy mode to locate and explore new ideas and information with children.

TAB mentioned children taking control of their own research through Google. She suggested that the Internet provided a means for children to be involved in researching their own topics of interest as they develop naturally – in other words, teachers being able to quickly respond in the moment and search for new information as children's interests emerge.

### ***Teachers Using YouTube for Research to Support Children's Learning***

Six of the 47 teacher comments mentioned that they accessed YouTube for research purposes with their children. TO's comment is representative of this use. She remarked:

I like taking the children onto the Internet to YouTube when they've had questions, for example, during the Olympics. We went onto YouTube and watched lots of sports and stuff. We use YouTube quite a bit as a research tool (TO)

In the above comment, TO indicated that ICT enabled teachers to collaborate with children around their ideas and interests and to extend these. She implied that YouTube was a legitimate research tool.

### ***Teachers Using Google to Research Aspects of Their Own Practice***

It was apparent in the data that two of the forty-seven teachers comments indicated they used Google as research tool for their own teaching practice. TP spoke of the teachers in her early childhood service using Google to research aspects of superhero play to inform their practice. She commented:

Our teachers use the computer to research subjects that they need to learn more about. We had a bit of an issue with superhero play here, so we Googled it and found journal articles to help understand its possible influences on play, so we used it as a research tool ... It's a research tool for staff as well as the children. (TP)

TP indicated that digital tools such Google, provided teachers with an easy means to access relevant information to inform their teaching practice.

Overall the teacher comments reported here indicated they had 'know how' in relation to their use of ICT in their teaching practice and teaching as itself being a

knowledge-based practice through their descriptions of how ICT could be used for research to develop both their own and children's learning. They indicated ICT was used as a tool to provide them quick access to a wide range of information that could support and extend children's ideas.

### **5.2.3 Pedagogy as a Relational Practice**

Building and sustaining relations with children, families and others is a key aspect of early childhood pedagogy, and this emphasis was apparent in the teacher data. The examples in this section describe instances of teachers and children using ICT in a relational manner. 18 teacher comments described the range of different modes of ICT they used in their teaching practice to build and sustain relationships with children and families. These included video, blogs, PowerPoint and Skype. Table 8 contains the contribution counts for these themes.

***Table 8 Using ICT to Build and Sustain Relationships***

<i>Using ICT to build and sustain relationships themes</i>	<i>Count</i>
Teachers using video to document and share learning	8
Teachers using a blog	4
Teachers using PowerPoint presentations	4
Teachers using Skype	2
Total number of contributions	18

#### ***Teachers Using Video to Document and Share Learning***

Eight of the 18 teacher comments that mentioned ICT use to build and sustain relationships specifically mentioned the use of video to document children's learning and share this with their families. For example, TF spoke of the value of the visual nature of video as communication mode for enabling families to see their children's learning in progress. She remarked, "We also use a video camera to record children's learning throughout the day to share with their families so they can see their children's learning as it is happening". TD indicated that videos enabled children's voices to be heard. She commented, "We use ICT in our communication with parents, and the part of that which is great is the children's voice coming through, so they're actually taking photographs and taking videos of themselves on the cameras. That's really rich communication". Here TD suggests that ICT (including video) provided a means for children to have their voices

heard within and through the documentation and communication of their learning. The implication was that this was a valuable aspect of this form of technology.

TP described how the teachers in her early childhood service use video to develop and sustain relationships within their wider early childhood centre community. She shared this example to illustrate her point:

We do a lot of music, and we had a CD of the haka, and one of the parents who is a teacher at the local school ... he brought a couple of boys down from the school who did the haka for our children, and we videoed it. Capturing that continuity, which is so neat, because you're using the community, and the children can see the school children, and that whole big whānau, family, community are included in building relationships and learning. They can all see this on the video it's just fabulous! (TP)

In the above comment, TP implied that video provided a transparent and engaging means to bridge emerging relationships across learning communities. As with all teachers' comments on video, the view was that video also allowed children to revisit and reinforce their relationships across home and the centre.

### ***Teachers Using a Blog to Develop and Sustain Relationships***

Four of the 18 teacher comments reported on the use of a blog site by teachers, children and families. These teachers used blogs in a range of ways to sustain and build relationships with children and families. The following two examples are indicative of this use.

TJ mentioned accessibility for children as a key feature of a blog site, which they could use to share their learning with their families. She commented:

[The blog's] actually been really cool for engaging the parents, they are really enthused about it, and we've found that the children are really, really excited. They get [on the blog site], and they go back to things and share with their families ... and yeah, that's the relational value. (TJ)

In the above comment, TJ suggested that a blog site was inviting for parents and children and provided children with a means to share aspects of their learning

with their families, which was important to them. She implied that the easy access for children to locate the learning they wanted to share with their families contributed to strengthening relationships.

TQ spoke about parents contributing information and images to the blog and shared in the example of a grandparent going overseas and sharing aspects of their trip on the blog. She described this as follows:

One of our grandparents went to Australia and was able to take photos of the uncle and put it onto the blog for one of the children, so it's just extending that home/centre relationship, and we get to know the children's world a little bit better. And families are so excited about being able to share that sort of stuff with us and share it with their wider whānau in the blog. It's really important. (TQ)

She further commented that, "It's really been fantastic for building that sort of relationship between parent to parent, teacher to parent, child to parent and child to child and sharing that knowledge and skills through the blog". As TQ indicated, it seems that blog sites provide a means for strengthening a variety of relationships within and outside the early childhood setting.

### ***Teachers Using PowerPoint***

Four of the 18 teachers comments described the use of PowerPoint to capture and share children's learning with their families as an aspect of their teaching practice. The following example encapsulates these views.

TR described how children's participation in the creation of a PowerPoint slideshow enabled them to select and make public aspects of their play and learning that they wanted to share with families. The slideshow played on a large screen in the reception area of the early childhood centre for parents/whānau to view when they collected their children at the end of each day. She commented:

The children contribute to making the slideshow up at the end of the day for the parents to view the learning that has taken place during the day ... Sometimes we do this at mat time, we include the whole group ... sometimes you'll be sitting there, and the children will take an interest in something that was captured during the day and then they tell us what's happening, how they perceive



it, so we put little captions [on the slides] from their point of view of what's happening in the programme. This is great for building relationships with families as they often talk about the slides when they collect their child. (TR)

In the above comment, TR suggested that children's involvement in the production of PowerPoint slides contributed to their perspectives being recognised and shared with families. She indicated that this process supported relationship building with families as it formed a starting point for further discussion about children's learning.

### ***Teachers Using Skype***

Two teacher commentaries mentioned the use of Skype to connect with those outside of the early childhood setting. It was apparent Skype played a valued role as a mode of communication for them and the children in their settings. They indicated that Skype supported relationship building in their teaching practice.

TL spoke of Skyping other teachers in a different geographical location. She said: "We've Skyped another kindergarten down south for a chat about different aspects of the curriculum". TK spoke of the teachers and children from her kindergarten Skyping her when she was away from work due to an injury. She remarked, "When I was at home with an injury and the children didn't understand why I wasn't [at the kindergarten], they Skyped me, and I was able to show them why I could not be at work". Both examples demonstrate the teachers' use of Skype to build and sustain relationships across spaces outside the early childhood setting, something that would not have been possible without the use of ICT.

The use of ICT as part of pedagogy as a relational practice featured in 18 teacher comments with ICT playing a role in developing and sustaining relationships between home and the early childhood service and between teachers and children, in various locations. ICT use allowed teachers to build and sustain relationships and communicate with families across time and place in ways that would not have been possible without ICT.

### 5.3 Subjective Norms

The concept of subjective norms is connected with the theory of planned behaviour (Ajzen & Fishbein, 1980) as described in Chapter 4. Subjective Norms refer to what individuals believe key people in their lives think about whether or not the individual should perform a particular behaviour. The perceived opinions of these key people as judged to help determine whether a person will actually perform the behaviour. A premise within this theory is that subjective norms are based on informed intentions and beliefs (See section 4.4.5). For teachers in this study, teacher comments about the way ICT use was perceived in their setting and their intentions for the use of ICT in their teaching have been categorised as indicating and illustrating their concern with subjective norms.

The analysis revealed 60 comments from the 33 teachers relating to the notion of subjective norms as it applies to the intentional use of ICT. Teachers spoke specifically of:

- ICT use in teaching is one of the things ‘we do here’
- Supporting each other to continue to learn how to use ICT
- Believing ICT supported children’s learning and development.

Table 9 contains the contribution counts for these themes.

***Table 9 Subjective Norms***

<i>Subjective norms themes</i>	<i>Count</i>
It’s just what we do here	29
We support each other to learn how to use it here	19
We believe it supports teaching and learning	12
Total number of contributions	60

#### ***It’s Just What We Do Here***

Twenty-nine of the 60 teacher comments relating to subjective norms contained the word ‘we’ when describing the use of ICT tools within their early childhood settings. The use of the term ‘we’ indicates there was support for the intent to use of ICT in everyday teaching practice. This use of ‘we’ supports the concept of subjective norms as a group understanding and a collective belief in the use of ICT.

TY implied that there was a sense of the use of technology being an accepted part of ‘how we do things here’ in her centre; it had become custom and practice as part of the culture of the early childhood centre. TY remarked, “You get to the point where [ICT is] so inbuilt within the culture of the centre that you just know we can just use this or use that. It becomes inbuilt into the programme” (TY).

TH implied that ICT use was nothing out of the ordinary; it was a routine part of teacher practice in her centre. She commented, “... when we do things with ICT, I don’t really see it as using ICT ... it is integrated into our practice” (TH).

TR indicated that ICT a variety of technologies were in daily use in the centre she worked in. She commented, “We’re lucky here as well with all of the different ways, all the different pieces of technology we’ve got to use almost daily with the children” (TR).

These examples are illustrative of the notion of ICT use as a subjective norm in the sense that it was part of everyday teaching practice and an accepted part of the early childhood centres for 29 teachers.

### ***We Support Each Other to Learn How to Use it Here***

Teachers supporting each other to learn how to use ICT was described as common practice in 19 of the 60 teacher comments related to subjective norms. The social nature of learning and of acceptance of the use of ICT was present in the data when teachers spoke of how ‘we’ learn and how ‘we’ support each other.

TJ discussed how access to technology as well as colleagues to learn from was an element in her learning to use and using ICT on the job. She commented, “I was supported by having lots of access to people and different technology”.

TB indicated that support from other teachers to use ICT enabled her to learn how to use ICT in her teaching practice. She remarked, “... definitely it’s new to my teaching practice. The teachers have been very encouraging ... like, ‘Just grab a camera’. So there was no resistance, it was more or less you get to use it and we’ll support you”.

TX suggested that a culture of ICT use had been developed in early childhood education, which had a positive influence on her own learning of how to use it in her teaching practice. Supportive colleagues were also important. She said, “I

think the support for it by the other teachers and the culture of ICT in ECE has helped me to learn how to use it” (TX).

Overall, teacher commentary coded to this section indicated that access to other teachers who were prepared to share their knowledge as well as to a range of technologies was the norm within many settings and that this was seen to be of value of and supported teacher use of ICT.

### ***We Believe ICT Supports Teaching and Learning***

Twelve of the 60 teacher comments coded as relating to subjective norms made direct reference to the intentional use of ICT to support and extend children’s learning. These teacher comments indicated a belief in the value of ICT as a teaching tool to extend learning in a range of ways. The following examples encapsulate these beliefs

TX was clear that ICT was useful in extending and scaffolding children’s learning as part of the centre teaching and learning programme. She commented:

We use [ICT] to extend learning ... but ultimately, it becomes that extension of other learning, it doesn’t become learning in itself ...  
It’s just part of the programme and part of supporting and scaffolding that other learning that they show interest in. (TX)

TE indicated that through using ICT children learn such skills as role modelling and problem solving which they share with other children. She remarked, “The other thing about ICT is we also see the skills of some children being role modelled to other children as well, so there’s a lot of problem solving that children are doing when they are using ICT” (TE).

These aspects of ‘it’s just what *we* do here’, ‘*we* help each other to learn how to use ICT’ and a sense that *we* (teachers) believe ICT makes a difference to children’s learning are all reflective of positive subjective norms for the use of ICT. These subjective norms appeared to influence and can be seen to embody teachers’ behavioural intentions for ICT use within the context of teaching. This suggests that subjective norms within teachers’ workplaces were positive and influenced their appropriation of ICT.

## 5.4 Relational Trust and ICT

Relational trust in this study takes into account the extent that teachers trusted technology to have a valid role and be of value in education, specifically whether or not they had a positive view of the three-way relationship between technologies, teaching and learning (Chapter Four). For the early childhood teachers who were interviewed relational trust was interpreted as them indicating that they trusted that the technology they used in their ECE setting could be and or was integrated into their pedagogical practice in a way that supported children's learning and development. In other words, it addressed teacher values and beliefs about the use of ICT (see Chapter Two, section 2.6.2. The teacher interview data revealed 52 teacher comments indicating whether or not teachers trusted ICT to be of benefit to teaching and children's learning. Teachers spoke about:

- Trusting that ICT supported teaching and learning
- Building their confidence with ICT use, that is developing a trust they could use it productively
- Concerns about ICT use

Table 10 contains the contribution counts for these themes.

***Table 10 Relational Trust***

<i>Relational trust themes</i>	<i>Count</i>
Trusting ICT supports teaching and learning	29
Confidence to use ICT in their teaching practice	12
Cautions and concerns about its use	11
Total number of contributions	52

### ***Trusting ICT Supports Teaching and Learning***

The strongest feature of relational trust present in the teacher data was the notion of trusting that the technology they used in their teaching practice supported children's learning. Twenty-nine of the 52 teacher comments indicating relational trust detailed the range of ways that teachers believed technology supported children's learning opportunities. The following five examples are representative of breadth of these ways.

TW indicated that ICT had the potential to enhance children's learning, commenting, "[ICT] reinforces and promotes children's learning". Here a sense of

trust can be inferred through the suggestion that ICT reinforces and has a positive influence on children's learning. Put another way, this comment positions ICT as having a trustworthy role in children's education.

Teachers' views of trusting that technology had a role to play in supporting learning included the notion of immediacy as a valuable aspect of technology use when extending on children's interest. TQ summed up this point of view when she described a situation at mat time where she responded to a child's interest quickly through the use of the Internet. She said:

Today on the mat, the children were showing the boats that they had made, and someone wasn't sure about how the sails worked on the boat, so while another teacher was taking the mat time, I whipped in here, Googled sailboats and was able to produce a picture immediately, and I was able to support that learning and show the children how the sails worked. (TQ)

A view of teachers trusting that children become more capable and competent users of technology when they have access to it, which then enhances their learning and development, was evident in comments such as this from TAC, who explained:

I believe children are capable of doing anything once shown. They just want to learn. It's a great opportunity, and it's down at their level too, you know, bring the computer down with them and let them explore, they can't hurt it. It's just another way of learning. (TAC)

Trusting that technology allows for flexibility in providing children educational experiences is evident in TAD's comment: "I think technology is helpful in that it gives children a variety of ways for their life learning to fit in with education". She indicated that ICT could respond to young children's everyday learning and enable them to connect this with early childhood education. She implied that she trusted that ICT had the potential to support children as they continued to learn and grow.

TD suggested that ICT played a critical role in education in her comment: “I believe ICT is the key to education, nowadays” (TD). She implied a sense of trust that ICT provided access education in the 21st century.

TC mentioned that ICT supported children’s curiosity and created a sense of democracy. He stated:

I use ICT to support the empowerment of children in their enquiry, their curiosity, their problem solving. ICT plays a part in my democratic relationship with children. I believe it contributes and protects against teacher-dominated curriculum. It creates the democracy of the place. (TC)

### ***Confidence to Use ICT in Their Teaching Practice***

Twelve of the 52 teacher comments indicated a sense of trust in the technology to foster teaching and learning and alluded to the importance of having confidence in their ability to use the ICT tools. The following two examples encapsulate these views.

TZ suggested that it was important to have the ability to use ICT confidently otherwise teachers may not use it in their teaching practice. She commented, “I think it basically comes down to confidence, skills and trust, because if you can’t use it, you’re not going to use it with the children” (TZ).

TV indicated that she had chosen to study two online papers as a part of her degree to help her develop confidence. She stated that this had been a positive experience, which helped her to develop a trusting relationship with ICT.

I purposely chose two online papers to extend my knowledge and become more confident because I didn’t have any confidence, really, in using computers, and that made a huge difference in two ways. It made a difference to my confidence with ICT and my ability to trust ICT had a place in ECE teaching. (TV)

Overall, these teachers supported the view that becoming more confident and competent with their use of ICT enabled them to develop a trusting relationship with the technology in regard to using it in their teaching practice.

### ***Teacher Cautions and Concerns about ICT Use***

Eleven teacher commentaries mentioned cautions or concerns relating to the use of ICT in early childhood education. While the eleven teacher contributions implied that there was a place for ICT in teaching and learning, they expressed caution about its possible overuse, risks relating to cyber safety and a concern that perhaps children should wait until formal school before they encountered it. The following examples illustrate these views.

#### ***Concerns about safety***

Six of the 52 teacher comments included a concern to make sure that ICT was safe for children. The following two examples are representative of the comments in this category.

TT mentioned cyber safety, and indicated that it was important to be aware of centre policies and procedures when using the Internet with young children. She remarked, “Knowing about cyber safety and all of those things, and the policies around that, I think that’s really important in teaching” (TT).

TH expressed a wish that the Internet could be a safe place where children could explore and play without the worry of keeping them safe. She commented, “I wish children could use the Internet without us having to worry about keeping them safe. However, I need to be aware of NetSafe, knowledge and understanding of cyber safety, teaching children to use it safely” (TH).

#### ***Concerns about over use***

Five teacher comments identified other concerns about the role of ICT in early childhood education. TL and TT illustrate these. TL indicated that she was concerned about children spending too much time on the computer at the expense of spending time in other areas of play. She indicated that she would much prefer children to play in the outdoor area than be inside sitting at a computer as follows:

I’m very much an outdoor person, so I would much rather be outside and teaching children the real physical stuff than sitting down with children at a computer. I’m a little worried computers might take over from outside play if we are not careful. (TL)



### *A concern about ICT use prior to school*

TT expressed the view that ICT belonged in school rather than in an early childhood setting. She explained:

Well I don't believe we are here to teach them everything, you know, ICT in particular is part of school learning. I know that, in the journals, people are moving into these interactive boards and all this. I just think there's going to be nothing new and exciting for these kids if we start to do a school programme here, there will be nothing new and exciting for them at school. (TT)

TT suggested the school environment was best suited for ICT and that by providing access to ICT in early childhood education it would take away some of the anticipation of learning new things when children moved on to school.

Through the data, teacher commentary categorised as relational trust, indicated that the use of ICT was considered to be both a valued and concerning aspect of teachers' practice. From a positive perspective they reported it supported children's learning opportunities. In contrast to this view other teachers indicated an awareness of possible negative aspects of ICT such as the risk of cyber safety and possible overuse of the technology at the expense of other activity. This suggests that a positive three-way relationship between technology, teaching and learning, including an understanding of possible negative impact of technology contributes to the appropriation of ICT for pedagogical purposes.

## **5.5 ICT Cultural Tools**

In this study, the term 'ICT cultural tools' is used to describe the software applications of technology that are used by teachers as pedagogical tools in their own teaching practice. Of the 33 teachers interviewed in this study, 11 referred to ICT software applications as tools that they used in their teaching practice. Whilst there were many other examples of teacher use of ICT (See sections 5.2.1, 5.2.2 and 5.2.3), these teachers specifically referred to software or apps as a cultural tool in the sense of ICT being a part of the culture of their early childhood setting and the cultural of teaching and learning in the 21<sup>st</sup> century. It is important to note that teacher use of the term 'cultural tool' was unprompted as I asked general questions (see Appendix H).

Eleven of the 33 teachers referred to ICT as tools they used in their teaching practice. They described the ways in which different ICT tools enhanced their work with children and expressed that, in their view, the use of these tools was a part of 21st century learning. The following three examples are illustrative of their views.

TV commented, "... part of my philosophy is that children are competent and capable and that they are 21st century learners. I see ICT as a tool of their culture, a cultural tool" (TV). In this comment TV explicitly describes ICT as a cultural tool that is part of children's everyday lives and as a tool that has a legitimate role in 21st century learning.

TB also spoke explicitly of ICT tools being cultural tools. For her they were tools that connected well with her teaching philosophy. She commented, "For me, it's those new cultural tools available ... it's still new to my teaching practice, so I'm sure there are endless possibilities for me to use them (ICTS)" (TB).

TO referred to ICTs as cultural tools that have the potential to enhance children's learning opportunities. She remarked, "I guess, really, ICT is a means to support the children's learning, which is what we're here for, and I believe in using the ICT cultural tools that are going to be the most effective in supporting that learning" (TO).

We can see that in these three comments teachers consider that ICTs are variously tools that are and need to be used by children as 21<sup>st</sup> century learners, with ICTs offering numerous possibilities for teachers to use to support children's learning. Cultural tools in these teacher commentaries indicate a sociocultural view of teaching and learning in regards to the use of ICT. By this, I mean they connect to Vygotsky's notion of cultural tools as mediational means (Vygotsky (1980) – ICTs as cultural tools mediate learning. It suggests that the range of ICT tools that teacher's use within their contexts reflects a culture of 'their place'. Whilst there was an acknowledgment that different tools could be used for different purpose, or to put another way ICT tools have a range of affordances, it appeared that the notion of ICT cultural tools were aligned sociocultural views of teaching and learning.

## **5.6 ICT and Enjoyment**

In this study, enjoyment is the category that encompasses teacher comments that suggested the use of ICT was accompanied by a sense of enjoyment (Chapter Four, section 4.4.5). Comments by eight of the 33 teachers interviewed were taken to indicate an experience of enjoyment when using ICT. The following two examples are representative of these comments.

TH shared from her perspective that the provision of an ICT-rich environment provided opportunities for teachers to have fun whilst exploring what might be of interest or importance to the children they are working with. She commented, “Providing an environment that’s rich with ICT use and encourages the exploration of that is really important for our tamariki [children]. And it’s fun ... It’s an integral part of my teaching” (TH).

TS also linked having fun learning to the use of ICT in her teaching and her own learning. She remarked, “So in this job, you’ve really got to have a lot of computer skills now, that’s where it’s all going to, it’s a lot of fun to use” (TS).

The notion of enjoyment in these two examples reflects an affective dimension of learning about and teaching with ICT. Although this aspect was not prevalent in the teacher data what data there is does provide evidence that enjoyment or fun can contribute to and or is part of ICT use. When teachers use ICT tools in ways that support their genuine interest, they will engage with ICT tools in ways, which allow them to feel a sense of enjoyment.

## **5.7 Chapter Summary**

This chapter has reported on the findings from interviews with 33 early childhood teachers in relation to their use of ICT in their teaching practice. Teachers articulated a range of pedagogical purposes for their use of ICT, including incorporating ICT into on-going assessment, using ICT as part of pedagogy as a knowledge-based practice and pedagogy as a relational practice. The use of ICT for capturing assessment for learning was the dominant factor in their descriptions of its use for pedagogical purposes. ICT allowed the teachers to document learning stories that illustrated children’s learning and experiences easily and attractively. This use was often spoken of as capturing learning moments to share with families without any expectation of families taking action to further support

children's learning. Although the use of ICT to capture learning for assessment purposes was the strongest aspect of teacher descriptions of the pedagogical use of ICT, they identified a range of other ways in which they engaged with ICT. These included building and sustaining relationships with children, families and others, supporting children's literacy learning, supporting an emergent curriculum and using ICT for research for their own professional learning and development purposes.

There was an indication that it was normal practice to use ICT in the 10 early childhood education settings involved in this study, with a sense of intentional use reflected in the collective views of teachers who spoke about 'its just what we do here'. Many teachers appeared to have developed a positive view of the role ICT could play in early childhood education. In this study, this positivity is taken as evidence of relational trust with ICT. On the other hand, some teachers indicated that they were still building a sense of relational trust with ICT, whilst others expressed concerns about cyber safety and the potential for ICT to take over traditional areas of play.

Eleven teachers in this study explicitly mentioned ICT tools as cultural tools, indicating ICTs as cultural tools had the potential to enhance children's learning. Whilst these eleven teachers represent only a third of those interviewed this low proportion may be due to the definition used for ICT cultural tools rather than reflecting teachers' views of ICT use in general

Enjoyment was the least prevalent theme in the teacher data, with mentions of fun and excitement when using ICT by eight teachers only. Although this concept did not feature often, it seemed to be an important aspect of ICT use for these particular teachers.

The next chapter reports on student teachers' are developing understanding of the pedagogical uses of ICT. I chose to present the findings on student teacher pedagogy separately due to the pervasiveness of this theme in the student teacher data. Therefore, the data to do with subjective norms, relational trust, ICT cultural tools and enjoyment is described in Chapter Seven.

## **Chapter Six: Student Teachers' Developing Understanding of Pedagogical Uses of ICT**

### **6.1 Introduction**

This chapter reports the findings from 230 student teacher contributions to online discussion forums that formed a part of the second-year paper *Making Sense of the World* in the early childhood Bachelor of Teaching programme during phase two and phase three. There were 59 student teachers in the course in phase two and 86 in phase three. During that period, this was the only compulsory paper in which student teachers were required to use ICT as a part of an assessment. Prior to undertaking a five-week teaching practicum, student teachers were required to respond to the following question (labelled here Question One) in one of their weekly online discussion forums. This question remained the same in the phase two and phase three versions of the paper.

#### **Question One**

By now all of you have been on placement and may have experienced ICT in one form or another. Some of you will have begun to read some of the articles on ICT and seen the video about ICT in early childhood settings as a part of this paper.

Given these experiences, how does ICT fit with your own vision and philosophy of teaching? What are some of the things children might be learning when they are involved in everyday technology? Use the readings and draw on your previous experiences on placements and your E1 practicum to inform your discussion.

When the student teachers had completed their five-week practicum, they were asked to respond to the following question (labelled here Question Two) in another weekly discussion forum.

#### **Question Two**

Now that you have been on practicum and may have had the opportunity to see ICT in action and maybe even used it yourself, what experiences, learning and skill acquisition do you think could

be provided during this three year programme to enable you to be confident in the use of ICT as a beginning teacher?

As in the prior chapter, I have used verbatim quotations with the intent to respect the authenticity of participants' voices and ensure participants' perspectives are depicted in rich detail. In this chapter, because the student teachers were in their second year of an ITE and were still constructing knowledge and developing pedagogical understandings, I refer to student teacher comments to do with teaching as 'developing pedagogy' rather than pedagogy. For protection of identities, the student teachers names are coded numerically, for example, Student Teacher 1 (ST1), Student Teacher 2 (ST2) and so on.

Online contributions from 195 student teachers (99 in phase two and 96 in phase three) mentioned ICT in relation to pedagogy. Themes in the student teacher commentaries on this topic included the use of ICT in:

- Developing Pedagogy as a Practice of Incorporating On-Going Assessment
- Developing Pedagogy as a Knowledge-Based Practice
- Developing Pedagogy as a Relational Practice

Table 11 contains the contribution counts for each of these themes. The figures in the tables combine both pre and post experiences. These figures are separated out in the text through the chapter under relevant subheadings.

***Table 11 Student Teachers' Developing Pedagogy in Relation to ICT***

<i>Developing pedagogy in relation to ICT use</i>	<i>Count phase two</i>	<i>Count phase three</i>
Developing Pedagogy as a practice of on-going assessment	49	52
Developing pedagogy as a knowledge based practice	34	26
Developing pedagogy as a relational practice	16	18
Total number of contributions	99	96

During the online conversations, student teachers appeared to be exploring and developing their pedagogical understandings of the affordances of ICT to support the assessment, relationship building literacy and numeracy development and research relating to their teaching practice as illustrated in the following sections.

## 6.2 Pedagogy as a Practice of Incorporating On-going Assessment

In total, there were 101 student teacher contributions across the two years that featured the use of ICT in and for assessment. Thirty-nine student teachers (20 in phase two and 19 in phase three) drew on their experiences from placements in early childhood settings in their first year of study and five one-day placements undertaken prior to their five-week practicum when making comments about assessment and ICT in response to the first question. Sixty-two contributions (29 in phase two and 33 in phase three) mentioned ICT and assessment after completing their five-week practicum. They discussed teachers documenting and sharing children's learning using ICT and children revisiting and sharing their documented learning. Table 12 below contains the contribution counts of these themes.

**Table 12 ICT and Assessment**

<i>ICT and assessment themes</i>	<i>Count phase two</i>	<i>Count phase three</i>
Teachers using ICT to document and share children's learning	30	42
Student teachers and teachers using ICT to document and share children's learning	6	2
Children revisiting and sharing their documented learning	5	3
Total number of contributions	49	52

### 6.2.1 Teachers Using ICT to Document and Share Children's Learning

Student teacher contributions (30 in phase two and 42 in phase three) mentioned a range of ways that they had observed teacher use of ICT to document and share children's learning. I will use examples from before and after the student teachers undertook their practicum using subheadings to indicate the distinction. The practices they reported are detailed next.

#### ***Teachers Using Digital Cameras to Document and Share Children's Learning***

##### ***Phase two examples – prior practicum***

Ten of the phase two student teachers contributions who described ICT in assessment, mentioned teachers' use of digital cameras to capture moments of children's learning and represent this in the format of learning stories that were shared with families. The following two examples illustrate the breadth of their views.

ST1 suggested ICT provided an empowering medium for teachers to use to document children's learning and share this with families. She commented:

Teachers indicated it was empowering for children to see themselves in digital images, especially children who are shy and find it easier to talk about a photo rather than talk directly to a teacher. I think ICT can provide parents with a good insight as to how their child is learning at the centre and can help put parents' mind[s] at ease to see their child is happy and doing well. (ST1)

In this contribution, ST1 indicated that the use of photographs to document children's learning benefited children, especially those who were shy, and their families, who could see how their child was learning, which helped assure them about their child's learning and well-being in the centre. She implied that photographs provide persuasive evidence of children's enjoyment.

ST2's post also mentioned that digital images were a good way for families to see and understand their child's learning. She commented, "During placement I saw teachers using a digital camera to create learning stories. It was a great way for families to view and understand their child's experiences at the kindergarten" (ST2). She indicated this was a legitimate mode to share children's learning with families as it provided opportunities for families to gain an insight into their children's learning experiences within the early childhood setting.

#### *Phase three examples – prior practicum*

Sixteen of the phase three student teacher contributions mentioned teachers using ICT to capture and document children's learning prior to the student teachers undertaking a five-week practicum. These contributions conveyed similar views to the phase two student teachers in that the focus was on sharing learning with children and families. The following four examples encapsulate those views.

ST4 commented on children's pride in their own work and extended this to include accessibility to children's learning that ICT could provide:

The advancement that ICT has had on children's learning is amazing. Some centres I have been in have beautiful profiles for the children that are filled with learning stories and will be kept for life. The kindergarten I am placed at has great individual profiles



for the children with stories and photos all created through ICT. When I got to the centre this morning there was a mother sitting with her child [who was] proudly showing her his new page in his profile. This type of ICT is great for early childhood education. Technology makes children's learning more accessible. (ST4)

In the above contribution, ST4 suggested that ICT had a positive impact on children's learning. She implied that digital images could capture children's learning and in a way they are likely to want to keep it for a lifetime. In this comment, she also described specific examples of how she had seen a child share this documentation with his mother, implying that the combination of images and text was a valuable aspect of what ICT offered in making the assessment documentation appealing and accessible for children and their families.

ST5 also spoke of her personal experience in seeing children having pride in sharing their learning story portfolios, which included images with their families. She commented:

I think one of the great things about teachers using ICT in centres is how children's learning stories can be supported through the use of digital images. I know from personal experience [on placements] the pride children have in showing off their portfolios to their families, and the importance for the families to see their child's development documented. (ST5)

In the above contribution, ST5 suggested that digital images provided an effective mode for children to share their learning with their families. She inferred that children were proud to share the learning stories with their parents, and at the same time, this enabled parents to gain an insight into their child's development.

ST6 mentioned teachers being able to extend children's learning opportunities when these were captured in digital photographs. She commented, "Digital photos are wonderful for capturing moments of learning and how they might extend these learning experiences for children [to] allow teachers [to] go back to these later to consider" (ST6). Here, ST6 indicated that, with digital images, teachers could reassess the learning experiences captured and plan for future learning opportunities.

*Phase two examples – post practicum*

Interestingly, only three of the phase two student teacher contributions mentioned digital images in their online contributions post practicum. ST8 mentioned digital images in relation to documenting learning in children's portfolios.

On practicum my associate teacher said the teachers all used their digital cameras to take photos for learning stories that were put in the children's portfolios. The parents see photos of their children in their learning stories doing various activities, or on trips the centre has arranged and the parents get [to] see what their children did during [the] trip.

She went on to explain how teachers took photographs during trips away from the centre so children's learning experiences while on trips could be shared with families.

ST39 mentioned the speed in which documentation could be produced and shared:

I really love the speed of ICT! The children do something fantastic during the day, and this can be documented with some photos and learning stories, and placed on the wall for people to look at in a couple of hours (even minutes) too! Also, if children or teachers want to find out about something specific, it will be there for them within a few minutes. (ST39)

In the above contribution, ST39 indicated the immediacy of ICT facilitated documentation to occur rapidly. She implied that immediacy had a positive influence on teacher/children inquiry through the Internet.

*Phase three examples – post practicum*

On the other hand, 18 of the phase three student teacher contributions mentioned observing experiences of teachers using digital images to document learning stories during their practicum. ST9 mentioned teachers using ICT to enhance assessment documentation in her contribution:

... the teachers said ICT has enhanced the way they document which is good for children, families and teachers in general. For me personally seeing my daughters' learning stories portfolio with

the photos makes the whole story so [much] more real than just reading text and is a delight to look at. (ST9)

In the above contribution, ST9 comments on the value of photographs in making the learning that was documented come alive for children and their families. She also mentioned that teachers have cameras on hand to capture photos of children while they were engaged in activity. She commented that this contributed to the attractiveness of assessment documentation and suggested that digital images added interest to the documentation of children's learning. She commented:

...[there] was always a digital camera nearby and teachers often captured moments of learning for children's portfolios. I think the digital cameras allowed teachers to produce documentation easily and attractively. I also think parents find this type of documentation interesting. (ST9)

By way of contrast, ST11's post described how photographs from a trip were displayed on the centre wall and generated rich conversations between children and families:

In the centre I was in ICT was used by the teachers. They had one camera, which was used to take photos for learning stories, and also of the trips they went on. The trip photos were documented on the walls in the centre, as well as in children's portfolios, and brought hours of conversation and enjoyment for the children and families seeing them and talking about them. (ST11)

ST11 indicated ICT provided a mode for teachers to capture moments of learning in a range of context, which could then be shared in a variety of ways with children and their families.

ST31 suggested that ICT provided teachers with a speedy way to capture and document episodes of children's learning. She commented:

While on practicum last year I took note[s] of what the teachers were doing with ICT. I learnt that you could upload pictures you have only just taken immediately and print them out. While the learning is fresh in your mind you can document the Learning

Story, add a couple of photos to go with it and presto it's done! In terms of speed ICT is fantastic. (ST31)

In the above contribution, ST31 indicated that the immediacy of ICT enabled teachers to produce documentation almost instantly, thus allowing them to document assessment while it was at the forefront of their mind.

### ***Teachers Using PowerPoint Slideshows to Document and Share Children's Learning***

There was no mention in any of phase two or phase three student teacher contributions prior practicum of the use of PowerPoint presentations in relation to documentation of children's learning. However, 15 of the phase two student teacher contributions post practicum did mention this.

#### *Phase two examples – post practicum*

Three of the 15 phase two student teacher contributions made after practicum described PowerPoint presentations being used by teachers to share children's learning with families. ST12's contribution encapsulates this practice. She described how the teachers set up a PowerPoint slideshow to share aspects of the children's day with families when they collected them at the end of each day. She noted that children watched the PowerPoint themselves and with their families. The slideshows contained an overview of aspects of the children's day in the centre, rather than individual assessments of learning, which were shared with families on a daily basis. ST40 mentioned that PowerPoint provided teachers with a quick way to share a selection of children's experiences from throughout each day with families. She commented:

I like that PowerPoint allows teachers in the centre [to] randomly display the photos for parents to see at pick up time. These are instant snapshots of their children at play only hours or minutes earlier. This is a great way for families to keep in touch with their children's learning and experiences. (ST40)

In the above contribution, ST40 suggested that PowerPoint presentations had the potential to be used to showcase children's experiences in an informal manner with families.

### *Phase three examples – post practicum*

Four of the phase three student teacher contributions after practicum mentioned PowerPoint presentations. ST13's contribution is representative of the practice that was described:

The kindergarten where I am doing my practicum has just purchased a 42-inch television. The teachers say it has many uses, in particular for showing PowerPoint slideshows of children's experiences in the kindergarten for their families to see. I think this is a great way to share children's learning. (ST13)

As in phase two, ST13's comment suggested that slideshows were being used to provide an overview of the learning experiences of the children at the centre/kindergarten that aimed to share with families aspects of their child's learning.

Also, inherent in student teacher commentaries was the notion of ICT having the potential to provide a mode, such as PowerPoint presentations, for teachers to record episodes of learning on a daily basis, including digital images of events that happened within an early childhood educational settings. This process was not specifically about individual children's learning but an overview of what had happened throughout the day that was shared with all families as a part of a centre's routine.

### ***Teachers Using Video to Document and Share Children's Learning***

One student teacher contribution in phase two-post practicum, and four contributions in phase three-post practicum mentioned using video to support children's learning. The following two examples are represent these views.

### *Phase two example – post practicum*

One of the phase two student teachers, ST14, described her experience during her practicum of teachers picking up on a child's interest and developing it into a production of *The Three Little Pigs* involving other children in the kindergarten. She commented:

During my practicum a boy came to kindergarten dressed in a pig outfit. The teachers there were fantastic at following children's interests; one thing led to another and by the end of the session

there was a full-scale production of the three little pigs! All of which was captured on camera and video. [DVDs] were made and sent home to the families and many Learning Stories were written from this production too. (ST14)

In her posting, ST14 shared how a production of *The Three Little Pigs* was videoed and the video shared on a DVD with the children's families. She also highlighted that the production generated a number of learning stories. In this case, video documentation of a collaborative event allowed for the immediate and later involvement of multiple children and their families.

#### *Phase three examples – post practicum*

Four of the phase three student teacher contributions mentioned teachers using video to capture and share learning. ST15 provided the most detailed comment. She described how teachers supported children to create a music video in which children had a variety of roles and responsibilities during the production process:

In my practicum centre the children were interested in Dorothy the Dinosaur and the Wiggles, they loved watching their music videos. One of the teacher[s] suggested they make their own music video. With the supervision of the teachers, the children made the whole video by themselves, taking on different roles. They used Moviemaker to edit it and put it all together. They were so proud of the video they made and couldn't wait to share it with their parents. The teachers said this was a great way to share children's learning visually. (ST15)

In this contribution, ST15 highlighted that the children took a major role in the producing of the music video. She indicated that teachers saw video as a "great way" to visually share the learning that took place at the centre as well as an opportunity for children to take a leadership role.

#### ***Student Teachers Using ICT to Co-construct Learning Stories with Associate Teachers***

Eight student teachers contributions contained (six in phase two and two in phase three) their experiences of participating in documenting children's learning during their practicum. There were no mentions prior to practicum. These student

teachers had been involved in a range of ways of documenting learning stories with the support of their associate teachers.

ST2's contribution is representative of the six phase two comments. She described how, by using her own digital camera and with the guidance of her associate teacher, she was able to capture children engaged in a rich learning experience. She commented:

I took my own digital camera on practicum. One of the activities I did with the children was making a beehive out of [papier-mâché] and little bees to fly around it. With permission from my associate teacher I was able to photograph the process, the interest and enjoyment of the children and share this with their families and teachers. I could not have captured this by just writing it down. My associate teacher helped me to use the photos for a learning story that we later wrote up. (ST2)

ST2 indicated that the use of a digital camera enabled her to capture the process of construction and children's interests as they engaged in a collaborative project together and then co-construct a learning story, which was in a richer format than what she could have produced with just text-based assessment.

Two phase three student teachers mentioned how writing learning stories with their associate teacher contributed to their confidence to use ICT in their developing teaching practice. ST16's contribution follows:

On my practicum, I used the computer to write a learning story to share with families. I was not able to do it at first, but I learnt from my associate teacher who showed me [how] to use it and write the story and put it in the child's portfolio. I think that this experience gave me confidence to use ICT as a beginning teacher. (ST16)

She reported that the opportunity to practise writing learning stories with her associate teacher had been valuable in providing insight into how to use ICT to capture and document children's learning. She indicated that this had contributed to her emerging confidence to use ICT as a beginning teacher.

### **6.2.2 Children Revisiting and Sharing Their Documented Learning**

Eight student teacher contributions (five in phase two and three in phase three) mentioned the role of ICT in enabling children to revisit, reassess and share their learning in a variety of ways post practicum only, as described in the examples below.

#### ***Children Revisiting and Sharing Their Learning Through Portfolios***

Two of the five phase two student teacher contributions in this overall category, post practicum, mentioned children revisiting documentation of their learning. ST17 reported she had observed teachers encouraging children to revisit the documentation in their portfolios. She commented, “In my centre teachers used the digital camera to record the children’s work for their portfolios and encouraged children to revisit it. I think this is a great way for children to look back on their learning” (ST17). She indicated digital images provided a valid means for supporting children to recall and revisit earlier learning.

The phase three student teacher comments also focused on children revisiting and sharing their learning as documented in their portfolios. ST18 shared her experience of children discussing aspects of their learning with her:

I have been enjoying looking through some of the children’s learning stories in their portfolios with them while on practicum. They told me about significant events based on the photographs ... In this kind of situation children can share what is important to them and extend their learning thorough their conversations with teachers and their families. (ST18)

She indicated photographs served as a visual prompt to children recalling and sharing what was important to them from their past experiences. ST18 also suggested visual images provided a means to prompt children’s conversations with adults about experiences and learning that was of interest to them.

#### ***Children Revisiting and Sharing Their Learning Through Video***

In phase two, there were two post practicum comments about children sharing their learning through video. ST2 posted on a placement experience as follows:

I was at a Kindergarten last year where the teachers were very positive about using ICT as a resource. The children were able to



use a video camera to record plays and activities and could re-visit these later to discuss their experience and share their thoughts and feelings with the other children, the teachers and with their families. (ST2)

Student teacher ST2 suggested that children enjoyed revisiting their learning experiences at a later time, playing the videos back and often using them as a basis to discuss their thoughts and feelings about the experiences documented within them.

ST13's contribution is representative of the three phase three student teacher contributions on video as a mode of documentation that children could revisit. ST13 explained how children in the early childhood centre she was placed in often recorded episodes of their play with the centre video camera. She commented:

... the children to use a video camera to record events and segments of their play. They often revisited these video clips and talk[ed] about what was happening in them with the other children and the teachers. (ST13)

ST13's comments suggest that she viewed video as a valid mode to document children's learning so that it can be revisited and discussed with others. She indicated video clips enabled children to explain from their own perspective what they were doing during certain aspects of play.

### ***Children Revisiting and Assessing their Learning Stories***

Again post practicum only, three of the five phase two student teachers spoke of ICT enabling children to revisit and assess their learning stories. ST19's example encapsulates the views of these teachers. She mentioned the notion of children assessing their own documentation in her contribution: "The other thing about teachers using ICT to document learning stories is that it helps children to assess themselves. Portfolios can be displayed at the centre, where children have access to them. This encourages self-assessment" (ST19). She suggested that ICT contributed to documentation by making the learning accessible to children. Student teacher ST19 inferred that this accessibility to revisit documentation promoted children's self-assessment of their learning.

Similar to the teacher data (See section 5.2.1), assessment featured prominently in the student teacher data. Student teacher commentary included observations of teacher use of ICT during their one-week placements and five-week practicum. The implication was that their observation of teachers' use of ICT for assessment documentation had contributed to their own understanding of the potential of the ICT tools to enable teachers to document and share children's learning in a range of ways. The observations of teacher's pedagogical practices in relation to ICT emphasised the multimedia and multimodal use of ICT, by this I mean the use of video, PowerPoint and digital cameras. Additionally the opportunities for student teachers to construct assessment documentation with associate teachers appeared to be a useful way to provide opportunities for student teachers to gain a deeper understanding of the affordances of ICT for assessment purposes. This learning by observation appeared to strengthen student teachers knowledge of the potential use of ICT in a range of teaching opportunities and provided a vehicle for student teachers to extend their pedagogical reasoning with and about ICT.

### 6.3 Pedagogy as a Knowledge-Based Practice

The notion of pedagogy as a knowledge-based practice in this chapter is based on student teachers developing understanding that teaching involves knowledge of curriculum and of pedagogy. It is the combination of curriculum and pedagogical knowledge that allows student teachers to support and extend children's learning. There were 60 student teacher responses that mentioned aspects of use of ICT that reflected an understanding of pedagogy as knowledge-based practice. The knowledge-based practices they described included, thirty-four student teachers (19 in phase two and 12 in phase three) mentioned computer games as a means to support children's literacy and numeracy learning in their online contributions. Whilst teachers using ICT as a research tool to support children's learning were mentioned in 26 of the student teacher commentaries (15 in phase two and 11 in phase three) Concerns about the use of games was evident in 3 of phase three contributions. Table 13 below contains the contribution counts for these themes.

*Table 13 Pedagogy as Knowledge Based Practice*

<i>Themes</i>	<i>Count phase two</i>	<i>Count phase three</i>
Games supporting learning	19	12
Teachers using ICT-based research to support learning	15	11
Concerns about games	0	3
Total number of contributions	34	26

#### 6.3.1 Games Supporting Learning

Computer games are referred to as educational games in this study. Comments were made prior to and post practicum, in both phases, about the use of games to support learning. The following examples illustrate these.

##### *Phase two examples – prior practicum*

Fourteen phase two student teacher contributions mentioned software games supporting literacy and numeracy learning. The following two examples represent these views. ST31 shared what she saw during her placement in an early childhood centre in relation to literacy and numeracy learning. She commented: "There are 3 computers for children to use on a daily basis in my placement centre. The software looks very beneficial for developing children's literacy and numeracy skills. I believe ICT can hugely enhance children's learning" (ST31).

She suggested that computer games that have educational focus were helpful for supporting children's learning, in particular the development of their literacy mathematical and knowledge.

ST32 agreed with ST31's view and extended on it in her response: "The use of multiple media to communicate is part of [the children's] world and is emerging as a natural way for literacy, language and numeracy learning. In fact it enhances learning in all these areas". ST32 indicated that it is becoming more of the norm for children to learn literacy, language and numeracy with the assistance of the range of technologies available to them today.

*Phase two examples – post practicum*

Five of the 19 phase two teachers mentioned seeing educational games being used by children during their practicum. Their views on educational games were similar to those of the student teachers who discussed educational games prior to going on practicum. The following example reflects these views.

ST3 mentioned children using computer programmes that supported development in a range of areas: "The teachers and the children's parents were supportive of the children using the computers and encouraged them to have a go at some of the [programmes], which encouraged literacy, language and mathematical skills and thinking" (ST3). She indicated that teachers and families considered computer games had a valid role in early childhood education. In this comment ST3 highlighted that a number of areas of learning were supported by these games.

*Phase three examples – prior practicum*

Seven of the 15 phase three student teacher contributions mentioned educational computer games in early childhood centres before their practicum. The following example encapsulates those views.

ST33 mentioned computer games that encouraged problem solving and word identification:

The centre I am [with] for placement has two computers for the children to use whenever they want. There were two [computer] games ... for them to play ... There was a lot of problem solving involved, identifying colours, words and numbers etc. The games are actually educational and the children love them. (ST33)

In the above contribution, ST33 suggests that computer games had educational value and were appealing and engaging for children. She indicated such games had the potential to provide children with experiences that required them to engage with ideas and find solutions.

*Phase three examples – post practicum*

Five of the 15 phase three student teachers mentioned computer games in their online discussion after practicum. They spoke of these from an educational stance commenting on a variety of aspects that games offered. The recurring themes in these discussions were the opportunities computers afforded children. The following example encapsulates these views.

ST24 indicated that games could offer a range of activities and indicated these could extend to other learning areas. She commented:

In my centre they have a computer that has got a lot of educational bible stories and games on it, which children play. All these games have also got books, which children can read. Most of the children asked the teachers to read them the book after playing the game.  
(ST24)

Overall, student teachers viewed computer games as educational tools, which had the potential to contribute to children's learning in a range of ways. In particular they indicated computer games had a relevant role to play to in supporting and extending literacy, language and mathematical skills.

**6.3.2 Concerns About The Use of Computer Games for Educational Purposes**

Three of the 15 phase three student teachers expressed some concern about computer games in early childhood settings, suggesting the constraints of the games might hinder problem solving and creativity. Also inherent in these contributions were views that games might take over from other areas of learning, and there should be a balance of how they are used. ST34 commented: "I have seen a computer in the corner of a centre that was constantly going every day for children to play when they liked, and I think this is a bit much" (ST34).

ST28 mentioned a balance of computer games and other areas of the curriculum. She remarked, "I disagree with children sitting on computers playing educational games. There needs to be a balance with areas of learning" (ST28).

ST48 raised a concern around possible negative impacts on children's creativity and problem solving through computer games:

The children may not be developing their creativity or problem-solving skills if they rely on computer games with prescribed actions and levels. I think there is other ways we can introduce ICT to centres without having computer games available at will to the children. (ST48)

ST48 indicated that she had concerns about a possible negative influence on children's learning through the prescriptive nature of some computer games. She suggested that there were other ways to familiarise children with ICT use that could benefit children.

### **6.3.3 Teachers Using the Internet to Support Children's Learning**

Twenty-six student teacher contributions post practicum (15 in phase two and 11 in phase three) featured aspects to do with teachers accessing the Internet to research topics, often in response to children's questions. They mentioned teacher and teacher-child collaborative use of the Internet to support and extend children's interests.

#### *Phase two examples – post practicum*

The following five examples are representative of the 15 phase two student teacher contributions. ST6 shared an example of teacher research, the answer in response to a child's question:

On placement yesterday at morning mat time a child showed some photos of his father and himself on the farm, he also had some cows' teeth. This lead to a discussion on how many teeth cows have, how many stomachs do cows have? The teachers could not come to an agreeable answer so they quickly looked up the answers on the Internet and were able to share the answers with the children. (ST6)

In the above comment, ST6 suggested that the Internet was used and provided an effective means to respond to a child's question promptly when teachers were unsure. She indicated that this process contributed to teachers' as well as children's knowledge.

ST25 mentioned that, when children were able to use the Internet to undertake research alongside teachers, it helped them to be connected to their learning. She commented: "... being able to use the Internet and work collaboratively with teachers in researching helps children to develop a secure sense of self, competent, confident and connected to the learning" (ST25). Here, ST25 inferred that collaborative research through the Internet supported children's confidence and helped develop their sense of self as learners.

ST36 described a mini Olympics. Again, this was associated with the children asking questions and finding out about different countries and their location. She shared her experience of this in her contribution below:

... we had a mini Olympics at the centre, and one boy wanted to know where China was. We have a world globe so showed him on that, then a teacher suggested that we Google it with him. It was excellent, as you could zoom in, and then move down to Aotearoa/New Zealand and get an idea how small we were compared to China. (ST36)

In this posting, ST36 has detailed that teachers were able to respond to a child's question about a country, research information and compare visual images to illustrate its size and place in the world. This provided more extensive information than would have been accessed by simply looking at the globe.

ST47 spoke of teachers being able to access instant information to answer children's questions:

The Internet for example is a great instant source of information that can help teachers assist children to find answers to their questions and develop their knowledge about a topic. Therefore I think the Internet can provide a great fast form of ICT for early childhood centres. (ST47)

In this contribution, ST47 suggested that the Internet was a valuable way for teachers to undertake research quickly in response to children's enquiries.

ST1 mentioned the immediacy of ICT in relation to researching topics in support of children's interests. She commented:

The Internet is so convenient and fast, especially when you or the child wants to find out about a certain topic, all you have to do is ask a question and bam! At the click of a button it is all there for you. Where as if you didn't have access to the Internet, it would involve more time, for example you may have to go to the library, do some research and find the right information, which would take up so much time. (ST1)

ST1's contribution contains evidence that she valued the ability to access information in the 'here and now' rather than having to find other ways to locate the relevant information. This was seen as being a valuable aspect of the immediacy of the Internet.

*Phase three examples – post practicum*

Eleven of the phase three student teacher contributions indicated that there was value in teachers' use of the Internet for research purposes. Their descriptions of teachers responding to children's interests and researching them imply this process could build on and expand their knowledge. The following three examples represent these outcomes.

ST35 drew attention to teachers and children researching together as a way to encourage children to become researchers in the future:

On placement the children are looking at outer space and they were making planet mobiles. The children were unsure of what colours they should colour their planets so the teacher got the Internet up and running and showed them the colours they could use. ICT is going to be more advanced in the future; we are just setting the children up to become researchers. (ST35)

In the above contribution, ST35 suggested that teachers were able to prepare children for the future by working with them to use ICT as a legitimate mode for research.

ST37 shared her experience from practicum of teachers encouraging children to undertake research using the Internet: "During my practicum the teachers used the computer for case studies on certain topics. The teachers got the children to join in with searching different websites ..." (ST37). ST37 implied that the Internet



provided a means that enabled joint research between teachers and children in response to children's interests.

ST38 shared her experience of a child asking her to "Google it" when she could not answer her question:

... a girl brought in a snail to the centre. She asked me questions about the snail's anatomy. I was unsure about the different body parts. She then suggested that we 'Google' it to see if we could find out. We discovered a diagram of a snail's body, [with] the body parts labelled. The Internet proved to be a great way for the child and me to learn alongside one another. (ST38)

In this contribution, ST38 noted that a child suggested that she use the google to answer here question and her experience of doing this affirmed for her that it was a valid and useful way for adults and children to learn together.

The student teacher data indicated a developing knowledge and understanding of the use of ICT for pedagogical purposes through observations of teachers and their own experiences while on practicum. This was highlighted in their identification of educational games as a mode of learning and the immediacy of the Internet for accessing information for educational purposes. Overall, their comments indicated that these student teachers had a growing recognition of the potential role for ICT, with this understanding was balanced in some comments with the caution around overuse of games.

## 6.4 Pedagogy as a Relational Practice

Building and sustaining relationships with children, families and others is an important feature of the New Zealand early childhood curriculum. Analysis revealed that 34 student teacher comments (16 in phase two and 18 in phase three) suggested that ICT had the potential to contribute to this in early childhood settings during the online discussions. The comments included mention of ICT building and sustaining relationships between the ECE centre and families, between teachers and children and across a range of contexts. Table 14 below contains the contribution counts these theme

**Table 14 ICT Building and Sustaining Relationships**

<i>Building and sustaining relationships themes</i>	<i>Count phase two</i>	<i>Count phase three</i>
Between centres and families	13	13
Between children and teachers	1	1
Across contexts	2	4
Total number of contributions	16	18

### 6.4.1 Building and Sustaining Relationships Between ECE Centres and Families

The value of photographs, videos and PowerPoint slideshows as a means for representing children's learning was discussed in Section 6.1.1. Comments about this facility also noted that these modes were useful for sharing learning with families. For this section, all postings were revisited to identify all those that mentioned building and sustaining relationships between ECE centres and families. Eighteen student teacher contributions (11 in phase two and seven in phase three) were identified prior practicum and seven, (one in phase two, and six in phase three) post practicum.

#### *Phase two examples – prior practicum*

Eleven student teacher comments mentioned ICT building and sustaining relationships between the centre and families in phase two prior to undertaking practicum. ST20, for example, talked directly about ICT providing a mode through which teachers could enhance children's experience of learning and the value of digital images in forming and maintaining relationships between families and centres:

It is exciting to think about how we might use ICT to enhance children's experience of early childhood. I think that digital cameras are capable of capturing important learning milestones or happy memorable moments and are valuable in forming and maintaining communication and relationships with families and the centre. (ST20)

It is of note in ST20's comment that she suggested that digital images can be used to capture memorable moments of children's learning and to both form and sustain relationships between families and centres.

ST21 posted a similar idea. She indicated that, whilst ICT could be used broadly in early childhood settings, its use was beneficial for fostering already developed relationships between the centre families. She described this in her contribution as follows: "I believe that the uses for ICT in a centre can be extensive. Many of the options available including digital cameras, are able to nurture and further develop the relationships between the centre and the families" (ST21).

#### *Phase two examples – post practicum*

Two student teachers mentioned ICT and relationship building after practicum in phase two. ST25 spoke of how digital images could capture children's interest and learning in a manner family could easily access. This comment from her experience summed up her perspective:

I believe pictures with learning stories can help a great deal with showing parents and family what the learning story is all about. By using digital images in this documentation, teachers can make stronger connection with parents and families to build relationships. (ST25)

In her comment, ST25 suggested that digital images provided parents with a visual window to their children's learning. She indicated that this form of documentation had the potential to increase parents' understanding of their children's learning and strengthen relationships between them and the teachers.

ST21 commented on the immediacy of ICT in communication in relation to sustaining relationships.

There are two French children at my centre who have just returned to France for six months and are sending photos and e-mails back to the centre and vice versa, to keep in touch. This generation are a generation of instant answers. The prospect of waiting for a letter or postcard from France is not something these children are familiar with. (ST21)

In the above contribution, ST21 inferred that the swiftness of emailing supported relationships and met children's expectations about fast responses that were more the norm.

*Phase three examples – prior practicum*

Seven teachers contributions mentioned ICT, in particular digital images and video, in regards to building and sustaining relationships between the centre and families in phase three, prior to undertaking practicum. Six student teachers mentioned digital images and one spoke about the use of video. The following three examples are reflective of these views. ST22 indicated that the speed and ease of use of digital cameras could contribute to strengthening relationships between families and the early childhood centre. She commented: "ICT makes contributing photos to learning stories an easier and more convenient process than when you had to send camera films away to be developed. I also think they help to strengthen relationships between the home and centre" (ST22). She noted that ICT made it easy to create learning stories with photos in them and suggested this supported more frequent exchange of information about children's learning.

On the other hand, ST24 spoke of teachers' use of video to capture children at play and them sharing this with families. She commented:

In the centre where I went last year for my placement, the teachers recorded children playing on a video and put it on DVD for children and parents to see. This was good as it gave the parents a real insight into what their child was actually doing during the day and helped build relationships. (ST24)

ST24's contribution suggested she considered the creation of DVDs to share with families containing aspects of the children's day contributed to relationship building.

### *Phase three examples – post practicum*

Six student teachers commentaries mentioned ICT and digital images and relationship building post practicum in phase three. Two of the comments identified means other than digital photographs. ST6 talked about email and ST26 about PowerPoint slideshows. ST6 reported that she had observed teachers using email to share information during her practicum. She commented: “For example [during my practicum] one of the focal points was keeping parents updated with what their children were doing via email throughout the day. I think this is great for relationships” (ST6). Here, ST6 described email being used to keep parents up to date with the events of their children’s day. She indicated that this was a way to build relationships through supporting families to be more connected to what is happening.

ST26 mentioned PowerPoint slideshows in her contribution:

I really like the idea of having slideshows available to the children and families ... I think this was a great way for families to see what their child had been doing during the day. The digital images provided an additional window into the child’s life at the centre and developed relationships with families. (ST26)

ST26’s comments highlighted ICT as a mode of illustrating for families what children had been doing during the day and also for developing relationships with families.

### **6.4.2 ICT and Building and Sustaining Relationships Between Teachers and Children**

Only two student teacher contributions (1 in phase two and 1 in phase three) mentioned directly that ICT played a role in regard to building relationships between teachers and children – one in phase two and one in phase three and both prior to practicum. There were, however, a number of examples where student teachers described children and teachers collaborating to use ICT to accomplish a range of tasks, such as photographing children doing things of interest, developing learning stories and undertaking research.

### *Phase two example – prior practicum*

ST27 mentioned ICT and relationship building between teachers and children. Inherent in her contribution was the notion, that through engaging together in

ICT-based activities such as using digital cameras, children and teachers might strengthen their relationships. She commented: “I believe that children can benefit from teacher/children relationships through engaging in ICT activities together, for example taking photos for learning stories” (ST27). She indicated that ICT could provide teachers opportunities to collaborate with children in a way that positively contributed to relationship building.

*Phase three example – prior practicum*

ST28 mentioned ICT contributing to relationship building between teachers and children in phase three. She commented:

ICT is a great way for centres to connect and develop relationships with families. On placement today I saw a learning story of a girl who had taken photos at her home of her and her new puppy to add to her learning story profile at the centre. I think that including ICT in centres can strengthen relationships between children, teachers and parents. (ST28)

In the above contribution, ST28 implied that the flexibility of ICT to be used between home and the centre provided a means for children to bring some of their home to the centre and therefore strengthen this relationship.

ST43 shared her experience of teachers using a blog from her practicum:

I really enjoyed, and learnt a lot from the teachers in my practicum centre. The teachers used video cameras, digital cameras and all sorts of computer software to enhance the children’s learning and share it through their blog with families. (ST43)

In this contribution, ST43 indicated that these were a valid range of ICT for teachers to use to strengthen children’s learning experiences and sustain relationships with families.

### **6.4.3 ICT Building and Sustaining Relationships Across a Range of Contexts**

Six student teachers contributions (two in phase two and four in phase three) mentioned ICT playing a role in building and sustaining relationships across a range of contexts. They commented on video conferencing, the Internet, blogs and email. The examples they reported are detailed next.

### *Phase two examples – post practicum*

Two of the Phase two student teacher contributions mentioned ICT in relation to building and sustaining relationships across a range of contexts. ST29's comments encapsulate the views shared. She described a range of contexts in which this could occur, including within the children's homes:

Some of the concepts that children can develop about ICT are far reaching. Almost like a pebble in a pond it ripples out at different levels. For instance at the child's home level they may receive emails via their home computer. At their ECE they may experience video conferencing or live crossovers to other centres, at a national level. At a larger more worldly or international scale they may have watched the opening of the Olympic games via the Internet.  
(ST29)

In the above contribution, ST29 highlighted the potential of ICT to provide a means to a variety of ways for children, teachers and families to communicate across a wide range of contexts. She indicated that these possibilities could contribute to children's developing understandings of the potential of ICT as well as expanding the learning across environments.

### *Phase three examples – post practicum*

Four of the phase three student teacher contributions also mentioned ICT in relation to building and sustaining relationships across a range of contexts. The following two examples are representative of these.

ST13 mentioned teachers using a blog site as a communication mode, which supported children's learning:

The kindergarten I have been placed in has a significant focus on ICT. To enhance teaching and learning they have created an online BlogSpot, which plays a vital role in communicating children's learning with parents. The children also have access to this BlogSpot, and they help the staff write blogs. I think this is a great way to communicate children's learning and sustain relationships with family and friends who do not live close to the kindergarten as they can view the child's learning and achievements. (ST13)

ST13 indicated that blog sites had the potential for children to use as a way to communicate with their families across a range of contexts. She inferred that blogs provided a legitimate means to develop and support relationships across geographical boundaries.

ST30 spoke of emails being a relevant mode of communication between centres and families. She commented:

At the centre where I am currently doing my placements, one of the teachers has been away on holiday in Fiji. All the children have been asking where she had gone, so one of the other teachers sent her an e-mail, and the teacher who was away on holiday e-mailed back some pictures ... This was a simple but very effective way of letting the children know where their teacher had gone to, and a beautiful way to sustain relationships between [teachers'] home life and centre life (ST30)

ST30 suggested that email provided a means of communication and a way to share images,

The observation that ICT use by teachers can support relational practice was evident in the student teacher data. Student teachers mentioned teacher use of email, blogs and the Internet to develop and support relationships both within the early childhood settings and outside the setting with family. The immediacy of the Internet as a tool for teachers to access information featured in the data, which suggests student teacher saw the benefit of information being quickly available to support children's learning. Equally teacher's use of email, video conferencing and blogs as modes of communication was featured in some student teachers contributions. This also indicates student teachers viewed positively the ability to children and they themselves to interact with people beyond those in their immediate early children setting.

## **6.5 Chapter Summary**

This chapter reported the views of 230 student teachers whose contributions (104 in phase two and 126 in phase three) mentioned ICT in relation to their developing understanding of early childhood pedagogy in their online contributions to discussion assignment questions that asked about their views on



ICT and the skills they thought they would need to develop during a three-year degree programme that would enable them to use ICT confidently in their teaching practice. The student teacher contributions illustrated an awareness of the complexities involved in children's learning and the role ICT might play in supporting this. Whilst the majority of contributions in relation to the use of ICT focused in on the use of ICT to capture, document and share children's learning, some mentioned the potential of ICT to support building and sustaining relationships. Student teachers also mentioned the role of educational games and the use of the Internet for research. Comments acknowledged the immediacy of access to information, digital photographs and documentation through the use of ICT. To sum up, looking back over the two years and the pre and post practicum comments, in all instances, the student teachers highlighted the role photographs played in enriching children's learning stories and engaging family members with the experiences that were documented. Post practicum, in phase three in particular, there was a strong theme of early childhood services having cameras on hand to photograph learning as it was happening. Most postings focused on the photographic representation of individual children's learning, but some also mentioned displays of group learning experiences, particularly as a follow-up to trips. Student teacher commentaries mentioned ICT being used in a range of ways to display events and experiences that had occurred in the early childhood services. They implied that the multimodal nature of ICT provided teachers and children with valid means to represent children's learning and assessment and gave families a rich range of ways to access and experience their children's learning. While there were many examples from the student teachers' perspectives of what teachers used ICT for, for example, to capture images of learning and represent these in artefacts such as documentation, there is little mention of how teachers used ICT or of the student teachers' pedagogical understanding of the affordances of ICT in relation to their teaching practice.

The next chapter will report on the themes subjective norms, relational trust, ICT cultural tools and enjoyment, which relate to personal and contextual elements that were embedded in student teacher comments in relation to what might support or inhibit the use of ICT by a teacher in a setting.

## **Chapter Seven: Subjective Norms, Relational Trust, ICT Cultural Tools and Enjoyment**

### **7.1 Introduction**

This chapter reports findings generated from student online discussion forums as part of a second-year paper. As in the previous chapter, I used a thematic approach to mine the data and illustrate the themes of subjective norms, relational trust, ICT cultural tools and enjoyment with verbatim quotations. I have used the same numerical coding as in Chapter Six to protect the student teachers' identities.

### **7.2 Subjective Norms**

The notion of subjective norms as used in this study relates to how teachers perceived the role of ICT in their teaching in terms of 'what we do here' (Section 5.3). For student teachers, subjective norms are taken to be them having an understanding of the pedagogical affordances of technology and/or a desire to learn about these – 'what we would have liked to learn'. This approach was adopted in the absence of their comments on 'what we do here'. They were not yet in teaching positions and so could only reflect on what they would like to learn or use technology for.

One hundred and thirty nine student teacher comments (57 in phase two and 82 in phase three) contained reference to aspects of subjective norms as described above. They mentioned they would have liked hands on opportunities to explore the use of ICT, to gain confidence in the use of ICT in their developing teaching practice, and to explore the potential for ICT to respond to different learning styles. Student teacher commentary also featured comments about having a dedicated ICT paper. Table 15 below contains the contribution counts for the hands on workshops theme. Table 16 in section 7.2.2 contains the counts for the dedicated paper theme.

**Table 15 Subjective Norms-Hands on Workshops**

Hands-on workshops	Count phase two	Count phase three
To explore the range of technologies	24	23
To developing confidence	14	19
To respond to different 'learning styles'	2	3
Total number of contributions	40	45

### **7.2.1 Hands-on Workshops**

Eighty-five student teacher contributions (40 in phase two and 45 in phase three) contained reference to the provision of hands-on workshops to support their developing understanding of ICT. They implied that these would have been useful to have during their degree programme. They also mentioned that a hands-on approach would have contributed to their building confidence whilst allowing them to become familiar with the technology that teachers were using in the early childhood services. There was also an indication that a hands-on approach would provide student teachers with a range of ways to engage with the technology and enable them to learn about the range of technologies available.

#### ***Hands-on Sessions to Explore the Range of Technologies***

Forty-six student teacher contributions (24 in phase two and 22 phase three) made comments which mentioned wanting to experience hands-on use of a range of technologies, and emphasised the multimodal nature of the technologies.

#### ***Websites and Resources***

Three of the 24 phase two student teacher contributions mentioned that they would have liked hands-on sessions to explore websites and resources that they could have used with children before they went on practicum. ST51's contribution is representative of these views.

ST52 described her experience and explained why she would have liked to have had more information regarding how to access relevant websites prior to practicum:

During my practicum, when children didn't know where camels lived; we went on a computer and searched 'camels'. We found some websites that had the photos of camels in deserts. These visual clues helped the children gain the new knowledge. During

this exercise I thought if only I were familiar with informative websites that were relevant to children's interests I could have extended this learning more. (ST52)

ST52 indicated that having an opportunity develop a deeper knowledge of the potential of website resources to support and extend children's learning, prior to undertaking her practicum would have strengthened her developing teaching practice in regards to the use of ICT.

#### *Digital Cameras and Photo Editing*

Four of the 24 phase two student teacher contributions indicated that they would have liked to have hands-on workshops to help them understand how to use digital cameras and edit digital photos to use in documentation. The following two examples encapsulate these views.

ST20 explained why she would have liked to have some experiences with digital cameras and editing photos in the following contribution:

In preparation for our role as beginning teachers I think it would be cool to have a workshop on how to use a digital camera and photo editing as an ICT experience in our programme. That way I would be prepared to use ICT for documentation in my teaching practice.  
(ST20)

In her contribution, ST20 also indicated that a hands-on workshop would have prepared her to use ICT effectively during her practicum. She suggested that opportunities to explore the affordances using ICT would have contributed to a deeper understanding of the use of ICT for assessment purposes, and enhanced her developing teaching practice.

ST53 also spoke of preparation for practicum through hands-on workshops. She commented:

I think a workshop about photography and the many different things you can do with it, would be great (not just theory on why it is beneficial but show us and let us have a play around). For me that would be a great experience to help me become more

confident in using cameras putting the photos onto a computer to create learning stories before I went out to a centre. (ST53)

In her contribution, ST53 indicated that a workshop with opportunities to learn through participation could have given her the opportunity to gain confidence with photography prior to going into an early childhood centre.

Two of the 22 phase three student teacher posts indicated that they would have liked hands-on experiences on the multimodal use of ICT. ST56's contribution represents these views.

ST56 suggested that a workshop on the multimodal nature of ICT used in centres would have been helpful. She commented:

I think that for us as student teachers the university could help prepare us for future teaching by having a workshop on the different types of ICT that we can use in centres, like cameras, scopes, and video recorders and all the other different ranges of equipment that could be used. That way we would be confident to try these as beginning teachers. (ST56)

In the above contribution, ST56 implied that the university had a responsibility to ensure student teachers were capable of using ICT confidently in their teaching practice when they graduated from their ITE.

*A teacher from the field illustrating the use of a range of technologies*

One of the 24 phase two student teacher comments mentioned that it would have been helpful to have early childhood teachers participate in workshops alongside student teachers to share their passion and knowledge about ICT use. ST19 stated:

I think that it would be good for us to have workshops at University, so that we can then take it out there to the centres and be new technology equipped graduates. It would be awesome to get ECE teachers to come to workshops and share their passion for ICT [and] teach us how to use it. I think having workshops like that would show us that [ICT] is truly educational. (ST19)

ST19 suggested inviting ECE teachers to come to a workshop and share their knowledge and experience of ICT, which would help student teachers to better understand the educational value of ICT in early childhood settings.

### ***Hands-on Workshops – Developing Confidence with ICT***

Thirty-three student teacher contributions (14 phase two and 19 in the phase three) mentioned they would have liked hands-on opportunities to develop confidence to use ICT in their teaching practice. The following seven examples illustrate these views.

#### *Phase two examples*

ST49 suggested that hands-on experiences with ICT connected to creating learning stories could be an opportunity for student teachers to gain confidence with technology. She commented:

I believe opportunities exist in this three-year programme for students to participate in more hands on experiences, and one example of this could be in the context of learning stories where digital cameras and computers are used to document children's on going learning and development. Hands on experience with technology would help us to become competent and confident beginning teachers. (ST49)

She expressed that learning through more hands-on experiences in the context of documentation could connect learning to teaching practice. This could contribute to student teachers developing both competency and confidence with technology.

ST50 indicated that hands-on experience in the use of ICT when documenting one's own learning in a similar manner, as documenting children's learning would be helpful. She commented:

I think that hands on experience would be really helpful. We could document our own learning in the ways we would document children's learning with them, we would be [practising] using ICT and complementing our learning and developing confidence at the same time. (ST50)

In the above contribution, ST50 proposed that opportunities for student teachers to have hands-on experience with ICT to document their own learning whilst

undertaking their degree would contribute to their understanding of the use of ICT for assessment purposes, providing a platform for practising to gain confidence.

ST15 also made a connection to hands-on workshops and spoke about gaining a basic understanding of ICT use in the following contribution:

I think that in order for us to scaffold the children's learning we need to have an understanding in the basics of ICT ... I think it would be a great opportunity to have hands on workshops in ICT [in this programme]. This would provide us training and support to learn new things, and confidence to use the new technologies we can use as teachers, which are being invented basically daily.  
(ST15)

She suggested that hands-on workshops could enable student teachers to overcome any fearfulness about their use of ICT. She indicated that this could break down any barriers student teachers might encounter when trying to keep up to date with technologies.

ST51 suggested that hands-on workshops would have provided a safe space for student teachers to practise and make mistakes when learning how to use ICT in her comment below:

I would have liked ICT hands on workshops in our programme. Computers are like so many other things in life you need to be given the opportunity to make a 'mistake' so you can learn how to rectify it in a safe space, which is the best way to gain confidence.  
(ST51)

Here ST51 suggested that being able to explore ICT use in a safe environment that included hands on opportunities to practice and learn through trial and error was complementary to the development of student teacher knowledge and of confidence with the use of ICT.

#### *Phase three examples*

ST55 suggested that hands-on workshops would enable student teachers to develop confidence to use ICT: "I really like the idea of interactive workshops provided for us student teachers where we could learn how to use the various

types of ICT and become confident to use them” (ST55). Here, ST55 proposed that interactive hands-on opportunities were beneficial to student teacher learning and confidence in relation to using ICT.

ST6 indicated that hands-on workshops would have helped student teachers become confident to use some technology. She remarked, “I think this paper would have been more beneficial if it had [a] hands on component that allowed us to use some of the technology available just as a starting point to start building on our ICT understanding and confidence” (ST6). ST6 implied that hands-on learning experiences would enable student teachers to develop a foundation of understanding of the affordances of ICT, which they would further develop as their confidence and knowledge grew.

ST28 indicated that hands-on learning opportunities that allowed student teachers to play with technology would have been valuable in their programme. She commented, “I like the idea of hands-on experiences, it would be helpful to spend a lecture discovering, playing and becoming confident [with] the ICT that is there for teachers to use in centres” (ST28). ST28 suggested that hands-on learning about ICT that included time to play with the technology could contribute to students’ confidence to use ICT in their teaching practice.

### ***Hands-on Workshops Respond to Different ‘Learning Styles’***

Three student teacher commentaries (2 in phase two and 1 in phase three) mentioned that hands-on workshops catered for different ‘learning styles’. ST54’s contribution encapsulates these views:

I believe that it could be useful to have some hands on experience with the equipment, as I have not had the opportunity to explore the new technology but would like to. As a lot of us I am a kinaesthetic learner so being hands on is how I learn the best.  
(ST54)

Overall, the student contributions on this aspect indicate that, in their view, time and space for student teachers to engage in hands on learning within the ITE programme could contribute to their appropriation of ICT for pedagogical purpose.



### 7.2.2 A Dedicated ICT Paper

Fifty-four student teacher contributions (17 in phase two and 37 in phase three) mentioned a separate ICT paper. They indicated that a paper about the use of ICT would help students to develop confidence to use ICT as a beginning teacher.

*Table 16 Subjective Norms-A Dedicated ICT Paper*

<i>Dedicated paper themes</i>	<i>Count phase two</i>	<i>Count phase three</i>
ICT for pedagogical purposes	1	27
Developing competence and confidence	15	8
Timing of the dedicated Paper	1	2
Total number of contributions	17	37

#### *ICT for Pedagogical Purposes*

One student teacher contribution in phase two, and twenty-seven in phase three indicated that a dedicated ICT paper would have added value to their learning. They suggested that this would help them develop a better understanding of how to use ICT and apply it to use it for pedagogical purposes. The following 10 examples encompass these views.

#### *A paper dedicated to ICT use for pedagogical purposes*

Twenty-one phase three student commentaries mentioned what they saw could be possible benefits from having a one paper dedicated to the use of ICT within the three-year degree programme. The following four examples illustrate these views.

#### *Phase three examples*

ST18 explained that she was still developing her understanding of ICT and indicated that an ICT paper that focused on integrating ICT into teaching practice would have been helpful. She commented, “I still have a lot to learn if I am to effectively integrate ICT into my teaching practice and other areas of learning and this paper is nearly finished. An ICT paper would have been helpful” (ST18). Here, ST18 indicated that an ICT paper would have been beneficial to her developing teaching practice.

ST58 mentioned that an ICT paper that focused on integrating ICT by exploring and discovering its affordances would have been useful. She commented, “*I* believe we need a paper about integrating ICT into early childhood education, with the view that children using ICT should be based on exploration and

discovery” (ST58). ST58 indicated that an ICT paper based on how children would use ICT could contribute to students’ understanding of how to integrate ICT meaningfully into their teaching practice. She suggested that linking how children use ICT into how teachers use it in their practice would also have been beneficial.

ST59 expressed that an ICT paper that focused on integration of ICT that was relevant to children would be valuable. She commented:

I feel that we as future educators would benefit from a paper, which teaches us how to integrate ICT into our early childhood programmes on a suitable level. We need to be aware that children of the future are going to have a large amount of technology around them and as their educators we need to have the right level of balance for incorporating this learning area as well as [an] understanding of how children will benefit from the vast variety of ICT resources. (ST59)

ST59 proposed that an ICT paper could enhance student teachers’ understanding of the relevance of ICT for children. She implied that this would also enable student teachers to gain an understanding of how children’s learning could be complemented through the use of ICT. Her view is particularly relevant given the exposure children have to ICT.

ST60 suggested that an ICT paper that focused on teaching ways to engage with and develop the skills to use ICT would have been beneficial:

I believe we need to have a paper that teaches relevant ways of engaging with ICT that we can [practise] in a centre. Because we cannot currently take a course about ICT, we are not going to [utilise] it in a centre. Learning relevant ICT skills like using a camera would benefit teachers and children. (ST60)

ST60 inferred that, without a dedicated ICT paper, student teachers would not be able to gain the knowledge and skills required to use ICT in early childhood centres.

ST61 expressed a similar view in her contribution. She suggested that an ICT paper that encompassed comprehensive knowledge of how to use ICT in teaching would have been useful in her commentary below:

I feel that teachers need to have a wide knowledge of ICT learning to put into their practice. I would find it very helpful to have an ICT paper to help me gain a better understanding and knowledge of incorporating ICT learning within my own practice. (ST61)

Here, ST61 implied that an ICT paper would enable her to gain a wider insight into how to use ICT in her teaching practice.

Six phase three student teacher contributions featured views about integrating ICT across papers rather than having a separate paper dedicated to ICT. The following two examples represent these views.

*An integrated paper on ICT use for pedagogical purposes*

ST62 took the discussion of an ICT paper in a different direction with her suggestion that ICT should be integrated across all third-year papers in the degree rather than in only one paper. She commented, “To help us fully understand current technology I think that it needs to be integrated into papers in the last year of this degree as well as in this paper” (ST62). ST62 implied that a wider integration of ICT within the programme would contribute to students gaining a better understanding of ICT.

The notion of wider view integration also featured in a contribution by ST63. She commented, “Something that really struck me as being important in our learning at university is integrating ICT in with the other things we are learning about in other papers, for example maths and art etc” (ST63). ST63 suggested that ICT could be integrated in other learning areas within the programme and inferred that this would enrich other aspects of learning.

*An Option paper on ICT for pedagogical purposes*

One phase two student teacher contribution mentioned an option paper in the first year of the degree would contribute to student teachers ability to keep up to date with the rapid growth of technology. She commented:

I do think this programme needs to incorporate more ICT. Apart from Microsoft Office, email ... I am totally ignorant of ICT and it's rapid update growth. ... An optional ICT paper in the first year for those who need it would be a great idea. (ST36)

ST36 also suggested that an ICT paper in the first year, which included basic ICT, would help reduce student stress

***Developing Competence and Confidence Through a Dedicated Paper on ICT use***

Twenty-three student teacher contributions (15 in phase two and 8 in phase three) mentioned opportunities provide in a dedicated paper on ICT use would have been beneficial to their learning. They implied a dedicated paper that was skills focused would have enabled them to develop confidence and competence with their use of ICT. The following examples represent those views.

*Phase two examples*

ST46 suggested that a paper with tasks such as how to use PowerPoint would have been useful:

I think that during our three years at University that someone could possibly offer an ICT paper, which you have to complete ICT tasks for. The tasks could range from making a PowerPoint, using digital cameras, etc. This would help to ensure that beginning teachers could go out into the workforce confident in their use of ICT.  
(ST46)

In the above contribution, ST46 implied that an ICT paper could contribute to students being confident in using ICT in their teaching practice.

ST36 mentioned that an ICT paper in the first year, which included basic ICT, would help reduce student stress. She commented:

I do think this programme needs to incorporate more ICT. Apart from Microsoft Office, email ... I am totally ignorant of ICT and it's rapid update growth. ... An optional ICT paper in the first year for those who need it would be a great idea. (ST36)

In the above contribution, ST36 indicated that lack of knowledge or understanding of how to use ICT contributed to student teacher stress. She stated that an ICT paper could help student teachers keep up with the fast growth of ICT.

ST65 indicated that it would have been helpful to learn about software in the degree programme. She commented:

I think that during the 3 years in our ITE we need to be able to work with some of the popular programmes and be given the opportunity to learn the basics, whether it is through optional classes or assessments or aspects of particular papers. (ST65)

In the above contribution, ST65 suggested that learning about software would be beneficial and suggested that this form of learning should be built into some facets of the programme.

ST66 indicated that she would have liked to learn about the interactive nature of ICT so that she could apply it to her teaching practice. She remarked:

As a beginning teacher something that I would love to learn about ICT in this programme, and explore using a variety of [programmes] that we can use to make things more interactive ... it makes learning very interesting and exciting! (ST66)

Here, ST66 implied that the interactive nature of some software could contribute to making learning interesting and suggested that it had a place in ITE.

ST67 mentioned that having an understanding about the types of software children used would have been useful for her prior to going into early childhood centres. She commented:

I think we all agree that it would be good to have the chance to learn more about software used by children. It would have been good to introduce us to some of the software [programmes] before we actually went out to the centres. If we could have had the chance to talk about, and experience [programmes] everyone would have benefited especially the children. (ST67)

In the above contribution, ST67 proposed that prior knowledge of software programmes and an understanding of how to use them would contribute to student teachers' ability to engage in software programmes with children and be of benefit to children.

*Phase three examples*

Confidence featured in a contribution by ST64. She remarked, "Having a paper that teaches us about a variety of ICT resources would greatly benefit our confidence in using ICT as a teacher, as well as developing our understanding of how ICT can be used in early childhood centres" (ST64). ST64 implied that student teachers' confidence would be enhanced through participating in an ICT paper. She proposed that this would provide an opportunity to gain a deeper understanding of the affordances of ICT.

ST34 articulated that she would have liked the opportunity to learn more about software programmes:

I think it would be helpful to have some sort of lessons in this course, on how to use different software [programmes] on the computer. I have been to a couple of centres where they [use] different software [programmes] that the teachers and children used, and I felt a bit stumped because I didn't know [how to] use them. (ST34)

In the above contribution, ST34 implied that a lack of knowledge of software was a barrier to her engagement in some aspects of her role as a student teacher.

ST68 mentioned being introduced to software that was relevant to early childhood centres. She remarked:

Technology is never ending and there will always be new [programmes] being developed and we do learn as we go along. However I think it would be good to be introduced to current [programmes] that would be useful in the early childhood centres so we could learn how to use it with children in our teaching practice. (ST68)

In the above contribution, ST68 implied that ICT was developing rapidly and student teachers needed to learn how to use the software that was popular at the time. She inferred that using software programmes with children was a valid aspect of teaching.

ST69 indicated that it would good to have the opportunity to gain confidence with software prior to becoming a full-time teacher: “I would definitely like to gain more confidence in learning to use the different software programmes in this three year degree, since you do not always have the time when working full time in a centre” (ST69). She implied that the three-year programme provided a space for learning about software programmes, and lack of time could be a barrier to learning about this when student teachers gained full-time employment.

### ***The Timing of a Dedicated Paper***

Three student teacher contributions (1 in phase two and 2 in phase three) discussed the timing of a dedicated paper. They indicated that the year in which such a paper was offered would influence the development of a foundation for their understanding of ICT use for teaching.

#### *Phase two example*

ST57 suggested that a paper about ICT use would best scheduled in the first year of the programme, with aspects of ICT use integrated into all the papers in the teacher education degree:

I think that ICT papers need to be offered at University, as first year option papers would be the best idea. I think the [first-year students] would develop a passion for ICT if they were taught all about ICT in their first years and had it mixed into all of their ECE papers as well. (ST57)

ST57 indicated that an ICT paper would be helpful for first-year students to help build both an understanding and enthusiasm for ICT. She suggested that ICT should also be integrated into all of the degree papers.

#### *Phase three examples*

Although ST5 supported the idea of an ICT paper, she indicated that it should be offered as an option paper within the programme. She remarked:

Personally I would have found it really useful to have a computer paper to learn about how ICT is used in ECE in the first year of the degree, maybe as an optional paper like Writing for University Purposes, to help us build a foundation. (ST5)

In the above contribution, ST5 suggested that an ICT paper outside of the degree programme would provide student teachers with an additional choice of option papers. She implied that this type of paper would contribute to students gaining understanding of how to use ICT early in their programme if that was an area that they were particularly interested in.

These aspects from student teachers of ‘what we would have liked to have learn,’ and sense of ‘how we would like to have learnt this’ reflect positive subjective norms in relation to developing an understanding of the use of ICT. These subjective norms then appeared to influence behavioural intentions for the need to know and do more within the ITE programme to enable appropriation of ICT by student teachers.



### 7.3 Relational Trust

Relational trust is a multi-layered construct that takes into account student teacher and practising teacher trust in the positive relationship between technology, teaching and learning. For student teachers, this was taken to mean trusting that the technology they used in their ITE programme and seeing in practice how ICT can be integrated into their own pedagogical practice to support children's learning and development.

One hundred and one student teacher contributions (59 in phase two and 42 in phase three) contained aspects of relational trust. Student teachers mentioned trusting ICT supports learning, trusting children with ICT and reservations about the use of ICT in early childhood education. Table 17 below contains the contribution counts for these themes.

**Table 17 Relational Trust and ICT**

<i>Relational trust themes</i>	<i>Count phase two</i>	<i>Count phase three</i>
Trusting ICT supports learning	42	17
Trusting children with ICT	4	7
Concerns about the use of ICT	13	18
Total number of contributions	59	42

#### 7.3.1 Trusting ICT Supports Learning

Forty-two phase two, and seventeen phase three student teacher contributions, mentioned that ICT supported children's learning. They commented about trusting ICT could support and enhance children's learning, trusting ICT had a valid role in 21<sup>st</sup> Century learning and trusting exposure to ICT had a positive influence on children's learning. The following 14 examples encapsulate these views.

##### ***Trusting ICT Support and Enhances Learning***

Twenty-two phase two and fourteen phase three student teacher contributions expressed views about the positive role ICT could play in supporting and enhancing children's learning. The following examples represent these views.

##### ***Phase two examples***

ST15 indicated that she trusted ICT had the potential to play a positive role in children's learning. She commented, "I am a great believer in ICT and I think that ICT should be incorporated in the centre as much as possible. There are so many

ways to use ICT to support children's learning" (ST15). ST15 suggested that ICT should be integrated into early childhood centre curriculums and inferred that she trusted it had the potential to be used in a range of ways that would have a positive influence on children's learning.

ST32 mentioned a range of affordances of ICT, and if it was used appropriately, it had the potential to make a significant difference to children's learning. She commented:

I believe the benefits of ICT for example [through] enhanced research for in depth investigations; superior documentation of photos for portfolios and group [PowerPoints] as well as the connectedness to the wider world [outweigh] the disadvantages, which are minor if properly, supervised. My philosophy would encourage appropriate use of ICT where the focus is on how it enhances the child's learning at all times. (ST32)

In the above contribution, ST32 implied that she trusted that the positive influence of ICT on children's learning outweighed any negative views of its place in early childhood education, particularly when appropriate supervision is in place.

#### *Phase three examples*

In her contribution, ST39 implied a sense of developing trust in which she shared her thoughts about her evolving teaching philosophy:

I have had to adapt to the ICT society due to university and work but I have never thought of the importance of ICT in my teaching philosophy before. However now I see the importance of ICT and believe that it will enhance children's learning. (ST39)

In the above contribution, ST39 inferred that she had developed a sense of trust in relation to the positive influence ICT could have on children's learning. She indicated that this had occurred through her participation in her university studies and her workplace.

ST43 indicated that she trusted ICT had a valid role to play in early childhood education. She commented, "Using ICT in centres fits very well with my philosophy of teaching. I believe teaching is about following children's interests

and creating [lifelong] learners, children who are curious about the world and ICT can help this” (ST43). ST43 implied that she trusted ICT had the potential to contribute to children’s curiosity to explore the world and encourage them to want to continue to learn throughout their lifetimes.

Trusting ICT could provide a wider worldview featured in ST74’s contribution: “ICT definitely fits into my own vision and philosophy of teaching, as it brings so much more to the learning of the children and gives them a whole new worldly perspective on things” (ST74). ST74 suggested that ICT had the potential to give children access to a wide range of perspectives that could enhance their learning. She inferred that she trusted ICT had a valid place in early childhood education.

ST75 mentioned that ICT had a positive place in children’s formative years and inferred that she trusted children’s use of ICT would contribute to them being successful in the future. She commented:

ICT fits with my own vision and philosophy of teaching, and I really like to see children experimenting with different forms of ICT. I believe that children should be given the opportunity to experience a range of technologies while in ECE because these are the formative years which will set them up for the rest of their lives. (ST75)

In the above contribution, ST75 expressed that she trusted ICT could have a positive contribution to children’s inclination to become lifelong learners by having exposure during formative years.

ST76 indicated that she trusted children learned through exploring a variety of technologies:

I think children should be able to use different types of ICT and they should be available to them in early childhood centres. This would give the children plenty of opportunities to experiment with them and learn how they work. I believe this links well with the statement in Te Whāiki, “in order to participate in this world, our children will need the confidence to develop their own perspectives as well as the capacity to continue acquiring new knowledge and

skills” (Smorti, 1999, p. 211). I suggest this statement includes ICT and that it should be readily available to children to explore and gain confidence with. (ST76)

ST76 suggested that ICT connected well with the aspirations of the early childhood curriculum. She indicated that she trusted that, if children were given opportunities to experience ICT in a range of ways, it would contribute to the development of new knowledge and skills.

### ***Trusting ICT Supports Learning in the 21st Century***

Sixteen phase two and three phase there student conditions mentioned exposure ICT in relational to 20st centaury learning or supporting learning in the future.

#### ***Phase two examples***

ST70 highlighted the influence ICT had in today’s society and inferred that she trusted it had a crucial role to play in early childhood education. She commented:

When it comes to ICT, and my views towards teaching I believe that ICT has an important and valuable place in ECE. I think of what it means to be a person in today’s society. We are very ICT orientated. Therefore, this is the world children should be learning about. (ST70)

In the above contribution, ST70 suggested that ICT was an integral part of children’s worlds today and implied that she trusted it added value to children’s learning.

ST71 inferred that she trusted ICT had a valid place in education for both children and teachers and would continue to develop in the future:

Personally I believe technology is the way of the future as it is everywhere in our lives now. Children enjoy computers; [DVDs], digital cameras etc, and children seem to have natural ability when it comes to technology. It empowers children to learn at their own pace and gives them a strong sense of belonging and achievement. (ST71)

In the above contribution, ST71 implied that ICT is increasingly becoming embedded within our everyday lives and will continue to do so going forward.

She indicated that she trusted ICT could be empowering for children and could respond to children's styles of learning.

ST3 suggested that ICT in education was the way of the future and inferred that she trusted it had a valuable place in early childhood education. She commented, "I believe that technology is the way of the future, and it will get a lot more advanced. I see ICT as beneficial and another creative way for young children to express themselves and to learn" (ST3). ST3 implied that ICT could provide a means for creativity in early childhood education and suggested that it would continue to be progressive in its development.

Trusting that technology could provide opportunities for teachers to seek new ways to enhance children's learning was evident in ST72's contribution: "Personally, I feel that early childhood centres that are equipped with ICT are excellent as teachers get opportunities to seek beyond the horizons for new learning methods to use with children in today's technological era" (ST72). ST72 implied that she trusted ICT had the potential to have a positive influence on teaching pedagogies as it created a range of new possibilities for teachers to access and acquire new ways of teaching and learning.

#### *Phase three examples*

ST61 expressed that ICT supported 21st century learners and had the potential to contribute to children's competencies as learners. She commented:

ICT fits my vision and philosophy of teaching in many ways. I feel computers, cameras, scanners, printers, video cameras, internet, smart boards and DVD players in centres is a great way of exploring new learning in the 21st century world we are living in. I believe children need an understanding and knowledge of ICT learning to become more competent learners themselves through out their lives. (ST61)

In the above contribution, ST61 implied that she trusted that the multimodal nature of ICT provided opportunities for children to explore new ways of learning in the 21st century where ICT is more commonplace.

### ***Trusting exposure ICT has positive influence***

Four phase two student teacher contributions indicated a focus on exposing children early to the use of ICT to ensure positive outcomes for their future learning. This theme did not appear in the phase three student teacher data.

#### ***Phase Two examples***

ST47 indicated that she trusted that exposure ICT had a wider positive influence on children's development rather than what many children can learn from using it. She remarked, "When children are exposed to ICT I believe we need to think about the benefits ICT can contribute to children's overall development rather than just what can children learn from ICT" (ST47). ST47 implied that there was a positive development aspect that should be taken into account when considering the use of ICT in early childhood education.

ST73 inferred that she trusted children's exposure to ICT was an important aspect of their education. She commented:

I believe that is extremely important for young children to be exposed to ICT in their early years. Computers and the Internet are found in most New Zealand homes and both primary and secondary schools. I think that it is extremely important that early childhood teachers provide extensive opportunities for children to explore technology. (ST73)

In the above contribution, ST73 implied that she trusted children would benefit from exposure to ICT in early childhood settings, as this was a natural extension of children experiencing ICT across multiple environments.

ST51 implied that she trusted that, the more children were exposed to ICT from an early age, the easier it would be for them to use it. She remarked, "I believe children should be exposed to ICT in their early years, and then it will become second nature to them" (ST51). Here, ST51 implied that she trusted that exposure to ICT from a young age was beneficial to children's ease of use of ICT.

ST25 shared a similar view in her contribution. She inferred that ICT was becoming commonplace in children's lives, and therefore, exposure to it was considered positive. She remarked, "For me personally I believe that ICT has a place in early childhood education, and that children should be exposed to ICT, as

it is such a growing part of their [everyday] world” (ST25). ST25 implied that she trusted ICT, and children should have access to it in early childhood centres.

### **7.3.2 Trusting Children to Use ICT**

Eleven student teacher contributions (four in phase two and seven in phase three) mentioned trusting children with ICT. The following five examples encapsulate these views.

#### *Phase two examples*

ST77 mentioned that, as a beginning teacher, she would have to develop confidence to trust children with ICT. She commented:

I can understand that some teachers might have a problem allowing children to use ICT equipment for the fear that it will get broken, and also because it is expensive equipment. I know that when I become a teacher I will be worried about the equipment but it will be something that I will need to work on so that children do not feel they are not allowed to use it and that I trust them. (ST77)

In this contribution, ST77 indicated that the cost of equipment and the potential for children damaging it might hinder her developing trust of children to use ICT. She inferred an inclination to want to develop this trust, as it would be beneficial to children’s learning.

ST78 shared a positive experience of teachers trusting children to use ICT. She inferred that children were competent users of ICT because of the trust afforded to them by the teachers:

Wow I was just amazed while on practicum last year in a kindergarten children walking around with cameras hanging around their necks clicking away merrily catching not only their peers but also the teachers it was just fantastic. I believe this [was] because there was trust from the teachers for the children to do this. (ST78)

In the above contribution, ST78 suggested that, when teachers trust children with ICT, they can make a valid contribution to their own assessment documentation and recording multiple aspects of their learning.

### *Phase three examples*

The notion of giving children responsibility was evident in the seven phase three student teacher contributions. The following three examples illustrated these student teachers' views.

ST79 suggested that, when children were shown how to use ICT, they could be trusted to take care of it. She commented, "I feel that if you show a child how to use the ICT equipment properly and explain how precious it is you would be surprised on how careful the children are with them" (ST79). In this contribution, ST79 indicated that, when children understood items were precious, they were very capable of being trusted to take responsibility for their use.

ST1 suggested that teachers had a responsibility to teach children how to use ICT safely and thus develop a sense of trust. She commented, "In regards to the whole trust issue around trusting the children [to use the ICT] equipment, I think that comes with the teachers showing them how to use the equipment appropriately" (ST1). Here, ST1 indicated that she believed that, if children were shown how to competently use ICT equipment, they could trust them to use it.

ST44 agreed with ST1's view in this contribution. She commented:

I agree with what has been said above about children being taught how to be responsible and respectful but I also think the teachers need to take some responsibility in allowing children to use the equipment. It takes a good deal of trust from the teachers to let children experiment freely with ICT equipment. For some it is a very hard thing to do, especially for those teachers and centres [where] resources and funding (or lack of) is an issue. (ST44)

In the above contribution, ST44 implied that, if children were shown how to use ICT equipment, they would use it respectfully. She thought that some teachers might be nervous to trust children to use the equipment by themselves due to the high cost of replacing it if damaged, and the pressure of limited funding was a consideration.

### **7.3.3 Concerns About the Use of ICT**

Concerns about the role of ICT in early childhood education were evident in 33 student teacher contributions (13 in phase two and 18 in phase three).



### ***Concerns About the Negative Impact of ICT on Children's Development***

The student teacher data revealed concerns about possible negative impacts of ICT on children's development in early childhood education. These concerns included worries about impacts on children's health and their social development. Six student teacher contributions in phase two and 17 in phase three highlighted these concerns. The following 7 examples encapsulate these.

#### *Phase two examples*

ST36 shared her concern that, if ICT had a strong presence in early childhood education, it could come at a cost to other aspects of learning and development. She commented: "My worry is if ICT is a very strong factor in a centre, when do children get to enjoy being 'just kids'" (ST36). ST36 inferred that she was concerned ICT could change the way children developed by taking away opportunities for children to 'just be themselves'.

ST46 mentioned concerns about possible negative side effects children might incur through overexposure to ICT. She commented: "I personally do not feel that we should be exposing children to copious amounts of ICT. Staring at computer screens and being around cell phones can have damaging effects on such small bodies" (ST46). ST46 suggested that it was not healthy for children to spend a lot of time engaged with ICT and that limited time would be better.

#### *Phase three examples*

ST82 suggested that there was a need to use ICT; however, she had concerns about the age at which children should use ICT in their learning experiences. She remarked:

We live in such a technological age that if we don't partake [in ICT] at some point we will be left behind. But I do think that learning about ICT [at] less than three years of age is going a little too far. (ST82)

In the above contribution, ST82 appeared to support children older than three years using ICT in early childhood education, and children under three years of age were too young to require it.

ST83 implied that close exposure to ICT might have an adverse effect on children's development. She remarked:

I am still a little cautious with regards to allowing children to be in close proximity to certain ICT resources like computers and televisions for extended periods of time. I have heard that these, in particular, can affect children's brains and stunt their cognitive and social development. (ST83)

In this contribution, ST83 indicated that caution was required about the close proximity and length of time children may be exposed to ICT, particularly computers and TVs, in early childhood settings. She implied that this might be harmful to children.

ST84 mentioned concerns about ICT use and children's social development in her contribution:

I definitely think that it is important for children to experience ICT. However, I do believe that there needs to be a balance. ICT is great but so is getting outside and running around. I worry that the children of the future will lack social skills as they spend more time communicating with ICT than with real people. I think we need to ensure that children still have these skills and still have the experiences that we had as children such as climbing trees and having tea parties with friends. (ST84)

In this contribution, ST84 inferred that ICT might be detrimental to children's social development if they used it primarily as a mode to communicate virtually rather than face to face with people.

ST85 highlighted balance in her contribution. She commented:

I think there should be at least a balance when it comes to using ICT. I believe that too much focus on ICT can hinder children from exploring their physical capabilities, which are also important for their growth and development. (ST85)

Here, ST85 suggested that too much emphasis on ICT in early childhood education could hamper children's physical development.

ST28 indicated that she had concerns about the possibility of ICT taking over from other areas of play. She commented:

Although I do believe that ICT has a place in early childhood centres but I think it needs to be balanced and managed efficiently. I feel concerned sometimes children will prefer sitting inside glued to a computer screen [than] outside building things and playing games etc. (ST28)

ST28 indicated that ICT had a valid place in early childhood settings. At the same time, she highlighted caution around the time children spent inside engaging with technology versus outside engaging in physical play and that both are required.

The concern that other areas of learning might get overlooked was also evident in ST60's contribution. She remarked:

I think children can learn greatly in other areas other than ICT. For me I would rather be outdoors as I love fresh air and running around getting dirty and what not. But then again I think the world is becoming so [technologically] advanced that children do need to engage in ICT a bit but at what cost are children participating in ICT today? (ST60)

In the above contribution, ST60 suggested that ICT could have a detrimental effect on children's learning if ICT detracted from other areas of learning and development. In particular, she expressed concerns that physical activities outside could be neglected.

ST86 mentioned that she was concerned ICT could take the place of other skills, such as handwriting, in this contribution. She commented:

I believe there is a time and place for some ICT in early childhood centres, however I have an awful fear that letting children write stories on the computer will take away that excitement parents show when seeing their children handwrite their name or first story. (ST86)

ST86 indicated that there was a place for ICT in early childhood centres; however, she was concerned it could have a negative impact on other areas of children's

development, such as writing. In addition, she expressed concerns that parents' enjoyment of more traditional learning, such as their children's first writing, could be lost.

### ***Concerns about ICT Taking Over Areas of the Curriculum***

Seven phase two student teacher contributions mentioned concerns around ICT detracting from other areas of the curriculum. There were also specific comments about this in the phase three of the student teacher data. The following 3 examples are from phase two student teachers. Their comments are consistent with those made by phase three student teachers.

ST80 expressed apprehension that ICT could overshadow other aspects of the curriculum in this contribution. She remarked:

I do think that ICT is an important part of children's learning but am unsure exactly how much emphasis I would put on it in the [centre's] curriculum. I do see the positives as the younger generations are growing up in a world full of ICT but just hope that the other forms of learning and activities are not neglected because of technology. (ST80)

In the above contribution, ST80 implied that ICT had a role in early childhood education; however, she articulated concerns about the possibility of other areas of the curriculum being overlooked due to a focus on ICT.

ST81 shared concerns that ICT might detract from other aspects of the curriculum in her comment:

I have to say that I do worry sometimes that computers and other digital things take focus off or highjack other important areas of the curriculum. I really think the idea of ICT supplementing children's learning instead of being the main focus is ok. (ST81)

ST81 also implied a concern that ICT should not become the key focus in early childhood education and inferred that it should be used to complement children's learning along with all other aspects of the curriculum.

ST17 expressed a concern about the possibility of ICT taking over. She remarked: "Most children are very excited to play with computers and want to play with

them as long as they can. However I don't want computers to take over the children's whole learning environment" (ST17). In this contribution, ST17 implied that ICT was considered to be valid to use with children as long as it did not become the whole focus of the learning environment.

***One Teacher's Views on her Developing Relationship with Technology***

During phase three one student teacher contribution contained a description of her emerging sense of relational trust with technology and highlighted the challenge with this as she worked through competing feelings about the use of ICT in early childhood education. ST87 mentioned that she was struggling with her developing relationship with technology. She commented:

I personally have a 'love/hate' (for lack of a better term) relationship with the idea of ICT being used in early childhood centres. On the one hand I can see all the benefits of ICT; how it has eased the workloads of teachers and how much more it can enhance a child's learning but I don't like the idea of it being used too much. In today's world there is just so much technology around. (ST87)

ST87 appeared to be wrestling with her views on ICT in early childhood education. She suggested that ICT could enhance children's learning whilst also highlighting a concern about the amount of ICT generally available to children outside of early childhood settings.

Similar to the teacher data, student teacher commentary revealed that teacher use of ICT was seen as having both valued and concerning aspects for teaching and learning. From a positive stance, the student teacher comments indicated that ICT had the potential to enhance children's learning when teachers trusted it enough to use it in their teaching, and if teachers trusted children to use ICT themselves. On the other hand student teachers, expressed an awareness of possible negative implications of ICT if its use impacted on other curriculum areas. Student teachers comments suggested that relational trust can be understood as a three-way relationship between technology, teaching and learning with both a positive and a negative aspect possible but with positive aspects predominating overall.

## 7.4 ICT Cultural Tools

The term ‘ICT cultural tools’ in this study is used to describe software applications of technology and the Internet that students used in their ITE programme (See section 4.4.5) and were exposed to during their placements and practicum in early childhood settings. Ninety student teachers (57 in phase two and 33 in phase three) mentioned ICT cultural tools in their online contributions. They described ICT cultural tools as:

- tools for learning
- tools teachers needed to take responsibility to engage with ICT
- tools for professional development
- concerns about ICT tools.

These views are reflected in the following examples. Table 18 below contains the counts of these themes.

**Table 18 ICT Cultural Tools**

<i>Developing pedagogy in relation to ICT themes</i>	<i>Count phase two</i>	<i>Count phase three</i>
ICT cultural tools as learning tools	37	30
Teachers’ responsibility to engage with ICT	10	2
ICT cultural tools and professional development	6	0
Concerns	4	1
Total number of contributions	57	33

### 7.4.1 ICT Cultural Tools as Learning Tools

Sixty-seven student teachers’ contributions (37 in phase two and 30 in phase three) contained aspects of ICT as a learning tool. These student teachers alluded to the potential of ICT tools to be used in ways that would both enhance children’s learning opportunities and position them as capable and competent learners. The following 13 examples (eight in phase two and five in phase three) are representative of these views.

#### *Phase two examples*

ST88 mentioned parents seeing their children as capable ICT users through documentation created by ICT tools. She commented, “The ICT used to document children using different types of ICT tools allows the parents to see how capable children are” (ST88). Here, ST88 suggested that the multimodal nature of ICT

provides teachers with a variety of modes to highlight children's capabilities to share with families.

ST14 expanded on this view in her contribution in which she was responding to another student teacher's comments about learning that can take place when children are using computers. She expressed:

... you make a great point about all of the other learning that goes on around the computer when children are using them. I think it is very easy to look at computers as just a tool for completing a specific task, just a means to an end and not an opportunity for so many other learning experiences. Also, other ICT tools such as video cameras and digital cameras are fantastic tools for capturing all those spontaneous, rich moments of learning!!! (ST14)

In the above contribution, ST14 indicated that the range of ICT tools had many purposes. She suggested that they could be used for tasks that have a specific outcome as well as tools for capturing spontaneity and moments of learning.

ST42 mentioned ICT as an effective tool to support children's learning. She commented, "I think many teachers in early childhood centres are now using ICT as an effective tool to enhance children's learning" (ST42). ST42 suggested that ICT tools were becoming commonplace in early childhood centres and that teachers saw them as an efficient mode to contribute and support children's learning.

ST50 indicated that children using and learning from ICT was important. She remarked, "ICT, for me, is not simply about building ICT skills for using technology in later life, there is so much that children can learn from using technology as learning tools" (ST50). In this contribution, ST50 suggested that children could learn a lot from using ICT tools themselves, and this would contribute to them developing skills to use ICT tools throughout their lifetimes.

ST71 mentioned that computers were considered learning tools for children, similar to other aspects of the curriculum. She commented, "I think computers in early childhood have generally become just like playing in the sandpit, or with the blocks. Computers have become another learning tool for children to learn and

explore with, even create art” (ST71). ST71 suggested that ICT had become another common aspect in the early childhood centre environments and indicated that they were legitimate tools for learning.

ST89 indicated that ICT could be used as learning tools for children and families. She shared this example:

Last week on placement was an ICT day because the centre had made a video for the children to watch ... It took about five minutes to get it up and going but the reaction from the children when they saw themselves [in the video] and other children from the centre was incredible. This video is available on the [centre’s] website for parents to view so it is a learning tool for all involved.  
(ST89)

In the above contribution, ST89 said that teachers sharing children’s experiences through video was a valid mode for sharing learning with the centre children and with families. She implied that this supported learning.

ST90 mentioned the Internet as a learning tool for children. She remarked, “I think having a computer with Internet is especially a great learning tool because children like to ask many question and the Internet is great for answering them. It enhances children’s thinking and learning” (ST90). ST90 implied that the Internet was a tool that enabled children to seek answers to questions, which in turn enhanced their learning.

ST91 indicated that ICT could be utilised to communicate in a range of situations. She commented:

Some of the technology tools on practicum not only helped learning and development for children but also was used as a tool for communicating with parents and teachers. When teachers created learning stories on the computer in the teacher’s room, they communicated about the children who they were writing about. They also shared their ideas as a team by using the technology tools. (ST91)



ST91 implied that ICT tools were valid for supporting learning whilst inferring that they had the potential to aid communication for a variety of purposes such as between teachers.

*Phase three examples*

ST92 spoke of the potential for ICT cultural tools to enhance all areas of children's learning, and she drew particular attention to cognitive and social development. She commented:

The use of technology can be a powerful tool for supporting all areas of learning in the early childhood centre and it should be integrated into the curriculum rather than [utilised] as an isolated curriculum component. If technology is viewed as a tool for learning; the appropriate use of technology in the early childhood [centre] has the potential to enhance the cognitive and social development of young children. (ST92)

In the above contribution, ST92 suggested that the integration of ICT into the curriculum as a learning tool had the potential to enhance learning. She implied that ICT should be used appropriately to harness its full potential as a learning tool.

ST93 indicated that ICT was now a part of children's lives and should be used as a teaching tool in her contribution. She remarked:

ICT can be a great tool to use for the children's learning and I support the use of ICT in centres. I believe our society has changed and today's children learn differently. Technology is an everyday part of their lives and we should embrace it and use it to [its] full potential. (ST93)

In the above contribution, ST93 suggested that society's use of ICT had changed children's ways of learning. She suggested that the use of ICT in early childhood centres should respond to this change.

ST58 highlighted virtual affordances of ICT cultural tools in her contribution. She commented:

I think that it is important to engage children with all the different ways of learning, and the Internet is a great learning tool for virtual visits. Last year on practicum a young child had great interest in China, so the teachers were able to look on the Internet and find out information. Later that week, the child was asking about the Great Wall of China, so they looked on the Internet and found there were many virtual tours. It was fantastic and the child was so excited about seeing the Great Wall of China, with a 3D feel! The Internet has created this incredible opportunity where the world is at the tip of our fingers; we are able to be there, without actually “being” there. (ST58)

In the above contribution, ST58 suggested that the Internet had the potential to enhance children’s learning through immediate access to virtual tours. She inferred that this could bring the world to children, based on their particular areas of interest and learning at the time.

ST30 highlighted the importance of teachers knowing how to use ICT cultural tools in meaningful ways in their teaching practice. Her contribution featured these comments in relation to those from another student:

With regard to the ‘virtual versus real’ trips and so on, that you mentioned ... like everyone else I can see the benefits of both sides of this. Although many kindergartens and ECE centres do have regular outings, for those who don’t or for those centres that wish to study and learn about places a bit further away, like you mentioned ... the Internet and virtual tours is an important tool in which to do this. (ST30)

In the above contribution, ST30 inferred that ICT tools could have a valid place in early childhood education. She implied that virtual tools could help bring the world closer and provided a platform for children to gain an insight into events and places that they could not experience due to timing or distance.

ST94 mentioned ICT as a tool for both children and teachers. She commented, “It is a useful learning tool for both the teachers and the children and can manifest

itself in many different ways” (ST94). In this contribution, ST94 suggested that ICT could contribute to teachers and children’s learning in a range of ways.

#### **7.4.2 Teachers’ Responsibility to Engage with ICT**

Twelve student teacher contributions (10 in phase two and two in phase three) mentioned the need for teachers to engage with and understand the affordances of ICT tools to enable them to support and extend children’s learning. The following five examples are illustrative of these views.

##### *Phase two examples*

Ten of the 57 phase two student teacher contributions in relation to cultural tools, mentioned it was the teacher’s responsibility to learn how to use ICT. The following three examples represent these views. ST49 mentioned teachers understanding ICT tools so they can use them to extend children’s learning. She commented:

During my practicum I saw the importance of teachers in an early childhood learning environments thinking and learning about the world of ICT. I believe it is important for teachers to know how to use these tools well so that they can support children’s learning.  
(ST49)

In the above contribution, ST49 inferred that ICT tools were valid to support children’s learning as long as teachers fully understood how to utilise them well.

ST89 suggested that teachers’ competent use of ICT was crucial due to the pervasive nature of technology. She commented, “Digital cameras, laptops and ICT have come into our lives extensively over the last ten years and it is important that teachers learn to use these tools competently so they can support children’s learning” (ST89).

ST89 indicated that the abundant range of ICT tools that have become a part of everyday lives placed responsibility on teachers to learn how to capitalise on the potential of these to enhance children’s learning.

ST17 mentioned teachers understanding how to bring excitement to children’s learning through ICT. She remarked:

I agree with you that the teacher should have [a] good understanding of ICT and teach children how to use ICT in easy ways. I think it is important for teachers to look at technology as valuable teaching tools, which can bring excitement to children's learning opportunities. (ST17)

In the above contribution, ST17 suggested that teachers had a responsibility to understand and be able to use ICT and maximise the use of ICT to bring excitement to children's learning.

#### *Phase three examples*

Two of the 23 phase three student teacher contributions mentioned it was the teacher's responsibility to learn how to use ICT.

ST51 expressed in her contribution that there was a difference between playing with ICT tools as a form of entertainment or with ICT for fun and using it as a learning tool. She commented:

I think the way centres introduce ICT technology is very important. I think it should be available to children as a learning tool rather than entertainment, well that is the way I have seen it being used in some centres. During my practicum children could play on [the computer] once a day for fifteen minutes each. Teachers using the word 'play' do not inspire children to think of the computer as a learning tool. (ST51)

In the above contribution, ST51 suggested that teachers should reframe how they talk about ICT to avoid children seeing ICT as entertainment.

ST61 mentioned teacher awareness of the variety of ICT tools as an important aspect of enhancing children's learning. She commented:

I think that at the end of the day teachers need to have an awareness of the different ICT learning tools available to support children's learning. Teachers need to understand ... how to work with ICT, how to incorporate different ICT learning that has a meaning to it throughout the daily activities involved at the centre. (ST61)

ST61 suggested that teachers needed to have an understanding of the ICT tools and their relevance to children's learning in early childhood centres. She implied that teacher knowledge of how to integrate ICT into learning that has meaning to children was important.

#### **7.4.3 ICT Cultural Tools and Professional Development**

Six of the 57 phase two student teacher contributions mentioned ICT and professional development. This theme did not appear in the phase three student teacher data. The following two examples encapsulate the views shared.

ST80 mentioned future possibilities of on-going ICT professional development opportunities in the workplace after graduation. She commented:

Hopefully our future work places will offer the opportunities some of us have yet to have to explore and experiment with new tools and computer [programs], so we can extend our own knowledge in the hope to extend children's learning in ICT. (ST80)

ST80 implied that student teachers had not had sufficient opportunities with their degree programme to gain a sound understanding of how to use ICT in ways that would be beneficial to children's learning. She indicated that professional development in the workplace would be helpful to further develop this knowledge.

ST95 mentioned teachers understanding ICT before it was implemented into an early childhood centre in this commentary:

I think that we should not overlook the importance of [teachers] being educated about all aspects of ICT before it is introduced into the early childhood setting. By teachers engaging in some research and professional development it will help them make positive choices with the tools they select and when and how to use them and how these tools can support children's learning experiences, development and participation of play. (ST95)

In the above contribution, ST95 implied that it was valuable for teachers to gain insights into the features of ICT tools to help teachers understand the potential to

support children's learning. She indicated that this should occur to help inform the choices of ICT in centres.

#### **7.4.4 Concerns**

##### *Phase two examples*

Four of the 57 phase two student teacher contributions and one of the 33 phase three student teacher contributions voiced some apprehension about the notion of ICT cultural tools being considered tools for learning in their contributions. They spoke of concerns about children spending too much time with ICT and not engaging in other areas of play, and of ICT not being used in meaningful ways. The following three examples are representative of these views.

ST91 shared her thinking about this based on her observation during her placement:

In my placement centre there is a computer lab with two computers ... Two children at a time can use the computer for ten minutes. Teachers peep through a window on the door and there is no assistance or scaffolding for them. It seems that the computer had not yet become such a meaningful tool for children or teachers in my placement centre. (ST91)

ST91 suggested that, without teacher input, ICT tools could become meaningless to children. She inferred that teachers were still developing an understanding of ICT as a valid teaching tool.

ST49 mentioned children using computers for long periods of time. She remarked, "I think problems can definitely be associated with ICT learning tools, for example computers, where I have experienced children spending large amounts of time focused on a "game" without any interruption from a teacher" (ST49). ST49 implied that it could be problematic for children to play computer games unsupervised for long periods of time. She inferred that this was not using ICT as a learning tool that would contribute to children's learning and development.

ST90 made a distinction between ICT as being perceived as toys rather than learning tools. She remarked, "In my opinion some teachers seem to have the idea that ICT are toys not learning tools. This worries me because of the possible influence of ICT [on] children's learning" (ST90). ST90 suggested that, if ICT

tools were considered playthings, they might be overlooked as learning tools to use with children.

*Phase three examples*

ST86 raised her concern about ICT cultural tools and learning goals or lack of them. It was apparent she had some reservations about the possible impact that ICT cultural tools could have on children's educational goals. She expressed:

How come all of a sudden ICT tools have such a huge impact on children's educational goals anyway? Haugland (1999) stated "For computers to have an impact on children's learning and for teachers to tap into rich benefits, computer activities need to mesh with children's educational goals" (p. 14) I think this is absolutely correct but if they don't what happens next? I feel a little uneasy about this. (ST86)

Implicit in ST86's contribution was apprehension that ICT cultural tools may not be woven into children's educational goals and therefore not providing any real benefit to their learning.

Student teacher commentary reflected a view of ICT tools as cultural tools for learning. This aligns with Vygotsky's notion of cultural tools, which was also evident in the teacher data (See section 5.5). Notions of ICT as a cultural tool in the student teacher data is consistent with a sociocultural view of teaching and learning that includes both teachers and children as active participants in the use of ICT. The need for space for student teachers to engage with the ICT cultural tools within the ITE programme, and teacher responsibility to ensure they understood to affordances of the tools was also revealed in the student teacher data.

Overall, their comments suggests that ITE programmes that take a sociocultural approach to teaching and learning, with an understanding of the notion of ICT cultural tools as a meditational means embedded in them, would be supportive of the appropriation of ICT by student teachers.

## 7.5 Enjoyment

The concept of enjoyment in this study refers to teachers and students displaying a sustained interest in the use of ICT in their teaching pedagogy, enabling them to feel a sense of fun and enjoyment whilst engaging with the ICT tools (Chapter Four). This concept did not feature as strongly as other concepts in the student teacher data. Eighteen student teacher contributions (12 in phase two and 6 in phase three) mentioned fun or enjoyment in relation to ICT. They described enjoying and playing with ICT. These views are reflected in the following examples.

### *Phase two examples – prior practicum*

Twelve phase two student teacher commentaries mentioned enjoyment or fun when using ICT prior to undertaking their practicum. The following four examples encapsulate these views.

ST96 mentioned keeping up to date with current ICT. She commented, “I enjoy using ICT, and try and keep up to date with the latest and greatest technology” (ST96). ST96 suggested that keeping abreast of new technology contributed to her enjoyment of using ICT.

ST12 remarked that ICT was a part of her life and growing up with ICT as a possible reason for her enjoyment of it in her commentary: “Personally, I really enjoy ICT, maybe because I have grown up with it and it is a part of my life” (ST12). ST12 inferred that being surrounded by technology throughout her life contributed to her enjoyment of it today.

ST97 shared her experience of using ICT to create a voice recording during her one-week placement and mentioned she found this fun. She remarked, “I had so much fun with my voice recording when using it at the centre when doing my placement tasks and uploading into the computer” (ST97). ST97 indicated that she found it enjoyable using ICT to create a voice file and upload it at the centre.

‘Play’ and ‘fun’ were terms used by ST67 to describe her experience of ICT during her practicum. She commented, “I couldn’t stop playing with the computer and cameras when I was on my placement it was such fun” (ST67). The terms ST67 used to explain how she felt when using ICT implied enjoyment.



ST14 shared her experience of using her own technology to contribute to an online discussion during class:

Just to let you know ... my last posting was typed and sent from my most fantastic, [shiny] black [iPhone], while we were in class today playing with our own ICT gadgets. It was very engrossing and exciting at the same time!! (ST14)

In the above contribution, ST14 inferred a sense of enjoyment in her description of engaging with technology as a part of a classroom event. She implied that this contributed to her engagement with the technology.

*Phase three examples – prior practicum*

Six phase three student teacher commentaries mentioned aspects of enjoyment, such as having fun, playing and enjoying using ICT, before undertaking practicum. The following three examples are illustrative of these views.

ST98 linked fun and having a positive influence on her own learning. She commented:

At my placement they have one computer, which the children are constantly using. All the games that I have seen are educational for example, math and literacy. These games are a lot of fun to play and quite often there are 2–3 children waiting patiently for their turn. I think this is a great fun way to learn. I know my learning is more efficient when I am having fun! (ST98)

In the above contribution, ST98 alluded to children being engaged in a sense of enjoyment when they were playing computer games and implied that she learned best when she was having fun.

ST99 shared how her own enjoyment of using ICT had developed since undertaking her study. She articulated:

Prior to studying I didn't really have an opinion about ICT in early childhood, I thought it was great but was 'neither here nor there' about how important it was. My opinion has changed a lot and I have enjoyed hearing about and learning about all the new and fantastic ways that ICT is being used to enrich learning experiences

of young children. I think my attitude change has come about through having to use more ICT myself since starting university and finding that I actually enjoy it a lot now. (ST99)

ST99 suggested that her sense of enjoyment when using ICT had increased since undertaking the degree programme. She implied a sense of enjoyment as her experience with ICT had increased.

Aspects of enjoyment were visible in ST78's contribution. She mentioned her enjoyment of learning about ICT in this contribution: "I really like ICT and I'm thoroughly enjoying all the new skills that I'm learning at the moment. I just like to have time to explore without interruptions" (ST78). ST78 alluded to a sense of enjoyment through uninterrupted time when engaged with ICT.

The notion of enjoyment was not a prominent feature in the student teacher commentaries, although enjoyment was identified in 10 examples that reflected an affective dimension of learning about and teaching with ICT. Similar to the teacher data in section 5.6, whilst the notion of enjoyment was not strong there was an indication that enjoyment or fun can contribute to and or is part of ICT use. When student teachers use ICT tools in ways that support their genuine interest and enjoyment they will be more likely to engage in their use.

## **7.6 Chapter Summary**

This chapter presented the views student teachers derived from their contributions from two online discussions during phase two and phase three, which formed a part of a compulsory paper in the early childhood degree programme. The themes subjective norms, relational trust, ICT cultural tools and enjoyment emerged from the data. A characteristic of the findings was the similar perceptions of the student teachers in both years of the programme, for example, the perceived value of ICT in early childhood teacher education. This was conveyed in all of the four themes; however, it featured more strongly in some.

Student teachers indicated a disconnection between learning about ICT in the paper that their discussions were drawn from and the way early childhood teachers used ICT in the early childhood sector. They appeared to have a skills-based focus of ICT, which suggested that the paper content was based on learning about ICT rather than learning through and with ICT. There was a perception that,

if ICT were integrated into other areas of the programme, it would have enhanced student teacher understanding of how it might support children's learning throughout the curriculum. It appeared that ICT was not embedded in student teacher developing pedagogies, and there were missed opportunities to gain knowledge about how ICT might contribute to enhancing children's learning and development in the design of the paper and the overall programme.

The next chapter discusses a synthesis and discussion of the findings, comparing student teacher and teacher perspectives. The data is revisited and reviewed through my researcher/lecturer lens based on my experiences of the use of ICT in the Bachelor of Teaching Degree and in relation to the literature.

## **Chapter Eight: Discussing the Themes**

### **8.1 Introduction**

Using a qualitative interpretive approach, this research examined the perceptions of student teachers and practising teachers regarding the use of ICT in the early childhood sector. I set out to examine what aspects of these perceptions might contribute to understanding the appropriation of ICT by student teachers in ITE programmes and teachers in the early childhood sector. Based on this agenda, data were gathered and analysed in response to Research Questions One and Two listed below. Research Question Three is addressed in Chapter Nine.

- How do student teachers and teachers use ICT for pedagogical purposes?
- How do student teachers and teachers consider they are/can be supported to learn to use ICT?

The participants in the study were 33 early childhood teachers employed in 10 early childhood settings in Hamilton and 145 student teachers enrolled during 2008 and 2009 in a compulsory paper that forms part of a three-year Bachelor of Teaching (Early Childhood) undergraduate degree at the University of Waikato. The data were analysed using thematic analysis. The findings for the teachers' and student teachers' data were presented in Chapters Five, Six and Seven. This chapter discusses the findings from these three chapters. In response to Research Question One, I begin by discussing student teacher and teacher pedagogical uses of ICT. I then go on to discuss how much the student teacher and teacher participants consider they learned about ICT use under the themes subjective norms, relational trust, ICT cultural tools and enjoyment. This discussion responds to Research Question Two. I set out a model to explain student teacher and teacher findings to answer Research Question Three in Chapter Nine.

### **8.2 The Pedagogical Use of ICT**

Research Question One focused on student teacher and teacher perceptions of the role ICT can play in teaching and learning. The student teachers and teachers in this study reported they used ICT for a range of pedagogical purposes, with assessment featuring the most strongly. The other categories revealed in the data were building and sustaining relationships, literacy development and support for student and teacher inquiry.

### **8.2.1 Pedagogy as a Practice Incorporating On-going Assessment**

ICT use for the purpose of assessment appeared as the strongest theme across the commentaries from all participants in this study, in particular, through creating learning stories. The strong emphasis on ICT use for learning stories can be seen to be reflective of New Zealand early childhood education policy (Ministry of Education, 2002, 2005b) and context. Specifically, this focus can be linked to the development of narrative assessment by Carr (2001) and supporting resources such as *Kei Tua o te Pae* (Carr et al., 2007). It is consistent with findings from studies by Hatherly (2009), Meade (2010) and Carr and Lee (2012) who have found that learning stories have continued to be a widely used mode of documentary assessment in the early childhood sector in New Zealand.

Student teachers and teachers spoke of the variety of ways in which ICT can be used to capture and document learning for a range of purposes. Alongside stories of individual learning, the other artefacts participants described as representing student learning included blog sites, PowerPoint presentations, learning stories, books that had been created collaboratively by teachers and children to illustrate group learning, digital photos displayed and portfolios that contained a collection of learning stories and artefacts such as children's drawings and paintings. The process for representing student learning included teacher documentation of children's learning, children documenting their own learning and teachers supporting children's involvement in the documentation of their learning/learning process either by children directing the teacher as to what they wanted recorded, and/or by self-assessing their own learning, which teachers then documented as learning stories (See sections 5.2.1 and 6.1.1) (Alasuutari, Markström, & Vallberg-Roth, 2014; Bailey & Blagojevic, 2014; Carr & Lee, 2012; Meade, 2010; Ramsey et al., 2006a).

Teachers and student teachers spoke of the ways ICT tools are able to capture digital images, which are attractive and bring assessment learning stories to life. The teachers' use of ICT to capture and create attractive assessment artefacts, primarily learning stories, is similar to the findings of the Children of the New Millennium study outlined in Chapter Two. Student teachers and teachers in this study indicated that digital images enabled teachers to document the subtle interactions that occur between children, their learning environments and their

teachers, thus giving a holistic insight into their learning processes. These findings resonate with the holistic premise of learning and development in *Te Whāriki* (Ministry of Education, 1996). They sit well with the notion of promoting children as competent, capable learners in body, mind and spirit.

Participant commentaries that documentation, including images, enabled families to see how their children engaged in various aspects of the curriculum throughout the day (See sections 5.2.1 and 6.1.1) and hence made children's learning more accessible for families are congruent with research by Wien (2011) and Edwards (2005). These authors also suggest that, at the same time, it provides a mode for teachers to gain a deeper insight into children's learning processes, a point also made by the participants in this study. Edwards (2005) argued that documentation that makes learning visible allows teachers to gain some insight into children's thinking and meaning making. By gaining a sense of what children are actually learning from the event or activity, teachers are in a better learning position, making this an important contribution that ICT use can make to pedagogy.

Student teachers and teachers intimated it was beneficial for children to revisit documentation of their learning to support reflection on their experiences so as to strengthen their learning (See sections 5.2.1 and 6.1.1). They considered that, when children have opportunities to revisit and discuss their learning as represented in documentation, it helps to strengthen their identities as confident and competent learners. This said, there were no examples provided of children revisiting assessment documentation and discussing with teachers areas of interest that they would like to pursue as has been found in other studies (for example, Carr et al., 2007; Carr, 2011).

Inherent in student teacher and teacher commentaries was the view that the affordances of the various technologies they had access to at the time of the data collection (2008–2009) made representation and revisiting of learning possible in a range of ways not possible without it (See sections 5.2.1 and 6.1.1). All groups commented on the use of images, on immediacy and on ease of documentation afforded by ICT. The ease and speed that ICT enabled for the documentation of learning was seen as an affordance for assessment by the participants in this study in a manner consistent with work by Conole and Dyke (2004) and Loveless

(2002). Loveless also noted that users of ICT are readily able to store and retrieve information to read, examine and interpret as and when required. Other studies have foregrounded this aspect as a still relevant aspect of ICT use for documenting learning in a dynamic setting, such as an early childhood centre (see, for example, Alasuutari, Markström, & Vallberg-Roth (2014)). In contrast, Wood and Ashfield (2008) caution that teachers have a key role in maintaining an appropriate pace of making information accessible to children who could be challenged by the content and confused by the speed of delivery. They argue that the possibility of fast-paced delivery highlights the importance of teachers developing the skills and professional knowledge required to mediate the interactions and information that is accessible to children through ICT.

It was apparent in the online discussion data that many student teachers had observed teachers using digital cameras to capture images to support the narrative in learning stories (See sections 5.2.1 and 6.1.1). The student teachers who had seen or participated with teachers in documenting children's learning while on practicum spoke positively of learning outcomes for children and of their own learning of ICT during this process. These student teacher views correlate with those reported by DeGennaro (2010). Importantly, Chen (2010) and DeGennaro (2010) argue that the student teachers who are able to observe and experience teachers using ICT for pedagogical purposes during practicum are more predisposed to use it in their future teaching. They validate Lambert and Gong's (2010) suggestion that practicum experiences, which include observation and participation in meaningful and relevant use of ICT, have the potential to contribute to the development of student teacher pedagogical understanding and use of ICT in their future teaching practice (See sections 5.2.1 and 6.1.1).

In summary, the predominance of commentaries to do with ICT being used to document assessment is congruent with early childhood policy and practice in New Zealand. Overall, much of the participant commentaries about ICT use appeared to be derived from the premise of ICT contributing to ease of production of learning stories that were illustrated by images, easily shared and easily revisited. However, although the multimodal nature of ICT was highlighted as a positive feature, there was no evidence of this in relation to how teachers might capitalise on ICT to enhance children's learning through a range of technologies.

Evident in the student teacher and teacher commentaries, ICT was positioned as a valid mode to represent children's learning in a summative manner, for example, to document and represent children's play.

### **8.2.2 Pedagogy as a Knowledge-Based Practice**

The data for this study was collected in 2008 and 2009, prior to the introduction of the national standards for reading, writing and mathematics in the primary school sector (Ministry of Education, 2009b) and reports that priority be given to these in early childhood settings (Education Review Office Te Tari Arotake Matauranga, 2011; Ministry of Education, 2009b).

#### ***ICT-supported literacy and numeracy development***

Teachers and student teachers in 2008 spoke of the potential of computer games to support children's literacy and numeracy learning and development. Games that provided a range of activities and options were perceived to have the potential to engage children in literacy and numeracy experiences and support learning. The 2008 student teacher commentaries mentioned that children use a range of ICT in their daily lives with the inference that the use of literacy-based computer software in early childhood settings was a natural extension of this. The 2009 student teachers mentioned computer games but made no explicit connection to literacy and numeracy learning. At no time did student teachers or teachers mention any pedagogical rationale for these differing viewpoints on the role of games.

Another aspect of ICT-supported literacy and numeracy development noted by teachers was being able to recreate storybooks with children so these books reflected the children's own context, that is, to construct the books around recent events that children had participated in to create DVDs of children's trips and to use PowerPoint slides as a format to create stories. Each of these activities was construed as adding value to children's literacy learning. Teachers also asserted that some computer software packages were helpful in encouraging children to recognise and practise writing their names. Student teachers and teachers intimated it was beneficial for children to gain an understanding that computers could support their literacy and numeracy learning in general. Valuing ICT in literacy learning is congruent with early work by Brooker and Siraj-Blatchford (2002), Siraj-Blatchford (1998) and Plowman and Stephen (2005). More recent



studies also contend that ICT can play a valid role in supporting literacy and numeracy (Alasuutari et al., 2014; Bailey & Blagojevic, 2014; Hatherly & Chapman, 2013).

### ***ICT Supporting Children and Teacher Inquiry***

Findings from student teacher and teacher commentaries were that both groups considered that inquiry can be supported by ICT use. They mentioned the Internet provided a fast interactive mode for the co-construction of knowledge. Put another way, the Internet enabled teachers to jointly explore with children their questions and ideas as they arose. A combination of Google and YouTube was considered a legitimate research approach to be used in collaboration with children to explore and extend their ideas. Google was also viewed as a useful tool in teacher-led research for resources that could be used to extend children's learning. It is interesting to note that examples of children and teachers using a range of ICT feature in Book 20 of *Kei Tua o te Pae* (Carr, 2009) although there are no illustrations of teachers or children using Google or YouTube to support children's inquiry or interests. Hatherly et al. (2009) reported that, whilst they found some opposition to the use of the Internet by teachers, a shift was beginning towards teachers considering it appropriate to provide children with alternative views and ideas through accessing the Internet. The findings of this study suggest teachers were beginning to accept that the Internet had a valid role to play in early childhood education.

The participants' focus on speedy access to information through the Internet did not appear to take into account any possible disadvantages of acquiring information in this manner. Downes (2009), for example, concludes that one negative aspect of accessing information quickly may be that this can detract from deeper enjoyment in the more cognitively demanding tasks that develop critical thinking in making sense of and incorporating information into knowledge.

Somewhat surprisingly, only two teachers mentioned they used ICT to research aspects of their own practice. The use of ICT for professional development is congruent with the findings of Eze, Adu and Rurumayi (2013), who contend that technology has the potential to transform teacher professional development opportunities.

### **8.2.3 Pedagogy as a Relational Practice**

Relationships have a critical role in the early childhood curriculum. Participants spoke of the ways ICT use can contribute to building and sustaining relationships with children and families in early childhood centres in a manner similar to that described by Ramsey et al. (2006b). Student teacher posts noted that teachers used ICT in a relational manner to build and sustain relationships. Teacher commentaries indicated that they exploited the multimodal possibilities for communication that ICT offered to build and sustain relationships with children, families and other teachers (Khoo et.al., 2013). Both student teachers and teachers considered that families appreciated being able to see their children learning within the context of the early childhood setting and to ask questions directly related to their child's actions and interactions (See sections 5.2.2 and 6.2).

Blogs were validated by student teachers and teachers as a relational mode of communication for building and sustaining relationships between parents, teacher to parent, child to parent and child to child, although both groups noted this relied on parents having access to the blog sites through passwords in the centre as well as from home. Student teachers and teachers spoke about PowerPoint presentations providing an alternative mode of communication to traditional whiteboard displays commonly positioned at the entrance of many early childhood centres as a way to engage and build relationships with families that focused on learning. Looped slideshows displayed through television screens provided a visual snapshot of children's experiences within a centre. Some teachers suggested that, when children were involved with creating PowerPoint slideshows, it brought their learning alive for them and also provided the children and teachers a useful medium for sharing this learning with families. The potential to communicate across geographical boundaries afforded by Skype was also mentioned by two teachers. These two teachers had used Skype as a tool to connect with other children and teachers in kindergartens in a different geographical location and for children to talk with a teacher who was home due to an injury.

Interestingly, while the use of digital images was a strong theme in the 2008 student teacher data, the student teachers in 2009 did not make any explicit connections between digital image use and relationship building, but both year

groups intimated that email could help build and sustain relationships with those outside the early childhood centre. They thought the immediacy of emails was significant and suggested that many children today would not be familiar with waiting for letters and postcards to arrive because electronic mail had superseded these older forms of communication. This difference, while it cannot be explained by the data that was available, does raise questions about the variations in student teachers' centres and course-based experiences in terms of what is seen as valuable.

Similar aspects of affordances of ICT noted in the commentaries about assessment were present in the rebuilding and sustaining relationships theme. Student teachers and teachers suggested that the ability to connect with people in a range of contexts through ICT contributed to the building and sustaining of relationships. These views are congruent with Bolstad (2004), who suggested that the education sector was beginning to recognise the potential of the affordances of ICT to contribute to or transform relationships experienced by children and teachers in early childhood education settings. Student teacher and teacher commentaries did not mention opportunities for new ways of learning through the use of these ICT tools. For example, Conole and Dyke (2004) spoke about the possibilities for communication and collaboration that could provide rich learning opportunities by people engaging with each other across geographical locations. This notion lends itself well to children learning and making sense of their world through interactions with people, places and things as outlined in *Te Whāriki*.

However, student teachers and teachers implied that the multimodal nature of ICT afforded them a range of opportunities to contribute to building and sustaining relationships and offered new ways to communicate with families, children and teachers. They suggested that ICT helped break down geographical boundaries and provided rich opportunities for families to see their children's learning captured and presented in dynamic ways, rather than in the form of static images and text. Student teacher and teacher commentaries did not mention what learning might occur for children through the use of these tools in the context of relationship building.

Overall, participant perceptions that ICT can assist in building and sustaining relationships are important because this connects strongly with the relational nature of *Te Whāriki*. In particular, Principle One: Ngā honongā, the notion of developing relationships with people, places and things, is posited in *Te Whāriki* as important for contributing to children's developing knowledge and ability to make sense of their world. In thinking about the nature of ITE, this finding suggests there is a need for student teachers to understand how ICT might be used for developing such relationships in their teaching practice.

### **8.3 Subjective Norms, Relational Trust, ICT Cultural Tools and Enjoyment**

Research Question Two focused on student teacher and teacher understandings of how they learned to use ICT. Four themes emerged with regard to this: the role of subjective norms, the importance of relational trust, understandings of ICT cultural tools and enjoyment. I discuss these themes in the following section from the perspective of how they relate to development of student teacher and teacher knowledge of and capacity to use ICT in their teaching practice. In this section, I discuss subjective norms from student teacher perspectives and then from teacher perspectives. In this study, the notion of subjective norms refers to student teacher perceptions of what aspects of ICT they would have liked to learn through their ITE programme and to early childhood teacher perceptions of how they learn and/or are supported in the use of ICT in their teaching practice. I then go on to highlight similarities and differences within the student teacher and teacher commentaries related to this theme.

#### **8.3.1 Student Teacher Views on What They Would Have Liked to Learn**

Student teacher commentaries scoped a variety of ways they would have liked to learn about ways to use ICT in their teaching practice while undertaking their ITE programme. These are described below.

##### ***Hands-on Learning***

The value of hands-on learning about ICT emerged as a strong theme across the 2008–2009 student teacher commentaries. Student teachers highlighted that they would have valued opportunities to participate in hands-on experiences using ICT during their ITE and indicated that this would have been beneficial for a range of reasons (section 7.2.1). For instance, they suggested that this approach to learning

about ICT would enable them to develop confidence and skills to use technology in their teaching practice. There was an inference that hands-on learning was a preferred way of learning for many adults and children.

### ***ICT Workshops***

Some student teacher posts indicated that workshops on ICT would add value to their ITE programme. They inferred that it would have been beneficial to their learning if workshops were offered in each year of their degree programme and implied that this would have provided them with spaces to explore and learn through their mistakes. Student teacher commentaries also highlighted a perception that it would have been worthwhile to invite early childhood teachers in to talk with them about the ways they used ICT. They would have welcomed passionate and skilled teachers to share their experiences of ICT use in such workshops.

Wanting to learn about the different features ICT had to offer featured in the student teacher commentaries. They indicated that it would have been beneficial to learn how to create attractive learning stories, upload photos and use software applications, such as PowerPoint, to enable them to have confidence to use ICT in these ways when they were on teaching practicum. Some student teachers wanted to know about how to use computer games and educational software in early childhood settings. They maintained that computer games had a legitimate role to play in early childhood education and implied that, by gaining a deeper insight into these, they could support children to use them to their full potential. Student teacher commentaries revealed a perception that workshops would have been helpful forums to enable them to build on their interest in learning how to use ICT in their teaching practice as well as learning about the pedagogical affordances of ICT or learning about or with ICT (Earl & Forbes, 2012).

### ***A Dedicated ICT Paper***

Forty student teachers spoke of wanting a dedicated ICT paper in their ITE programme (See section 7.2.2). They suggested that such a paper should include learning basic ICT skills as well as making connections to what and how teachers in early childhood settings used ICT. They mentioned that this could be either a compulsory paper or an option paper and implied that it would contribute to their understanding of how to integrate ICT into their teaching practice to enhance

children's learning experiences. Again, the inference was that a dedicated paper would help them become confident users of ICT, which they could then use in their teaching. It was inferred that a dedicated paper could provide opportunities for student teachers to learn about ICT for pedagogical purposes and how to use a range of ICT tools that might contribute to student teachers' opportunities to build on or extend children's learning.

To sum up, the student teacher subjective norm of 'what we would have liked' in the ITE programme predominantly featured technical aspects. This is consistent with a focus on learning about ICT, as posited by Earl and Forbes (2012). Learning about the pedagogical uses of ICT did not feature as highly in student teacher commentaries. Moreover, they reported that there had not been a strong focus on learning about the pedagogical affordances of ICT in their ITE programme.

### **8 3.2 Teachers' Views: 'It's Just What We Do Here'**

The teacher commentaries implied that the use of ICT is positioned as a part of normal practice in their early childhood centres, or put another way, its use was taken for granted as 'it's just what we do here' (See section 5.3). The word 'we' was used by 29 of the 33 teachers in this study when describing the use of ICT, implying this had become a subjective norm within the study contexts (Chiou, 1998).

#### ***We Support Each Other to Learn About ICT***

It was apparent in teacher commentaries that the social nature of learning played a key role in teachers learning about ICT in their early childhood centres (Rogoff, 1995; Smidt, 2009). The social nature of learning as described by Bell (2012) is a process where learning is the mediation of different views as learners are supported to uncover different perspectives and shared meanings are reflected in the teacher commentaries. Twenty-nine of the 33 teachers indicated that they supported each other to learn how to use ICT. Their comments mentioned that 'we' learn and 'we' support each other. They implied that access to and support from colleagues was an important part of their learning and inferred that this collegial approach to learning about ICT was an accepted and valued part of the practice within their early childhood centres (Lam, Baum, & Pine, 2003). Teacher commentaries implied that 'hands-on learning on the job' occurred in centres as

they learned how to use ICT from more-skilled colleagues. Teacher commentaries about the use of ICT appeared to be influenced by the custom and practice of ICT use in each early childhood service rather than being driven by teachers' beliefs on how one might use ICT from a pedagogical stance (Teo, Chai, et al., 2008).

Although 12 teachers did mention a clear pedagogical purpose for their use of ICT, the notion of 'it's just what we do' in the teacher commentaries overshadowed this data. These views appeared to be influenced by the notion of intention, which is a subjective norm, defined as a "person's perception that most people who are important to him think he should or should not perform the behavior in question" (Ajzen & Fishbein, 1980, p. 3). In other words, this theory assumes that people may choose to engage in behaviour, for example, using ICT, because they believe their colleagues think they should, even if they don't agree fully with this behaviour or its consequences or understand why others are using it.

The analysis showed evidence from teacher commentaries that similar views about the use of ICT were present across the 10 early childhood settings that the data were drawn from. This supports the theory that subjective norms exist within and across these settings and have been developed through an almost taken for granted notion of 'it's just what we do'.

#### **8.4 Relational Trust – Student Teacher Perspectives**

Relational trust as described in this study takes into account student teachers and teachers' trust in regards to the positive relationship between technology, teaching and learning. In this section, I firstly discuss relational trust from a student teacher perspective and then go on to discuss relational trust from a teacher viewpoint. In this study, student teacher relational trust showed aspects of trusting ICT can make a positive difference to children's learning and is appropriate to use in early childhood education contexts. It also contained aspects of caution or still developing relational trust.

##### ***Trusting ICT Supports Learning***

Student teacher commentaries in 2008 and 2009 revealed a strong sense of trust in regard to the positive role ICT could play in supporting children's learning (section 7.3.1). The terminology used by student teachers when expressing their

views about ICT and learning included words characteristic of relational trust, such as belief, meaningful learning and benefit (Bolstad, 2004; Fisher et al., 2006; Hatherly, 2009). In this way, the belief that ICT is part of how learning in the 21st century occurs was reflected in student teacher commentaries. Student teachers expressed the view that ICT has a place in early childhood education. They implied that ICT is a part of the world children live in and considered it beneficial to young children's educational opportunities (Blackwell, Lauricella, Wartella, Robb, & Schomburg, 2013). The presumption that ICT was empowering for children, valuable in regard to supporting children's creativity and can also contribute to the development of children as lifelong learners was a common theme inherent in the student teacher commentaries.

### ***Trusting Children with ICT***

Around 18% of student teachers in both years spoke of teachers trusting children to use ICT (See section 7.3.2). They implied that teachers should trust young children to use ICT, and they portrayed small children as trustworthy and able to take care of ICT equipment responsibly (Ramsey et al., 2006a). Although the notion of teachers trusting children to use ICT was a feature of these student teacher commentaries, there was an inference that it may be difficult for teachers to develop this trust because this might be overshadowed by the need to keep children safe and the cost of replacing ICT equipment if it were to be broken.

### ***Concerns of the Role of ICT in ECE***

On the other hand, commentaries by 24% of student teachers revealed a level of uncertainty or reservation about the use of ICT in early childhood education. Student teachers indicated that they had not developed a sense of relational trust with ICT, and they described a sense of distrust through concerns about ICT taking over from other aspects of play, maintaining it should not form the foundation of early childhood programmes (Plowman & Stephen, 2003). They implied that there was a need for a balance between ICT use and other areas of the curriculum. They appeared to be concerned the curriculum might be 'hijacked' by ICT (See section 7.3.3).

## **8.4.1 Relational Trust – Teacher Perspectives**

Teachers' perspectives of relational trust contained aspects of trusting that technology played a positive role in children's learning and had relevant



connections to curriculum and trusting that it was safe for children to use by themselves.

### ***Trusting that ICT Supports Learning***

Trusting that ICT supported children's learning was the strongest theme to emerge from the teacher commentaries in regard to relational trust. Twenty-six teachers mentioned a variety of ways they used ICT in their teaching practice and inferred that it had the potential to reinforce children's current knowledge and provide opportunities to build on this (section 5.4). They indicated that ICT provided a range of trustworthy mediational means, which enabled them to respond quickly to children's enquiries and encouraged children to see themselves as capable and confident learners. This aligns with the notion of children learning to become confident learners through participation in experiences with people, places and things in *Te Whāriki* (Ministry of Education, 1996). In this way, teacher commentaries indicated a sense of trust that ICT played a valid role in early childhood education, contributing to children's dispositions to become lifelong learners in a manner similar to findings by Ramsey et al. (2006a). They alluded to the presence of relational trust through an inference that they trusted that ICT could legitimately bridge children's learning opportunities with *Te Whāriki*.

Teacher commentaries indicated a sense of trust that ICT played a valid role in early childhood education, contributing to children's dispositions to become lifelong learners. Teachers indicated that they trusted that ICT could contribute to fostering, teaching and learning and that was relevant for children today. They expressed that positive trusting relationships between technology, teaching and learning had been developed, which enabled them to trust that technology could contribute positively to early childhood education in a variety of ways (Mason & Lefrere, 2003; Ramsey et al., 2006a).

### ***Trusting that ICT Fits with Curriculum***

Connections to the early childhood curriculum were present in the teacher commentaries. Three teachers mentioned links between the use of ICT and aspects of the early childhood curriculum. They maintained that these connections enabled children to explore areas of the curriculum and created possibilities for them to direct curriculum interests through their own use of ICT. Inherent in these teacher commentaries was the notion of a democratic relationship made possible

through the use of ICT by children with teachers (Archard, 2012). They alluded to the presence of relational trust through an inference that they trusted ICT could legitimately bridge children's learning opportunities with *Te Whāriki*.

### ***Trusting that ICT use is Safe for Young Children***

Cyber safety featured in six teachers' commentaries. They expressed a sense of mistrust in relation to children having access to the Internet and implied concern about content that might be available to children. These teachers discussed the importance for early childhood centres to have good Internet safety policies in place (Li, Hess, & Valacich, 2008).

The potential lack of freedom for children to play and have fun on the Internet due to these issues was also evident in the teacher commentaries. Overall, these six teachers indicated that the freedom for teachers and children to explore ICT without being compromised by cyber safety issues was paramount to developing relational trust (Pavlou, 2003).

### ***Trusting Yourself to Use ICT***

Teacher commentaries highlighted confidence or trusting yourself to use ICT. Twelve teachers discussed the need to have the confidence and the ability to use ICT themselves before they were able to use it effectively with children. They believed that there was a need to build relational trust with the technology to enable them to integrate it into their teaching practice. These views correspond with Ottenbreit-Leftwich, Glazewski, Newby and Ertmer (2010), who maintain trusting relationships are strengthened when people don't feel vulnerable and are therefore more confident in their actions. They contend that teachers are more inclined to engage with technology when they feel confident to use it and trust that ICT will enable them to enhance children's learning experiences.

### **8.4.2 Concerns of the Role of ICT in ECE**

Five teachers described concerns that indicated a sense of distrust about some of the affordances of ICT. These teachers indicated that they thought too much exposure to computer games was not advantageous to children's learning and believed outdoors activities should be prioritised (Plowman & Stephen, 2005). Also inherent in these teacher commentaries was the notion that children should primarily learn about ICT at school.

In summary, student and teacher commentaries contained a number of aspects that contribute to the notion of relational trust with ICT. These included student teacher and teacher beliefs that ICT could contribute positively to children's learning, particularly when connections between ICT and the curriculum were evident. Concerns or a sense of mistrust about how much ICT should be used in teaching also featured in student teacher and teacher commentaries in relation to the importance of outdoor play, Internet safety and keeping a balance of ICT in curriculum areas.

## **8.5 ICT Cultural Tools – Student Teacher Perspectives**

The term 'ICT cultural tools' in this study is used to describe the kinds of ICT tools and Internet use that were used in ITE programmes and in early childhood settings. I first describe student teachers' views and concerns about the use of these tools and then go on to discuss the teachers' views and concerns.

### **8.5.1 Learning Tools**

The notion of ICT tools being framed as 'ICT cultural tools' was present in the 2008–2009 student teachers' data. Student teachers referred to ICT through terms such as 'learning tools' and 'teaching tools'. This implied that these tools formed a part of the culture of early childhood settings (Smidt, 2009). The potential for ICT as a cultural tool to enhance children's learning opportunities was a recurring theme present in the 2008 and 2009 student teacher commentaries. They positioned ICT cultural tools as learning tools that could bring an element of excitement and spontaneity to children's learning and position young children as capable confident learners, primarily through documentation such as learning stories. Conversely, student teachers did not mention children being capable users of ICT cultural tools on their own; rather, they mentioned ICT cultural tools being used with children, implying there was a need for adult facilitation.

### **8.5.2 Teachers' Responsibility**

Student teacher commentaries contained the view that teachers had a responsibility to make sure they could use ICT competently in their teaching practice. Student teachers mentioned the pervasive nature of ICT, meaning it was teachers' responsibility to understand the affordances ICT cultural tools had to offer so they could ensure they could use these to support children's learning.

### **8.5.3 ICT Cultural Tools and Professional Development**

A small number (six) of the 2008 student teachers mentioned the need for ongoing professional development on the use of ICT cultural tools. There was a common view that it was important for teachers to keep up to date with technology so they could use it effectively in teaching practice (Carr et al., 2007; Jimoyiannis & Komis, 2007).

### **8.5.4 Concerns**

ICT cultural tools not adding value to children's learning featured in five student teachers' commentaries (four in 2008 and one in 2009). They mentioned feeling concerned about the purpose and value of the ICT cultural tools and indicated a sense of uncertainty about the possible length of time children might spend with ICT cultural tools. It was expressed that, if there were no specific learning goals and outcomes for the use of ICT cultural tools, they had the potential to just become time-consuming entertainment, distracting children from engaging in other areas of the curriculum.

## **8.6 ICT Cultural Tools – Teacher Perspectives**

Teachers' perspectives on ICT cultural tools included that tools were effective for supporting learning and are a part of children's culture today and relevant to 21st century learners. 8.6.1 Learning Tools

Eleven teachers mentioned the notion of ICT cultural tools in the teacher commentaries. They maintained that ICT cultural tools were ingrained in today's culture and therefore were a part of many children's lives today. Inherent in these teachers' commentaries was the notion that ICT cultural tools are used by 21st century learners (Ottenbreit-Leftwich et al., 2010). Teacher commentaries implied that these 11 teachers considered ICT cultural tools were their 'tools of the trade', in other words, tools that formed a part of the culture of teaching and learning in their early childhood settings (Somekh, 2008). They indicated that these tools responded to learning in the 21st century and considered them legitimate tools to use in early childhood education (See section 5.5).

In summary, student teacher and teacher commentaries implied that ICT cultural tools were an accepted part of the culture of early childhood settings. Student teachers suggested that teachers had a responsibility to fully understand what ICT

could offer in relation to enhancing children's learning opportunities. Student teacher commentaries indicated that, if teachers understood the benefits of ICT cultural tools, they would be positioned to use them as valuable tools, which could contribute to both children and adult learning.

## **8.7 Enjoyment**

Enjoyment refers to student teachers and teachers displaying a sustained interest in the use of ICT in their teaching pedagogy, enabling them to feel a sense of fun and enjoyment whilst engaged with the ICT tools. The notion of enjoyment did not feature highly in the 2008–2009 student teacher or teacher commentaries. Some mentioned aspects of ICT use as fun or exciting; however, there was no mention of being engaged with ICT for periods of time that might constitute genuine enjoyment (Csikszentmihalyi, 1990). Both the student teacher and the teacher commentaries suggested that there were not opportunities to engage with ICT for sustained periods as might be the case when motivated by the notion of enjoyment (Shernoff, Csikszentmihalyi, Shneider, & Shernoff, 2003). This perceived lack of time or space might be an attribute of the structure of the ITE programme and due to time constraints and work demands for teachers in the early childhood settings.

## **8.8 Student Teachers and Teachers Sociocultural Views of ICT Use**

Student teachers and teachers comments indicated that they were conceptualising children's learning with ICT as a social and relational process (Bell, 2012; P. Kelly, 2006; Smidt, 2009). Inherent in the student teacher and teachers comments was the view that learning with ICT was a process which required opportunities to work collaboratively on a joint enterprise. This understanding is congruent with that of Johnson (2007) who argues that sociocultural views of learning with ICT include an understanding of the interconnectedness of the cognitive and social aspects of learning. There were examples of student teachers, teachers and children using ICT in a relational manner in the data to build and sustain relationships with children and families (See sections 5.2.3 and 6.4.1).

Student teachers and teachers positioned ICT as a cultural tool or a means through which learning was mediated in ways that were different from other more traditional other mediational tools such as books and conversations (Werstch

1991), through greater use of visuals and more immediacy. There was evidence in the data that student teachers and teachers appropriated ICT tools. They made them their own in order to achieve particular pedagogical purposes. For example student teacher and teachers mentioned using PowerPoint presentations to share children's experiences with families in an informal manner. These were in the form of rolling presentations of images of children's activities and experiences through the day (See sections 5.2.3 and 6.2.1). This type of use of ICT fits with the notion of learning *about*, *with* and *through* ICT posited by Earl and Forbes (2012). Earl and Forbes argue that ICT users must learn *about* how to use ICT and to understand how ICT use can influence the learning context. In my example, teachers needed to learn how to use PowerPoint to create a presentation that was informative for families. Learning *with* in education contexts involves using ICT to complement other pedagogical practices. In my example the PowerPoint complemented conversations that took place while children were being picked up. Finally the PowerPoint example includes what Earl and Forbes identify as learning *through* ICT because teachers presenting what children had done during the day would not have been possible without the use of ICT.

Student teacher and teacher views were compatible with the notion that the appropriation of ICT for pedagogical purposes is a participatory process linked to experience and or observation of ICT use in action. Both groups commented that ICT use could have both positive and negative influences but their commentary emphasised the benefits. The findings presented in Chapters 5, 6 and 7 illustrate that it was taken up in a range of ways, which included the emotional aspect of enjoyment as articulated by some student teachers and teachers.

## **8.9 Chapter Summary**

The use of ICT to document assessment information for children and families dominated student teacher and teacher commentaries. As mentioned earlier, this is not surprising given the shift to a narrative method of assessment in response to the development of *Te Whāriki* and supporting resources such as *Kei Tua o te Pae*. This said, much of the teacher data revealed assessment documentation was created without a clear pedagogical purpose for how this would engage children in critical thinking and deeper levels of learning.

Student teacher and teacher commentaries revealed an understanding of affordances of technology to capture and display learning; however, the technological use of the tools overshadowed their pedagogical purposes. Student teacher perception of use and teacher use appeared to be anchored in the notion of learning about ICT described by Earl and Forbes (2012) and did not feature an understanding of learning with ICT to complement their pedagogical practice. However, student teachers and teachers did make connections to the relational affordances of ICT and the relational nature of *Te Whāriki* through their applications of a range of ICT tools to build and sustain relationships.

The absence of a clear articulation of the pedagogical affordances of ICT in the student teacher and teacher commentaries raises questions about how student teachers and teachers appropriate ICT within ITE and early childhood centres. Although student teachers and teachers spoke about what they used ICT for, many did not articulate how they used ICT or describe the pedagogical purpose of the ICT tools that they used. These findings highlight the need to ensure student teachers and teachers have a sound pedagogical understanding of technology affordances and are able to appropriate and integrate ICT into their teaching practice.

The themes subjective norms, relational trust, ICT cultural tools and enjoyment were present in the student teacher and teacher data with similar views expressed by both student teachers and teachers. All four themes have relevance to the broader understanding of sociocultural views of learning and aspects that might contribute to insights into student teachers' appropriation and integration ICT into their teaching practice. Subjective norms featured predominantly in the student teacher and teacher commentaries. The student teachers' subjective norms were based on the notion of 'what they would have liked' to have learned about ICT in their ITE programme, whereas the teachers' subjective norms emerged on the premise of 'what they do' in their teaching practice. These perspectives reflect student teachers' developing understanding of pedagogy and practice and the views of practising teachers in the sector on how they learned to use ICT in their workplaces.

The role of relational trust was evident in the student teacher and teacher commentaries in regard to student teachers and teachers developing trusting relationships between technology, teaching and learning. For example, their commentaries included mention of trusting ICT-supported learning, trusting it was safe for children to use and trusting it was able to be linked to curriculum. In contrast to the positive views about relational trust, a small number of student teachers and teachers raised concerns about the safety of the Internet and the possibility of ICT taking over from other areas, indicating a sense of distrust.

ICT cultural tools as tools to support children's learning were present in the student teacher and teacher data. This indicated that student teachers and teachers were aware of the growing expectations of use of ICT tools in children's lives and education, particularly given an increased ICT awareness and use in children's daily lives. The limited mentions of enjoyment in the student teacher commentaries may indicate lack of time and space for sustained enjoyment with ICT to occur within the ITE programme or in teachers' workplaces.

Whilst some of these four themes featured more predominantly in the data than others, all play a part in the overall understanding of how the student teachers and teachers perceived these themes contributed to their understanding of the use of ICT in their teaching practice. The next chapter describes TEAM, a sociocultural model for appropriation of ICT in ITE programmes, developed from the student teacher and teacher findings.



# **Chapter Nine: TEAM – A Model for Teacher Appropriation of ICT**

## **9.1 Introduction**

This chapter responds to Research Question Three below:

- Taking into account the sociocultural orientation in New Zealand towards ECE curriculum design, what might be the nature of a model to facilitate student teacher and teacher appropriation of ICT for pedagogical purposes?

Earlier, I argued that there is a need for a sociocultural model that could be used by early childhood ITE providers to facilitate student teacher appropriation of ICT for pedagogical purposes. Conceptual frameworks and models are described in a number of ways in the literature. For example, Jabareen (2009) describes conceptual frameworks and models as “products of qualitative processes of theorization” (p. 50). He posits that conceptual models or frameworks can be used to represent key concepts that arise during analysis of qualitative data and the relationship between these concepts. Fisher, Denning, Higgins and Loveless (2012) propose that conceptual frameworks and models can offer “ways of describing and thinking about” different aspects of research that might influence educational practice (p. 307).

It is my hope that TEAM will provide early childhood initial teacher educators with a model that they can use to facilitate student teacher appropriation of ICT for pedagogical purposes. In this chapter, I draw on the findings from the student teacher and teacher data and the literature to set out and explain the Teacher Education ICT Appropriation Model (TEAM).

TEAM was developed as a model that encompasses student teachers’ and teachers’ views at the time the data were collected and analysed in this doctoral study. It portrays a sociocultural framing of teaching and learning because this underpins the early childhood curriculum, assessment and pedagogy in Aotearoa/New Zealand and more widely. I hope that TEAM will be used by early childhood ITE providers to gain insight into and generate conversations about how student teachers and teachers appropriate ICT for pedagogical purposes as

part of professional learning programmes. In proposing TEAM, I am aiming to provide a model that will not only contribute to early childhood ITE providers' understanding of ICT appropriation but also provide a model that might be used to inform curriculum design in ITE programmes more generally so that these better support and enable student teacher appropriation of ICT as part of their pedagogy.

TEAM accounts for the wider context for ICT use in the early childhood sector as set out in Chapter Two. It sets out four elements, or mediational means, that I identified in the student teacher and teacher data and were discussed in Chapter Eight. These elements are subjective norms, relational trust, ICT cultural tools and enjoyment. Each of these aspects is discussed in detail in the following sections, and connections are made to the four models from the literature that was described in Chapter Three: Concerns Based Adoption Model (CBAM), Technology Acceptance Model (TAM), Substitution, Augmentation, Modification and Redefinition Model (SAMR) and Technological Pedagogical Content Knowledge Model (TPACK).

I begin by reiterating three features of sociocultural theory in relation to the appropriation of ICT and then describe the elements of the TEAM model.

## **9.2 A Sociocultural Framing for ICT Appropriation in ITE**

As outlined in Chapter Two, the early childhood curriculum and curriculum support materials in New Zealand are strongly framed within a sociocultural view of learning. TEAM is underpinned by the view that a sociocultural approach to participatory appropriation of ICT into ITE has at least three features:

- It is consistent with a view of learning as situated in social relationships with others within learning and caring communities.
- ICT is seen as a cultural tool, one of the key mediational means for understanding across a number of cultural sites (for example, ITE and an ECE centre); its use has ethical, political and community-building aspects that may be different from other mediational tools (activities, books, conversations).
- The use of ICT will change an individual's goals: learners make it their own in a range of embodied and affective-emotional ways (See section 2.6.1).

TEAM therefore is strongly situated within a sociocultural theoretical perspective on teaching and learning. A sociocultural orientation to teaching and the notion of learning about, with and through ICT use within early childhood education takes account of the situated, social, material and historical context of and for learning (Wertsch, 1991).

In conceptualising TEAM, there were a number of facets of the context that it was important to be aware of. Firstly, student teachers undertake practicum within early childhood settings whose culture and practice is influenced by local, national and global factors (Dale, Robertson, & Shortis, 2004). Secondly, student teachers bring their own attitudes, beliefs and experiences of learning from within and outside early childhood settings and their campus-based courses to their practicum experiences. Thirdly, all ICT tools are developed within a particular sociocultural environment and carry with them the provenance of that culture, which is not always or necessarily focused on teaching and learning (Sutherland et al., 2004). For example, PowerPoint was developed primarily for use within a business context, and the pre-set templates can push users towards business genres of presentation. This said, it needs to be remembered that ICT cultural tools are appropriated in the different contexts of their use for different purposes and that they are continually upgraded and refined to meet the growing demands and pressures of society (Sutherland et al., 2004). Therefore, to enable student teachers to keep up to date within this environment of change, it is important to have an understanding of appropriation rather than mastery. It is this that enables student teachers to integrate relevant ICT tools into their teaching practice in ways that are responsive to their students and to take advantage of the affordance of ICT tools as they continue to be shaped and developed.

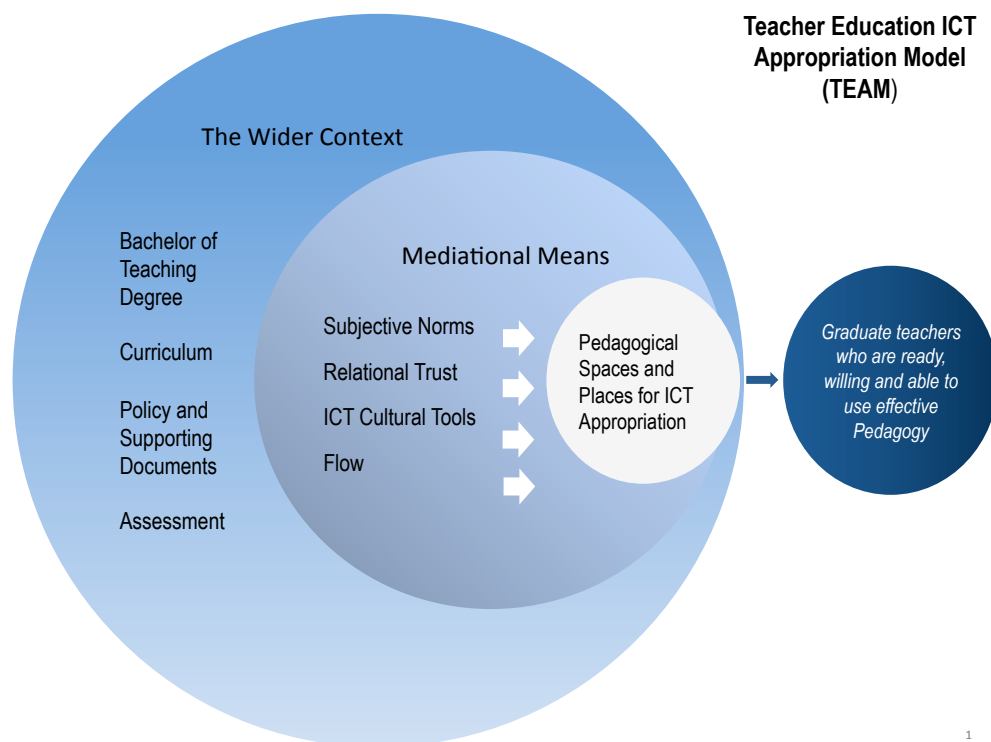
Vygotsky (1980) proposes that, within a view of learning as a social process, an individual's behaviour impacts on others as well as on how people live communally in family groups. TEAM responds to the notion of learning as a social enterprise by taking into account social context for sharing ideas and learning that exists in early childhood settings in New Zealand. Within TEAM, this aspect involves recognition of the value of and opportunities to work collaboratively.

The notion that tools mediate all human action is a key aspect of sociocultural theory and of TEAM. In TEAM, I have interpreted Vygotsky's notion of tools as including ICT. I use Fisher et al. (2012) to explain the notion of technologies as a complex set of ICT cultural tools that can contribute to learning. I drew on Laffey (2004) to highlight the difference between mastery and appropriation of such tools (See sections 1.3 and 2.6.1). In TEAM, student teachers' appropriation of ICT in their teaching practice is taken to imply that student teachers not only make use of ICT as a tool, they also make it their own for their own pedagogical purposes (Laffey & Espinosa, 2003).

In summary, TEAM was designed to build on the sociocultural view of learning as a socially situated, goal-oriented activity that involves the dynamic interaction between people and tools that are both a means and ends for learning and teaching.

### **9.3 Detailing the Elements of TEAM**

Within TEAM, it is proposed that student teacher (and teacher) learning and use of ICT for pedagogical purposes is shaped and framed by the wider policy context and the ITE programme, in this instance, the early childhood education policy and practice in New Zealand and the Bachelor of Teaching (ECE) programme that student teachers experienced. The literature review provides an overview of this context (See section 2.3). This wider context influenced the four mediational means identified in this study – subjective norms, relational trust, ICT cultural tools and enjoyment. It is proposed that these need to come together to support the appropriation of ICT for pedagogical purposes and that they constitute the space and place for the appropriation and integration of ICT for pedagogical purposes. The diagram below provides an overview of these components.



**Figure 5 TEAM**

The hypothesis that underpins the model is that, when the three elements of the context detailed in the left-hand circle of Figure 5 come together within an ITE programme, they contribute to the preparation of student teachers who have a sound understanding of the affordances of technology for pedagogical purposes and who are able to appropriate and integrate it into their teaching practice, hence, developing effective pedagogy. I now describe the elements of TEAM in detail.

### **9.3.1 The Early Childhood ITE, Curriculum, Policy and Assessment Context**

Whilst the minimum early childhood teacher qualification is a Diploma of Teaching ECE, most ITE provider entry-level qualifications in New Zealand are at the Bachelor of Teaching level. This content of ITE programmes is influenced primarily by *Te Whāriki*, which was introduced in 1996 but mandated by the New Zealand Government in 2008. The Graduating Teacher Standards introduced in 2008 (New Zealand Teachers Council, 2008) detail what graduating student teachers should have learned whilst gaining their qualification. Ministry-funded supporting documents such as *Kei Tua o te Pae* (Carr et al., 2007), which provide examples of learning stories, have had a significant influence on how learning is documented and represented. External auditing of early childhood services by the

Education Review Office is another influence on the early childhood context – both in practice and in initial teacher education. These factors are included in TEAM as they establish the context for teaching and learning. Specifically, they establish early childhood education as a context in which a relational pedagogy, narrative assessment and ICT are valued.

### **9.3.2 Mediational Means and TEAM**

The four mediational means identified in TEAM are derived from teacher and student teacher commentaries on what supported their wanting to use and their use of ICT. They are subjective norms, relational trust, ICT cultural tools and enjoyment. Here, I conceptualise these as the mediational means that will contribute to the appropriation and integration of ICT into teaching practice when they are present in an ITE programme.

#### ***Subjective Norms***

In this study, I was interested in the extent to which teachers and student teachers thought others (such as peers and or lecturers) believed technology use was an important and valid aspect of pedagogy in early childhood teaching. In TEAM, the notion of subjective norms encompasses the notion and extent that student teachers perceived learning about ICT should be part of their ITE programme (See section 7.1) and the extent that teachers said it was an important aspect of their teaching practice (See section 5.3).

The notion of subjective norms was introduced and explained in Chapter Three as part of the description of TAM. To recap, subjective norms are attitudes that affect behavioural intentions. They are influenced by the expectations and beliefs of others of the importance or value of a particular behaviour or action (Ajzen & Fishbein, 1980). Not only are subjective norms a key feature in TAM, they are also inherent in CBAM in the guise of individual attitudes and beliefs (Straub, 2009). The notion of subjective norms also takes into account perceived social pressure to perform or not to perform certain actions. This perceived pressure reflects an individual's perception that those who are important to them, for example, their peers, would approve or disapprove of their actions (Ajzen & Fishbein, 1980; Venkatesh & Davis, 2000).

As part of TEAM, subjective norms are used to encompass the priority that sociocultural views place on the situated and social nature of learning and action. The focus is on shared understandings rather than on individual constructions (Chiou, 1998). The majority of student teacher and teacher participants in this study endorsed the importance of ICT use and learning within early childhood ITE programmes and early childhood education services.

### ***Relational Trust***

Trust features strongly in TAM; however, in that model, it is focused on the trustworthiness of the ICT systems. In TEAM, due to its sociocultural framing, the emphasis is on trust as a relational process. Hall and Hord (2011) and Bryk and Schneider (2002) propose that relational trust is embedded in the interpersonal social exchanges that take place within a community, such as a school. These exchanges might be from principal to teacher, principal to parent, teacher to teacher, teacher to student or teacher to parent. Respect, personal regard for others and integrity form the basis of relational trust. In TEAM, I adapt this relational aspect to encompass the trust that teachers and student teachers have in the value of ICT for teaching and learning.

In TEAM, relational trust includes lecturer, student teacher and teacher trust. There is a positive three-way relationship between technology, teaching and learning. For student teachers, relational trust is taken to refer to the trust they have developed that ICT can support children's learning and development and that it can be integrated into their own developing pedagogical practice (See section 7.3.1). For teachers, the findings in section 5.4 indicated that many of the teachers who were interviewed trusted that their technology use supported children's learning and development. Examples of this trust included the use of the Internet to access information in response to children's enquiries and to provide children with access to new ways of learning (See section 5.4).

Relational trust in TEAM takes into account the notion that (student) teachers who trust that ICT will make a difference to children's learning are more likely to engage with it. In other words, if they trust in the value of ICT enough, they will 'give it a go'. Specifically, the inclusion of relational trust as one of the mediational means in TEAM is intended to provide a platform to highlight student teacher trust in the value of ICT – a focus for consideration in the design of ITE

programmes. Teachers make professional decisions daily about the use of ICT in their teaching practice based on their belief and trust that particular actions will be of value/benefit (Ottenbreit-Leftwich et al., 2010). Attention to relational trust has the potential to foreground, challenge and develop student teacher relationships with technology and to contribute to their appropriation of it for pedagogical purposes.

### ***ICT Cultural Tools***

Within TEAM, the concept of ICT cultural tools is based on Vygotsky's (1980) notion that tools play a role in learning. This sociocultural view of ICT cultural tools is expanded by Fisher et al. (2012), who posit that technology can be considered "a complex set of cultural tools or 'mediational means' (Wertsch, 1998) with particular context related affordances, enabling or assisting 'subjects' (teachers, students) to engage in purposeful activities related to learning" (p. 311). Puentedura (2006) alludes to the notion of technology as cultural tools in SAMR. Within SAMR, Puentedura describes 'technology tools' as a part of a process of moving from 'substitution' to 'redefinition'. I have drawn on these views of cultural tools and reframed them to represent the aspects of student teacher and teacher views in the data that focus on the notion of 'tools' and 'ICT cultural tools'.

TEAM takes the stance that different ICT tools have different affordances, and the specific affordances of the different ICT tools contribute to the nature of the mediation process they enable as part of teaching and learning (Bell, 2012). The argument here is that the various ICT tools that teachers and others use within early childhood settings form a part of the teaching and learning culture of 'their place'. Examples from this study are digital cameras, computers, PowerPoint, blogs, e-portfolios and digital images (See sections 5.2.1 and 5.2.2). Student teachers identified a similar set of tools (See section 6.2.1). For ITE providers, this factor means that student teachers' learning about ICT needs to include learning about the affordances of the various tools practising teachers are using within their centres/settings. Student teachers certainly thought this was the case; their comments indicated an understanding of how the different affordances impacted their appropriation of ICT cultural tools that could be integrated to their teaching and learning practices (See section 7.4).



### ***Enjoyment***

The notion of enjoyment does not explicitly feature in CBAM, TAM, SAMR or TPACK, but I propose it here as relevant to ICT appropriation and thus relevant to TEAM. Vygotsky (1980) proposed that individuals experience emotions, such as enjoyment, when engaged in sustained activities and learning (see also Villamil & de Guerrero, 2006). In this study, enjoyment is used to encapsulate the sense of excitement and fun that student teachers and teachers experienced as they engaged with new ICT tools and explored the affordances they offered for enhancing different aspect of pedagogy.

The inclusion of enjoyment in TEAM recognises the affective dimension of learning about and teaching with ICT. While enjoyment and fun did not feature strongly in the teacher or student teacher commentaries, it was raised as part of ICT use (See sections 5.6 and 7.5). The inclusion of this affective element in TEAM is intended to signal that ITE providers need to consider carefully the level of challenge and relevance of the activities they provide. For enjoyment to be present in the use of ICT as part of teaching and learning, which is desirable, there must be places and spaces for concentration, exploration and pursuit of personal interest. Ideally, these spaces and places will be experienced within an ITE while on campus and during practicum (Chai & Lim, 2011; Sutton, 2011). To reiterate, the assumption within TEAM is that the goal is to provide spaces and places where participants can concentrate and become engaged in ICT-based activities, be inspired to develop a genuine interest in ICT tools and experience opportunities to use these tools in ways that allow them to feel a sense of enjoyment.

## **9.4 Pedagogical Spaces and Places for the Appropriation of ICT**

In TEAM, the notion of ‘pedagogical places and spaces’ is used to describe the sites of development within early childhood ITE programmes and early childhood services where the four mediational means come together to enable student teachers and teachers to appropriate ICT tools and integrate them into pedagogy. SAMR infers teachers need time and space to explore technology and enable them to progress through the levels or stages to develop the knowledge needed to be successful users of ICT (See section 3.4). The notion of a developmental progression for ICT use is central to SAMR, which posits that, when learning to use ICT for educational purposes, teachers move through a progression of stages

to gain knowledge as they develop their use of technology in and for their teaching practice. Student teachers made comments that indicated they wanted places and spaces in their ITE programme to allow them to develop their use of ICT. For example, student teachers indicated that they would have liked space within their programme to explore learning through hands-on experience with ICT to explore the pedagogical uses of games and the multimodality of ICT. It is evident in the student teacher data that having time and space to explore ICT within ITE programmes was important, as once student teachers graduate and become beginning teachers in ECE centres, they considered there would not be time or space to do this (See sections 7.2.1 and 7.2.3). The teacher data revealed teachers had to learn how to use ICT on the job, with an indication that the support of other teachers was critical in this process (See section 5.3).

In proposing the need to consider spaces and places, TEAM draws on work by Harrison and Dourish (1996). They described the distinction between space and place as “Physically, a place is a space, which is *invested with understandings* of behavioural appropriateness, cultural expectations, and so forth. We are *located* in ‘space’ but we act in ‘place’. Furthermore, ‘places’ are spaces that are valued” (p. 69). We can see from this that Harrison and Dourish characterise the relationship between space and place as a social one, as they suggest that people, through their perception of a space and their social interactions within it, transform spaces into places. Place is therefore a space with meaning. In TEAM, the pedagogical spaces and places referred to as part of an ITE programme have meaning for student teachers in relation to how they learn to appropriate ICT into their teaching practice. The opportunities they have for learning involve more than physical spaces; they involve opportunities whereby learning is understood and takes place through participation and social interaction. Hence, the setting for ICT use is conceptualised as a place and a space for teaching and learning to happen as social and mediated processes. Student teacher commentaries (See section 7.2.1) suggested that pedagogical spaces and places that provide opportunities for their learning and use of ICT would include opportunities:

- for hands-on practical experiences with the use of ICT for teaching and learning purposes

- to engage in conversations and reflections that will contribute to their understanding of affordances of ICT in relation to their developing teaching practice (that is, positive subjective norms for ICT use in their early childhood ITE)
- to explore the use of new ICT tools (that is. to explore new ICT cultural tools).

Teacher commentaries (See sections 5.3 and 5.4) indicated pedagogical places and spaces that were effective in supporting their learning to use and use of ICT, including opportunities:

- to build knowledge through learning as a social process where this included access to people with pertinent expertise (subjective norms)
- to develop their confidence and trust with ICT as a pedagogical tool (relational trust).

In thinking about how learning happens in these spaces and places, I draw on the notion of appropriation, which is a fundamental aspect of the sociocultural view of learning. The appropriation of ICT, as the term is used in TEAM, is based on the notion of a reciprocal relationship between users and tools; in this case, that the interaction between a user and an ICT tool is one of mutual influence. In TEAM, the appropriation of technology is understood as a social process and is based on subjective norms whereby student teacher actions and thoughts about using technology are shaped by the technology (ICT cultural tools), and the meaning and effects of the technology are shaped by student teachers' beliefs and actions (relational trust and enjoyment). Thus construed, effective pedagogical spaces and places in TEAM afford opportunities for conversations about the ideas, methods and practices relating to technology use in teaching and learning and opportunities to explore what they can do (Kolb & Kolb, 2005).

## **9.5 Understanding the Development of Effective Pedagogy**

As outlined in Chapter Two, ICT has a valid and important role to play in enhancing teaching and learning in early childhood settings. Understanding how to support student teachers to graduate ready, willing and able to use ICT effectively as a part of their pedagogy is the main goal of this study (See section 1.1). A key aspect of TEAM is that learning about effective pedagogy should be

woven through all aspects of ITE programmes; in other words, the teaching and learning about pedagogy should be part of on-campus courses and student teachers' practicum experiences (Li, Guy, & Holen, 2006). This section sets out findings to do with the features of pedagogy that the teachers and student teachers in the study identified, thereby highlighting the influence of the outermost circle of TEAM. These features are described below.

- pedagogy as a practice that incorporates ongoing assessment
- pedagogy as a knowledge-based practice
- pedagogy as a relational practice

### **9.5.1 Pedagogy as a Practice Incorporating Ongoing Assessment**

Assessment featured strongly in both the student teacher and teacher data (See sections 5.2.1 and 6.2.1) as a pedagogical practice that was usefully supported by a variety of ICT tools. TAM contends that the acceptability of a technology information system is determined by two key influences: how users perceive its usefulness and how easy it is to use. Aspects of both of these influences were evident in teacher and student teacher descriptions of the use of ICT for documenting assessment. As noted in Chapter Two, learning stories are a narrative form of assessment that is the predominant form of assessment used in ECE settings in New Zealand (Carr & Lee, 2012), and so, unsurprisingly, narrative assessment documentation practices were the predominant assessment strategy described. Both student teachers and teachers reported that their use of technology enhanced their assessment documentation by bringing it alive, enabling them to share children's learning easily with families. They identified affordances arising from:

- the use of digital images to capture and share children's learning
- PowerPoint slideshows to share aspects of the children's day informally with families
- videos that captured learning events
- the Internet, which allowed fast access to a body of information.

Teachers spoke of the value of digital cameras in capturing and displaying photographs as part of learning stories to represent students' learning to themselves and to others (See section 5.2.1). They indicated that the

documentation process included teachers encouraging children to direct what aspects of their learning they wanted teachers to document and/or children themselves playing an active role in the documentation process. Teachers also indicated that student teachers should be able to use ICT for assessment purposes in meaningful ways when they graduate from their ITE programme (See sections 5.2.1 and 6.2.1).

### **9.5.2 Pedagogy as a Knowledge-Based Practice**

Shulman (1987) emphasised that teaching is a knowledge-based practice. He developed the notion of pedagogical content knowledge as the unique form of ‘know how’ for teaching. This is a blend of content and pedagogical knowledge that allows a teacher to support the learning of particular children in a particular setting. Mishra and Koehler (2006) extended the pedagogical content knowledge model to include technological knowledge. They posited that teachers’ expertise for the pedagogical use of ICT involves a blend of technological knowledge, pedagogical knowledge and content knowledge, which they called technological pedagogical content knowledge. The teacher data revealed teachers had ‘know how’ in relation to ICT use that contained aspects of technological knowledge, pedagogical knowledge and content knowledge. There is evidence that the technological knowledge they commented on included understanding of the affordances of different ICT tools. For example, the pedagogical content knowledge the teachers described included how ICT could be used for literacy and maths activities (See section 5.2.3). The features they identified as beneficial for children were the ability to create books about trips the children had been on outside of the ECE centre, literacy and numeracy computer games and the use of digital images and labels to support name recognition. Teachers also indicated that ICT provided an efficient and effective tool for developing their own content knowledge through their use to research teachers’ and children’s questions. Student teachers wanting to develop a knowledge base for technology use can be seen as the complement to these teacher commentaries. The student teachers talked about wanting to learn how to use ICT for pedagogical purposes and to explore the affordances and possibilities of different ICT tools in supporting their developing pedagogy (See section 7.2.1).

### **9.5.3 Pedagogy as a Relational Practice**

Bell (2012), writing within a sociocultural frame, describes nine features of pedagogy: teaching as a relational practice, a social practice, a cultural practice, an emotional practice, a caring practice, an ethical practice, an embodied practice, a spatial practice and a political practice. The participants in this study described actions associated with one of these pedagogies as a relational practice. Not surprisingly, this aspect resonates closely with effective pedagogy as characterised in *Te Whāriki* and other ECE policy documents (Carr et al., 2007). Early childhood pedagogy in New Zealand has been described as the pedagogy of relationships (Clark & Grey, 2010). As such, it takes into account the reciprocal relationships between teacher, learner and family. Further, a relational approach to pedagogy in early childhood education in New Zealand recognises the holistic nature of learning and acknowledges that education and care are integrated and that learning, development and children's experiences are interrelated (Lee et al., 2013). The notion of relational pedagogy and ICT is foregrounded by Sutherland-Smith and Saltmarsh (2010), who posit that relationships play an important role in teacher pedagogy, particularly in the context of technology use. Teacher and student teacher data in this study emphasised the role of ICT in teaching as a relational practice. ICT was said to play a valid and vital role in developing and sustaining relationships between home and the early childhood service and between teachers, student teachers and children. Examples of relational pedagogical practice included student teachers and teachers using ICT to build and sustain relationships with families through PowerPoint presentations, and across contexts outside of the centre by using Skype, which enabled teachers and children to connect across different time and spaces (See sections 5.2.2 and 6.2).

## **9.6 Conclusion**

Pedagogy that takes advantage of the affordances of available technology is the desired outcome within TEAM. The model aims to take account that the technical aspects of teaching and learning with technology are not enough. Based on the data from this study, it recognises that ICT readily and productively affords the conduct of teaching as a knowledge-based practice, as a practice incorporating ongoing assessment and as a relational practice. When developing TEAM, it was important to acknowledge the well-established pedagogies that exist in New

Zealand early childhood centres (Mehanna, 2004), and hence the finding that pedagogy has knowledge, assessment and relational aspects is not surprising in the New Zealand policy and practice setting. Moreover, these aspects are congruent with sociocultural theory (Bell, 2012; Smidt, 2009). Put simply, effective pedagogy, as reflected in the views of the participants in this study and thus as encompassed in TEAM, has knowledge, assessment and relational aspects consistent with a sociocultural view of learning. The assumption in this model is that effective pedagogy is developed in learning environments that include spaces and places for student teachers to collaborate, explore and learn how to appropriate ICT into their teaching practice (Kuriloff, 2005).

## **9.7 Chapter Summary**

In this chapter, I have set out TEAM, which is intended to support initial teacher educators in their thinking about how to support student teachers to appropriate and integrate ICT for pedagogical purposes during their early childhood ITE programme. I began by giving a brief overview of the connections and gaps in the four models that are commonly used to explain aspects of technology adoption and use: CBAM, TAM, SAMR and TPACK. Then, I described the themes that were identified in the findings of this study.

Next, I introduced and justified my argument for the elements of TEAM as a technology appropriation model that is founded on a sociocultural view of learning that acknowledges and provides for the social nature of teaching. Each of the elements of in the TEAM model aims to explain the various factors influential in the appropriation of ICT for pedagogical purposes. Specifically, the pedagogical spaces and places that allow for appropriation of ICT are mediated through subjective norms, relational trust, ICT cultural tools and enjoyment. Findings suggest effective pedagogy contains aspects of knowledge-based pedagogy, of assessment practice and relational pedagogy. The model aims to explain how, in the context of early childhood ITE programmes, pedagogical places and spaces need to provide opportunities for enjoyment with and exploration of ICT. This is important when the anticipated outcome of an ITE programme is student teachers' appropriation and integration of ICT into their pedagogy. This thesis has developed a literature and evidence-based model for ICT use as a mediational means for learning in ITE in those cases where the

curriculum that student teachers are being prepared for is socioculturally framed. Sociocultural constructs are increasingly common in early childhood curriculum documents (New Zealand and Australia provide examples). Hence it is anticipated that TEAM will provide criteria and constructs that will inform the use of ICT in ECE ITE programmes so that student teacher teaching practice evolves to include the use of ICT for pedagogical purposes in a manner that incorporates ICT use as part of ITE pedagogy.



## **Chapter Ten: Conclusion and Implications**

### **10.1 Introduction**

This last chapter provides an overview of the study as a whole. First, I reflect on the study in terms of its stated purpose and process. Then, I provide a summary of findings and set out the study's contribution to understanding how student teachers can be supported to appropriate and integrate ICT for pedagogical purposes. Next, I identify the limitations associated with the study. The implications of the research for ITE providers, student teachers, teachers and policy makers are discussed and suggestions for further research are made.

### **10.2 Reflecting on the Study**

This thesis explored early childhood student teacher and teacher views about the use of ICT in relation to teaching and learning and how student teachers might be supported to appropriate and integrate ICT into their teaching practice. The intention was to gain an insight into their perspectives in order to develop a model that could inform ITE providers about ways to foster purposeful student teacher appropriation and integration of ICT. A lack of empirical evidence in this area raised the need to investigate the personal and professional factors that student teachers and teachers consider contribute to their use of ICT in early childhood settings. Whilst there is a large body of literature relating to ICT use, there was a gap in our understanding of ITE teacher preparation in regard to the appropriation and integration of ICT for pedagogical purposes in early childhood education, all the more so when the curriculum and learning is viewed from a sociocultural perspective.

I drew on an interpretive paradigm for this research as this enabled me to gain an insight into participants' experiences with ICT and the sense they made of these. Furthermore, interpretive research is compatible with the sociocultural view of learning that underpins the early childhood curriculum and policy in New Zealand and elsewhere. Semi-structured group and individual interviews with teachers and analysis of student teachers' online contributions enabled me to hear their voices and accounts of their experiences with ICT. I employed thematic analysis to identify the significant categories within the data. Through this process and my analysis of the literature (including existing models), I was able to describe the

range of pedagogical purposes student teachers and teachers had for ICT and to delineate four themes related to influences on their use of ICT for pedagogical purposes: subjective norms, relational trust, ICT cultural tools and enjoyment.

The findings provided evidence that student teachers' and teachers' pedagogical use of and experiences with ICT are varied. Participant commentaries indicated that both student teachers and teachers valued the multimodal nature of ICT, which enabled teachers and children to document and represent children's learning in a range of engaging ways. Student teachers and teachers also discussed other pedagogical uses of ICT within an emergent curriculum: building and sustaining relationships with children, families and others; supporting children's literacy learning; and supporting children's inquiry. It was also used for their own professional learning and development purposes.

How student teachers and teachers learned to use ICT was an important focus for the research. The research found that the student teachers wanted to learn more about ICT use within their ITE programme and that, whilst they took part in online discussions about ICT use in one paper, ICT use was not explicitly connected into their practicum experiences or to other papers in their ITE programme. Early childhood teachers indicated that learning on the job with the support of colleagues was central to how they learned to use ICT for teaching and learning purposes.

Finally, the researcher developed a model to help ITE providers understand and support student teachers' appropriation of ICT. Whilst the four theoretical models explored in this study contribute to understanding how individuals learn to use and use technology, none of these four models was developed solely for the purpose of understanding how student teachers appropriate ICT within ITE programmes. None of them has a sociocultural orientation, and hence none is consistent with New Zealand early childhood policy and practice. The TEAM model developed in this study, aims to address this gap.

In summary, this study was able to develop answers to these research questions:

- How do student teachers and teachers use ICT for pedagogical purposes?
- How do student teachers and teachers consider they are/can be supported to learn to use ICT?

- Taking into account the sociocultural orientation in New Zealand towards ECE curriculum design, what might be the nature of a model to facilitate student teacher and teacher appropriation of ICT for pedagogical purposes?

The research resulted in the development of TEAM, a model designed to be of use to ITE providers.

### **10.3 Contribution of this Study**

The primary outcome of this study is the development of a sociocultural theoretical model, TEAM, intended to help ITE providers understand how student teachers and teachers might be supported to appropriate and integrate ICT into their pedagogical practice. TEAM is based on themes drawn from earlier models and themes that emerged from the data generated in this study. It takes into account the sociocultural context for and nature of teaching and learning through attention to:

- the wider policy context – including the sociocultural aspects of the New Zealand policy relating the early childhood sector and early childhood ITE programmes
- the local early childhood setting – including the notion that learning is situated within each context and reflects the cultural tools and subjective norms of each setting
- student teacher/teacher personal experiences and priorities in relation to the use of ICT in ITE programmes and teaching – including student teachers’ and teachers’ understanding, values and beliefs of ICT for pedagogical purposes.

### **10.4 Limitations of this Study**

There were three limitations to this study. Firstly, semi-structured interviews were employed to gather the teacher data, and online conversations were chosen to gather data from two cohorts of student teachers. Thus the study draws self-report data on the role of ICT in ITE and teaching practice. It does not include observations of teachers’ actual practice or student teachers’ actual experiences, which may differ from the interview data. I was aware of the disadvantages of self-report interview data and also of the use of online discussion data that was

being conducted for a purpose other than research. Because I was drawing on data from online student teacher discussions I did not have the opportunity to probe specific responses through follow up questions (Janssens & Kraft, 2012). However, in many cases, the self-report data from the participants included examples to illustrate their comments for their peers thereby ameliorating this limitation.

Secondly, the generalisations possible from this study are limited by several factors. The student teachers were drawn from a single New Zealand initial teacher education programme and teachers from early childhood services in one region, the Waikato.

Finally, the data for this study was collected during 2008 and 2009. While it is important to note that early childhood settings and the ICT tools available within them have changed since this time, in some respects, the changes have not been transformational. For example, digital cameras have been replaced or complemented by mobile phones and iPads, but the broad-based affordances of these ICT tools in relation to the production of images for the quick and easy inclusion in documentation remains essentially the same. In addition, Margaryan, Littlejohn and Vojt (2011) found no evidence to support previous claims suggesting that current generation of students adopt radically different learning styles, exhibit new forms of literacies, or use digital technologies in more sophisticated ways. Findings from their study, which investigated the extent and nature of university students' use of digital technologies for learning and socialising showed that, regardless of age and subject discipline, students' attitudes to learning appeared to be influenced by the teaching approaches used by lecturers rather than by the tools that were available.

### **10.5 Implications for ITE Providers, Policy Makers and Practice**

The findings from this study have the following implications for ITE providers, policy makers, early childhood student teachers and teachers.

Whilst there are a number of theoretical models relating to ICT uptake, these do not encompass sociocultural views of learning and are not explicitly focused on understanding how early childhood student teachers appropriate and integrate ICT for teaching purposes, and many ITE providers are still struggling to ensure their

graduates are confident users of ICT (Bakir, 2015; Kerckaert, Vanderlinde, Vanderline & Van Braak, 2015). TEAM acknowledges that preparing student teachers to use ICT is a complex task and offers some guidance as to how ITE providers might focus their attention and where they could embed productive opportunities for student teachers to explore the use of ICT for pedagogical purposes. Possibilities include active use of ICT in the ITE educator's own teaching practice, a focus on the affordances of different ICT tools for teaching and learning, considering carefully opportunities for ICT when selecting practicum settings and encouraging student teachers to use ICT in their own work and during practicum. TEAM provides a coherent sociocultural framing for ITE providers to address the various aspects that need to be attended to in order to support student teachers to appropriate and integrate ICT for pedagogical purposes.

This study has several implications for policy makers. Firstly, policies regarding ICT use in early childhood need to continue to be reviewed and strengthened. There is mention of ICT use in the Graduating Teacher Standards, but this could be made more explicit by providing supplementary materials containing examples of what this might look like in practice.

Secondly, it is timely to consider the role of ICT in *Te Whāriki*. A more explicit focus on ICT as a means to supporting pedagogy would align the curriculum with recent curriculum developments internationally (section 2.4). This would also serve to encourage New Zealand early childhood education ITE providers, professional development providers and early childhood teachers to ensure they provide opportunities for learning about the affordances of ICT for teaching, learning and assessment.

Currently, there is very little funded professional development available to the early childhood sector. The literature suggests professional development about affordances of ICT and how teachers can use these to extend and deepen children's learning is important (Jimoyiannis & Komis, 2007). The study findings suggest the use of ICT for documentation and representation of children's learning is likely to be well established. Other uses of ICT such as developing children's questioning and wider family involvement in their children's learning

would seem important foci for continued development in the use of ICT for building relationships and communication that enables teachers and families together to contribute to children's learning.

For early childhood teachers, findings indicate that, at the time of data collection, ICT was largely used for documenting children's learning journeys through learning stories. Since then, it is possible the other uses have been more fully explored. Early childhood leaders could be supported to consider the influence of the social and cultural context for use, alongside and in addition to a focus on the availability of ICT. A focus on the affordances of different ICT tools in relation to their use of ICT for different pedagogical and learning purposes also has the potential to expand use.

For student teachers, the implication of the findings is that the role and potential of ICT in supporting children's learning could be a stronger focus in ITE programmes, including time to use and reflect on the use of ICT. Programmes need to effect a shift in their views from a skills-based perspective to more of a pedagogical approach.

## **10.6 Implications for Research**

Research possibilities include studies into whether the elements of TEAM are evident in other contexts and whether and how it can be used to design/redesign initial teacher education programmes for early childhood teachers and professional development for early childhood teachers. The findings of this study provide evidence of only one of Bell's (2012) eight aspects of teaching, when teaching is viewed as a sociocultural practice, that is, the notion of teaching as a relational practice. Further research is needed to explore if and how the seven other elements of Bell's notion of teaching as a sociocultural practice are involved with and could be supported by the use of ICT and if /how these other aspects might be supported by application of TEAM.

## **10.7 Concluding Comments**

In conclusion, TEAM focuses in on the context for learning to use ICT and the generic affordances of ICT rather than the use and affordances of particular ICT tools. Although ICT artefacts have changed since the data collection, it is my view that the disjuncture between ICT use in ECE and ICT use in ITE has widened; the

literature continues to highlight a lack of preparedness of student teachers in relation to the appropriation and integration of ICT for pedagogical purposes (Bakir, 20015; Instefjord & Mutnthe, 2016, Tondeur, Van Braak, Eetmer & Ottenbreit-leftwich 2016) There remains a compelling argument for a theoretical model that moves beyond a focus on learning to use ICT as an individual activity and takes into account sociocultural views of learning and curriculum. TEAM was developed to specifically address this matter. TEAM provides a sociocultural framework for ITE providers to use to consider required shifts in the design of programmes so that these better enable student teachers to appropriate ICT into their teaching practice in ways that will substantially contribute to the strengthening of effective pedagogy.

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## **Appendices**

Appendix A	Letter to Head of Department
Appendix B	Letter to Waikato Kindergarten Association
Appendix C	Letter to early childhood education and care centre managers
Appendix D	Letter to early childhood education and care centre teachers
Appendix E	Letter to kindergarten teachers
Appendix F	Letter to student teachers
Appendix G	Introduction/information letter
Appendix H	Questions for teacher interviews

## ***Appendix A: Letter to Head of Department***

Dear ...

As you are aware, I am currently studying for my PhD at the University of Waikato. The working title for my study is *ICT literate early childhood graduate teachers – who are they?* Through this research project I will be exploring ways in which ICT can be integrated into the School of Education's Bachelor of Teaching ECE programme.

My goal is to ensure that when student teachers graduate they will have the confidence, knowledge, dispositions and skills to use ICT as another tool in their teaching practice. I would like to investigate student teacher responses to the ICT module of the paper TPS212: Making Sense of World. I think that it is important students' views and experiences of our papers are considered. My study should provide a basis for informed decision-making about the future design of this and other papers at the School of Education. I seek your consent to approach the student teachers in the paper TEPS212-08/9B (Ham & TGA) Making Sense of the World, to participate in this research. I would like to access the online discussions in this paper as data to be analysed to develop an understanding of how student teachers appropriate and integrate ICT into their developing teaching practice. It is possible that I may want to discuss specific students' contributions further. In this case I would approach individual students to arrange an interview of up to 15 minutes.

All participants will remain anonymous. Data will be treated confidentially and stored securely. Participants can withdraw from the study at any time up until I have returned their online discussion data and interview summaries for checking. The primary use of the data will be to contribute to my PhD. Data may also be used in seminars and/or conference presentations, publications and research and teaching periodicals. Any reports of this research will employ pseudonyms to retain confidentiality.

I have attached a consent form copy and a copy of the general research questions.  
If you have any queries please contact me.

Rosina Merry: Phone :Home ....Work .... Email rosinam@waikato.ac.nz

If you have further queries please contact Dr Bronwen Cowie from the University  
of Waikato.

Dr B Cowie: Phone: Work...Email bcowie@waikato.ac.nz

Yours sincerely

Rosina Merry

.....

### **Informed consent**

I have read the above information and give consent for you to invite student  
teachers in the paper TEPS212-08/9B Making Sense of the World, to participate  
in the study under the conditions outlined in the introductory letter.

I consent to you approaching students in the paper TEPS212-08/9B Making Sense  
of the World to participate in the study

Signed: .....

Name: .....

Date: .....

## ***Appendix B: Letter to Waikato Kindergarten Association***

Chief Executive officer

Waikato Kindergarten Association

P.O. Box 4311

Hamilton

Dear ....

As part of a PhD I am enrolled in at the University of Waikato I am undertaking a research project with student teachers in the early childhood pre-service teacher programme. The working title for my study is *ICT literate early childhood graduate teachers – who are they?* Through this research project I will be exploring ways in which we can integrate ICT into the University of Waikato's teacher education degree programme so that when student teachers graduate they will have the confidence, knowledge, dispositions and skills to use ICT as another tool in their teaching practice. I am approaching you to ask permission to interview teachers within the Waikato Kindergarten Association. I will also be approaching five early childhood education and care centres to interview some of their teachers.

In consultation with you, I would like to identify five kindergartens to be involved in the study. I will then invite the teachers in the kindergarten to take part in this research. I plan to interview the teachers from each kindergarten in a group. The focus of the interview will be to seek teacher opinions on what role ICT should play in initial teacher education. The interviews will take place at a time and place that is convenient to the teachers. I anticipate that the interviews will last up to 45 minutes.

All participants will remain anonymous. Data will be treated confidentially and stored securely. Participants can decline to answer interview questions and withdraw from the interview at any time.

Participants can withdraw from the study at any time up until I have returned their interview summaries for checking. The primary use of the data will be to



contribute to my PhD. Data may also be used in seminars and/or conference presentations, publications and research and teaching periodicals. Any reports of this research will employ pseudonyms to retain confidentiality

I hope that your teachers will be interested in participating. I have attached a copy an information letter and the general research questions for your interest.

If you have any queries please contact me on:

Phone :Home ...Work ...Email [rosinam@waikato.ac.nz](mailto:rosinam@waikato.ac.nz)

If you have further queries please contact Dr Bronwen Cowie from the University of Waikato. Phone: Work... Email [bcowie@waikato.ac.nz](mailto:bcowie@waikato.ac.nz)

Yours sincerely

Rosina Merry

.....

**Informed consent**

I have read the above information and consent to the Waikato Kindergarten Association participating in the study under the conditions described.

Signed:.....

Name: .....

Date: .....

### ***Appendix C: Letter to Early Childhood Education and Care Centre Managers***

Dear .....

As part of a PhD I am enrolled in at the University of Waikato I am undertaking a research project with students in the early childhood pre-service teacher programme. The working title for my study is *ICT literate early childhood graduate teachers – who are they?* Through this research project I will be exploring ways in which we can integrate ICT into the University of Waikato's teacher education degree programme so that when student teachers graduate they will have the confidence, knowledge, dispositions and skills to use ICT as another tool in their teaching practice. I am approaching you to ask permission to interview teachers within your early childhood education and care centre. I will also be approaching four other ECE centre managers and a kindergarten association to seek permission to interview some of their teachers in five kindergartens.

In consultation with you, I would like to invite a group of the teachers to be involved in the study. I plan to interview the teachers in a group. The focus of the interview will be to seek teacher opinions on what role ICT should play in initial teacher education. The interviews will take place at a time and place that is convenient to the teachers. I anticipate that the interviews will last up to 45 minutes.

All participants will remain anonymous. Data will be treated confidentially and stored securely. Participants can decline to answer interview questions and withdraw from the interview at any time.

Participants can withdraw from the study at any time up until I have returned their interview summaries for checking. The primary use of the data will be to contribute to my PhD. Data may also be used in seminars and/or conference presentations, publications and research and teaching periodicals. Any reports of this research will employ pseudonyms to retain confidentiality.

I hope that your teachers will be interested in participating and I have attached a copy of the general research questions for your interest.

If you have any queries please contact me on:

Phone Home ... Work ... Email [rosinam@waikato.ac.nz](mailto:rosinam@waikato.ac.nz)

If you have further queries please contact Dr Bronwen Cowie from the University of Waikato. Dr B Cowie Phone: Work ... Email [bcowie@waikato.ac.nz](mailto:bcowie@waikato.ac.nz)

Yours sincerely

Rosina Merry

.....

### **Informed consent**

I have read the above information and give consent for you to invite teachers to participate in the study under the conditions outlined in the introductory letter.

I consent to you approaching teachers to participate in the study

Signed: .....

Name: .....

Name of Education and Care Centre

.....

Date: .....

#### ***Appendix D: Letter to Early Childhood Education and Care Teachers***

Dear .....

As part of a PhD I am enrolled in at the University of Waikato I am undertaking a research project with student teachers in the Bachelor of Teaching ECE programme. The working title for my study is *ICT literate early childhood graduate teachers – who are they?* Through this research project I will be exploring ways in which we can integrate ICT into the University of Waikato's initial teacher education programme so that when student teachers graduate they will have the confidence, knowledge, dispositions and skills to use ICT as another tool in their teaching practice. I am also gathering data from teachers in four other early childhood education and care centres, and five kindergartens as a part of this research process.

I am approaching you to invite you to participate an interview. The focus of the interview will be to seek your opinion on what role ICT should play in initial teacher education. The interview would take place at a time and place that is convenient to you. I anticipate that the interview will last up to 45 minutes.

All participants in this research will remain anonymous. Data will be treated confidentially and stored securely. Participants can decline to answer interview questions and withdraw from the interview at any time. Participants can withdraw from the study at any time up until I have returned their interview summaries for checking. The primary use of the data will be to contribute to my PhD. Data may also be used in seminars and/or conference presentations, publications and research and teaching periodicals. Any reports of this research will employ pseudonyms to retain confidentiality

I hope that you will be interested in participating and I have attached a copy of the general research questions for your interest.

If you have any queries please contact me on: Phone :Home ... Work ...Email  
rosinam@waikato.ac.nz

If you have further queries please contact Dr Bronwen Cowie from the University  
of Waikato. Dr B Cowie : Phone: Work ...Email bcowie@waikato.ac.nz

Yours sincerely

Rosina Merry

### **Informed consent**

I have read the above information and give my consent to participate in the study  
under the conditions outlined in the introductory letter.

I consent to participating in an interview for this study

Signed: .....

Name: .....

Name of Education and Care Centre

.....

Date: .....

### ***Appendix E: Letter to Kindergarten Teachers***

Dear .....

As part of a PhD I am enrolled in at the University of Waikato I am undertaking a research project with student teachers in the Bachelor of Teaching ECE programme. The working title for my study is *ICT literate early childhood graduate teachers – who are they?* Through this research project I will be exploring ways in which we can integrate ICT into the University of Waikato's initial teacher education programme so that when student teachers graduate they will have the confidence, knowledge, dispositions and skills to use ICT as another tool in their teaching practice. I am also gathering data from teachers in four other kindergartens and five early childhood education and care centres as a part of this research process.

I am approaching you to invite you to participate an interview. The focus of the interview will be to seek your opinion on what role ICT should play in initial teacher education. The interview would take place at a time and place that is convenient to you. I anticipate that the interview will last up to 45 minutes.

All participants in this research will remain anonymous. Data will be treated confidentially and stored securely. Participants can decline to answer interview questions and withdraw from the interview at any time. Participants can withdraw from the study at any time up until I have returned their interview summaries for checking. The primary use of the data will be to contribute to my PhD. Data may also be used in seminars and/or conference presentations, publications and research and teaching periodicals. Any reports of this research will employ pseudonyms to retain confidentiality.

I hope that you will be interested in participating and I have attached a copy of the general research questions for your interest.

If you have any queries please contact me on: Phone: Home ... Work... Email rosinam@waikato.ac.nz

If you have further queries please contact Dr Bronwen Cowie from the University of Waikato. Dr B Cowie: Phone :... Email bcowie@waikato.ac.nz

Yours sincerely

Rosina Merry

### **Informed consent**

I have read the above information and give my consent to participate in the study under the conditions outlined in the introductory letter.

I consent to participating in an interview for this study

Signed: .....

Name: .....

Name of Kindergarten

.....

Date: .....

## ***Appendix F: Letter to Student Teachers***

Dear .....

I am currently studying for my PhD at the University of Waikato. The working title for my study is: *ICT literate early childhood graduate teachers – who are they?* Through this research project I will be exploring ways in which ICT can be integrated into the School of Education's Bachelor of Teaching ECE programme. My goal is to ensure that when students graduate they will have the confidence, knowledge, dispositions and skills to use ICT as another tool in their teaching practice.

I would like to invite you to be part of my research while you are studying the paper TEPS212-08B (Ham & TGA) Making Sense of World. I believe that it is important students' views and experiences are considered in this research project. Participation in the study will provide you with an opportunity to influence the future design of the paper and help me gain an insight into how undergraduate student teachers view the role ICT in early childhood education. It will also provide you with an opportunity for you to reflect on your own learning.

As part of the paper you will be participating in online discussions on the role of ICT. I would like to access these discussions as data for my research so that I can gain an understanding of how student teachers appropriate and integrate ICT into their developing teaching practice. It is possible that I may want to discuss specific contributions further. In this case I may approach individual students to arrange an interview of up to 15 minutes.

The online discussions are a compulsory part of the paper and so all student teachers must contribute. However, you can withhold the use of your contributions for research purposes. You can withdraw from the research study at any time during the paper. If you do this, I will not use any of your subsequent contributions as data. Participation in the survey and interviews is voluntary. You can decline to answer interview questions or withdraw from an interview at any time.

All participants will remain anonymous. Data will be treated confidentially and stored securely. Participants can withdraw from the study at any time up until I



have returned their interview summaries for checking. The primary use of the data will be to contribute to my PhD. Data may also be used in seminars and/or conference presentations, publications and research and teaching periodicals. Any reports of this research will employ pseudonyms to retain confidentiality

I hope that you will be interested in participating. I have attached a copy of the general research questions for your interest.

If you have any queries please contact me on:

Phone : Home ... Work ... Email [rosinam@waikato.ac.nz](mailto:rosinam@waikato.ac.nz)

If you have further queries please contact Dr Bronwen Cowie from the University of Waikato.

Dr B Cowie: Phone: Work...Email [bcowie@waikato.ac.nz](mailto:bcowie@waikato.ac.nz)

Yours sincerely

Rosina Merry

### **Informed consent**

I have read the above information and consent to participate in this research project

I consent to the use of my online data

I consent to being approached for an interview

Signed: .....

Name: .....

Date: .....

## ***Appendix G: Introductory Information Letter***

As part of a PhD I am enrolled in at the University of Waikato, I am interested in undertaking a research project about student and graduate teachers use of ICT in their teaching practice. The working title of this thesis is *ICT literate early childhood graduate teachers – who are they?*

Through this research project I hope to continue to explore ways in which we can embed ICT in the University of Waikato's Bachelor of Teaching ECE programme so that when student teachers graduate they will have the confidence, knowledge, dispositions and skills to use ICT as another tool in their teaching practice.

My interest in this research area came about as a result of a one-year Flexible Learning Leaders (FLLinNZ) scholarship that I was privileged to win in July 2005. This was a Tertiary Education Commission funded scholarship. The purpose of FLLinNZ was to facilitate and enhance provision of flexible learning in tertiary education organisations through supporting the leadership and professional development of 15 leaders, establishing a national mentoring network, and creating a pool of leaders who are committed to sharing their expertise nationally to improve excellence in e-learning.

My FLLinNZ scholarship explored innovative ways that ICT can be used in early childhood undergraduate teacher education programmes. Teachers in Aotearoa/New Zealand are confronted by technology in many aspects of their daily work; however, unless there is an online component to their studies, they have little exposure or opportunity to use technology whilst gaining their teacher education qualification.

One conclusion from a comprehensive literature review undertaken by the New Zealand Council of Education Research (NZCER) in 2004 is that studies in initial teacher education in ICT for early childhood teachers should have a strong foundation in educational theory. This means embedding teachers' learning about ICT into the context of their understanding about children's learning and development. In addition, the review suggests that teachers in training also need to see and experience meaningful uses of ICT in early childhood educational settings

For this section of this research, I anticipate gathering data from online

discussions of student teachers who are enrolled in a compulsory paper called Making Sense of the World in the second year of their degree, and interviewing early childhood teachers in Waikato. I anticipate collecting data from February 2008. I would like to digitally record the interviews; these digital recordings will be returned to participants after my study commitments are completed. If approval is not gained for an interview to be recorded, I will take handwritten notes, which I will ask the person being interviewed to check over for accuracy.

.....

### **Consent form**

I have read the introductory information letter for this project.

Should you agree to the gathering of data, the following ethical considerations will apply:

1. Any information obtained will be used for the purpose of this directed study and possibly other academic publications.
2. Only myself as the interviewer, and my supervisors (Dr Bronwen Cowie and Professor Margaret Carr) will have access to the data. You will be consulted regarding my interpretation of your interview material. The final report will be made available to all participants, and my supervisor.
3. You have the right to withdraw from this study at any time.
4. You have the right to refuse to answer any questions that you do not wish to answer.
5. Your name will not be used on any written information.
6. Every effort will be taken to ensure that you will not be able to be identified.
7. Once the thesis is completed the raw data will be returned to you.
8. In the event of any ethical issues arising for me as a researcher, I will follow the appropriate procedures discussed and agreed upon by my supervisor.

I can direct questions and any problems I have about the research to Rosina Merry (email: [rosinam@waikato.ac.nz](mailto:rosinam@waikato.ac.nz) tel: ...) For any unresolved issues I can contact Rosina's supervisor, Dr Bronwen Cowie (email: [bcowie@waikato.ac.nz](mailto:bcowie@waikato.ac.nz) tel: ...

I give my consent to being involved.

Name: \_\_\_\_\_

Signed: \_\_\_\_\_

Date: \_\_\_\_\_

Yours Sincerely

Researcher: Rosina Merry.

Phone: (Home) ...(Work) ...

Email [Rosinam@waikato.ac.nz](mailto:Rosinam@waikato.ac.nz)

### ***Appendix H: Questions for Teacher Interviews***

1. How do you use ICT in your teaching practice?
2. How did you get to be able to use it?
3. How does ICT fit with your vision and philosophy of teaching?
4. What advice do you have for our teacher education programme?