

Implementing digital technologies in one New Zealand school: Challenges and opportunities

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Abstract

In New Zealand, and indeed globally, there has been a growing trend to incorporate the use of digital technologies into programmes of teaching and learning throughout all levels of education. A recent revision of the New Zealand Curriculum has resulted in the strengthening of digital technologies within the technology area of the curriculum and formalised the requirement for schools to integrate their use into programmes of teaching and learning.

Using a practitioner research approach, this study explores the challenges experienced by one school which had previously possessed few digital resources, and little knowledge or experience at using them, as they begin to implement the use of digital technologies in the junior classes. Through semi structured interviews and documentary evidence, participants shared their experiences using technologies, identifying practices they had found effective and difficulties which had hindered their use.

The study emphasises the need for effective and ongoing professional development to support teachers to develop their own digital fluency and the pedagogical knowledge needed to effectively implement the curriculum requirements. Also highlighted is the importance of adequate resourcing, and of technical support which allows resources to be managed effectively, while still allowing schools the autonomy to make decisions regarding their set up and use.

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CHAPTER ONE: INTRODUCTION

1.1 Background

The changes brought to our everyday lives by digital technologies have been experienced on a global scale, and governments and organisations have long acknowledged the critical role that education plays in preparing young people to contribute to the constantly changing society in which they will live and work (Ananiadou & Claro, 2009). In 2000, the European Council, recognising the need for education systems to adapt to meet the demands of the knowledge society, identified the need for the promotion of digital literacy throughout the European Union (European Parliament, 2000). More recently, the Organisation for Economic Co-operation and Development (OECD) has acknowledged the impact that digital technologies have on our economies and societies and the critical role of education in developing the digital skills needed for new innovations (OECD, 2016).

The increasing shift towards the use of digital technologies in educational settings around the world is also seen in New Zealand. A recent New Zealand Council for Educational Research (NZCER) survey noted that “Over the past two decades there has been a significant and concerted effort to strengthen learning with digital technologies in New Zealand schools” (Bolstad, 2017, p. 17). In the consultation draft of the Digital Technologies Hangarau Matihiko curriculum, the Ministry of Education (MOE) stated that New Zealand is a digital nation and therefore “Our education system needs to change how we prepare our children and young people to participate, create and thrive in this fast-moving digital world” (MOE, 2017a, p. 4).

The Technology learning area of the New Zealand Curriculum has been restructured and now includes two areas which focus on digital technologies “to ensure that all learners have the opportunity to become digitally capable individuals” (MOE, 2017b, p.1). These two areas are: Computational thinking for digital technologies and Designing and developing digital outcomes. This revised curriculum came into effect from the beginning of 2018, with the expectation that all schools would be prepared to implement it fully by the beginning of 2020.

1.2 Context

This research took place in a decile two, medium sized primary school in Auckland, New Zealand. The school caters for children in their first six years of schooling and is set in a community where many of the challenges linked to lower socio-economic environments are experienced, including a transient population, poverty and the associated outcomes. The school has a fluctuating student population of around 415, of which 18% identify as Maori and 71% as Pasifika (MOE, 2018). It is situated in an area with a deprivation index of 10, meaning it is in the most deprived 10 percent of small areas (Environmental Health Indicators New Zealand, 2018). Many students have limited access to digital devices at home and thus there is some considerable challenge and responsibility in terms of the school providing digitally enabled teaching and learning that will equip students for a digitally enhanced environment.

The school had previously concentrated on developing teacher proficiency in delivering class literacy and numeracy programmes designed to accelerate the progress of students considered by the Ministry of Education to be priority learners- students who the Education Review Office (ERO) define as “historically not experiencing success in the New Zealand schooling system” (Education Review Office, 2012, p. 4). The literacy and numeracy acceleration programmes had not relied on the use of digital technologies and budget allocations had not allowed for purchasing to be made in this area. Given the school context and the emphasis on literacy and numeracy, digital technologies had not been seen as a high priority for school budgets or teacher professional learning.

A recent change in senior leadership, including the appointment of a principal experienced at introducing technological change, occurred in the middle of 2016. This has resulted in a greater focus on the use of digital technologies for teaching and learning.

Appointees to new senior teacher positions which have arisen since new leadership, have all been teachers who have had experience working in digital environments. The budget has reflected the new emphasis on digital technologies and the school is now working on building digital resources for use in classrooms. However, it is acknowledged that it will take time to

bring resources to an amount that would allow full integration of digital technologies into classroom programmes.

The school has identified digital technologies as one of four major focus areas for staff development and has created a curriculum team comprising of teachers from all areas of the school, to oversee this development. Two classroom teachers from the junior area are on this curriculum team. The principal is also a member of the team.

This research focusses on technological experiences in the junior area of the school, or year zero to two. This is an area of particular interest to the researcher as an experienced and enthusiastic junior level teacher. At the time of the research, there were eight classes in the junior team. Two of these classes were shared by two teachers. The teachers in the junior team range in experience from those who are in their first few years of teaching to those who have been teaching for over thirty years. The majority have worked under the previous leadership team and have had had little opportunity to use digital technologies in their teaching. Technologies available for teachers had been limited to two fixed computers and one digital camera in each room. At the time of the research, each classroom was equipped with three fixed computers, one digital camera and either a TV or a data projector. The school had also recently purchased a number of iPads, enough for each junior class to have three at the start of this study, then, due to an additional purchase, four per class at the beginning of the new school year. One teacher had been donated two laptops from an external source for her class to use.

It is worth noting the particular challenges for the school and thus the focus for the research. The challenges associated with a low decile school that has not previously had a focus on digital technologies or digital pedagogies resulted in low resourcing, low awareness and lowered capacity in the area of digital technologies. In short, the school culture while strongly focused on student achievement, lacked a focus on and an awareness of the possibilities associated with digital and technological approaches, strategies and resources.

Teachers have been provided with opportunities for professional development in the use of digital facilities from an external facilitator over several years, but these opportunities had formerly been limited by the lack of resources that would have enabled them to put their new learning into practise. More recent professional learning sessions have focused on ways that teachers can utilise their new and unfamiliar resources. Professional development in other curriculum areas has also included the use of technologies, and digital resources have been created. As well as moving towards the greater use of digital technologies for teaching and learning, all school staff have been encouraged to utilise them in everyday work practices, such as internal communications and sharing information with the wider community, so that their use becomes normalised.

1.3 Research Aims and Questions

The aim of this study was to explore ways in which the junior teachers in this school could begin to implement the digital technologies content of the revised technology curriculum area, when their access to digital resources was limited. It was intended to meet this aim by enquiring about current technology practices, and the needs which the teachers themselves identified to establish what support might be required. The aim and research questions are as follows:

Aim

To explore opportunities for the implementation of the digital technologies content of the revised technology curriculum area in a school with limited resources.

Research Questions

The project was guided by the following research questions:

1. What are teachers' technology practices and understandings in this school?

2. What do teachers in this school identify as important in their own development around digital technologies in teaching and learning?
3. How can this school best support teachers to implement the digital technologies content of the revised technology curriculum area?

The questions outlined above relate specifically to the environment of a low decile school with limited access to digital technologies.

1.4 Rationale

This study was prompted by two events mentioned previously, which occurred within a relatively short space of time. Firstly, after having very limited access to digital technologies and with little expectation for using them in teaching and learning programmes, a change in direction from the new senior leadership team and an increase in resources meant that teachers were able to explore the use of digital devices in their classrooms, and in fact were being encouraged to do so. Secondly, the introduction of two new technological areas to the national curriculum featuring digital technologies, gave more importance to their use and created some urgency for the teachers to incorporate them into their teaching programmes. For a school which had previously had a limited focus regarding the integration of digital technologies into everyday teaching practices and is in the early stages of building up both digital resources and the teacher capacity to use them effectively, the introduction of this revised curriculum area presents both challenges and opportunities.

In the report “Innovating Education and Education for Innovation: The Power of Digital Technologies and Skills” (2016), the OECD describes the education sector as one that is not averse to change but points out that international surveys suggest that digital technologies are yet to be fully integrated into teaching and learning programmes. The 2016 report suggests that there are barriers that need to be addressed if technologies are to be utilised to their potential (OECD, 2016). This statement provided guidance for the study and for the school at the centre of this study. Namely, it would seem to be important to recognise the barriers that may impede teachers from fully utilising digital technologies in their teaching programmes, identify those

factors which would help them to implement this revised curriculum content and determine what support mechanisms they would need to have in place to ensure they were able to do this successfully.

It has been suggested that teachers can be reluctant to change their practices, or for various reasons can find it difficult to do so (Hoban, 2002). There is much research which suggests that teachers have a large influence on the way that digital technologies are used for teaching and learning. Several studies have found that those teachers who were comfortable using technologies in their own lives were often the most confident when using them in the classroom setting (for example Flewitt, Messer, & Kucirkova, 2014; Prestridge, 2011). It is therefore likely to be of benefit to establish how the teachers in this school view the use of digital technologies and what their current practices are in this area, as well as discovering what they perceive their own needs and aspirations might be around the use of technologies for teaching and learning.

Much of the research currently available on the use of digital technologies in the classroom examines the barriers that schools might face in trying to implement their use but does not necessarily look for solutions to overcome these barriers. One reason for undertaking this study and using a practitioner research approach, was to investigate if these teachers in this school might be able to generate some of the solutions they required, as they would have the greatest knowledge of the constraints under which they are operating, and therefore be in the best position to identify the most feasible ways of working around them.

It is hoped that the results of this study will provide the school with information which will assist them in preparing to implement the digital technologies content of the revised technology curriculum area. By identifying the practices that are already in place and establishing the conditions which would be needed for successful implementation, as recommended by research and by the teachers themselves, the school may be able to develop strategies which will enable them to establish these new learning areas as part of everyday practice.

The information gained from this study may also prove to be of benefit to other low decile schools who are in a similar position of having few resources at their disposal and limited experience amongst teaching staff at using them for teaching and learning.

1.5 Thesis Outline

Chapter One – Introduction

This chapter provides an introduction to the nature of this study. It also provides a background and context for the project, including a recent history of school events, and provides a rationale for its undertaking. The research aim and questions are set out and an outline of the thesis is provided.

Chapter Two – Literature Review

In this chapter, literature relevant to the themes in this study are examined, including the world-wide focus on the development of digital literacy to prepare for life in the knowledge societies of the 21st century. Issues around implementation are examined, including those which relate specifically to the New Zealand environment. Also explored, are studies which investigate the potential benefits of using digital technologies in various educational settings.

Chapter Three – Methodology

This chapter examines the ontological and epistemological stance from which this research was conducted and explains how these relate to the approach used of practitioner research. The reasons for the choice of data collecting methods are described, along with the processes used for participant recruitment. Also covered are validity and ethical considerations and how these were addressed.

Chapter Four – Findings

In this chapter, the findings from the semi structured interviews and data logs have been organised into themes and presented in relation to the research aim and questions.

Chapter Five – Discussion

This chapter discusses the findings of the study in relation to the research questions and with reference to the reviewed literature.

Chapter Six - Conclusions and Recommendations

In this chapter, I have drawn upon the findings of the study and the reviewed literature to answer the research questions. The conclusions of the study then lead to the recommendations which the school may wish to consider as it embarks upon the process of implementing the digital technologies content of the revised technology curriculum area. The limitations of this study are discussed, together with suggestions for further study. I have also included a brief summation of events which have occurred since the conclusion of the study as the school moves forward.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter presents a review of the literature associated with the changes to education systems in the knowledge societies of the 21st century and the introduction of digital technologies to teaching and learning programmes.

2.2 The need for 21st century learning

Several reports prepared since the turn of the century have emphasised the need for education systems to respond to the changes from the industrial based societies of the previous century and equip learners with the skills and competencies they will need to contribute to the knowledge-based economies of 21st century societies (European Parliament, 2000; Ananiadou & Claro, 2009; OECD, 2016). These were defined as “those skills and competencies young people will be required to have in order to be effective workers and citizens in the knowledge society of the 21st century” (Ananiadou & Claro, 2009, p. 8).

In 2010, the OECD report, ‘Are the new millennium learners making the grade?: Technology use and educational performance in PISA’ (2010) points out that most, if not all of these competencies “are either supported or enhanced by ICT” (p. 14). Ananiadou and Claro (2009) grouped these skills and competencies into three areas; those relating to information included the skills needed for researching and problem solving such as accessing, evaluating and organising information, particularly the wealth of information now available over the internet. Communication related skills are needed for the sharing and transmitting of information as well as collaborating with others, as again, technology has opened up new ways of sharing and communicating with others. Skills relating to ethics require the ability to act responsibly and be aware of the impact of one’s actions.

Of the seventeen OECD countries which responded to this questionnaire study, most integrated the development of 21st century skills and competencies across curriculum areas but often taught ICT skills as a separate subject. Several had teacher training initiatives that focused on developing teachers' ICT pedagogical skills but there were few programmes that targeted the development of 21st century skills. The need for governments to include these competencies and skills in the educational standards which should be reached by the end of compulsory schooling, is emphasised by Ananiadou and Claro as “for many young people, schools are the only place where such competencies and skills can be learned” (Ananiadou & Claro, 2009, p. 5).

Even previously understood definitions of traditional curriculum areas, are now being challenged. Kervin (2016) discusses the idea that literacy acquisition now involves not only reading and writing skills, but also the necessary skills required by a technological society, including the ability to use them in a socially appropriate manner.

In New Zealand, the English-speaking curriculum identifies five key competencies which are: thinking, relating to others, using language, symbols and texts, managing self and participating and contributing. These are described as “capabilities for living and lifelong learning” (MOE, 2007, p. 12).

Not only are schools an important place for the development of 21st century skills and competencies, they are also an ideal setting for the use of digital technologies as “the interactive nature of digital literacies, and the internet in particular, is especially suited to the needs and learning styles of young children” (Forzani and Leu, 2012, p. 421).

Similar views are held in Australia where “digital technologies are fundamentally shifting learning” (Edwards-Groves, 2012, p. 99). A national curriculum was released in 2010, becoming implemented across Australia in 2014, the year the technologies learning area, including digital technologies, was introduced (Australian Curriculum, Assessment and Reporting Authority, n.d.). The states of Victoria, New South Wales and Western Australia

have produced additional curriculum documents for their own states to provide guidelines for educators in the implementation of this area (see New South Wales Education standards Authority, n.d.; School Curriculum & Standards authority, Government of Western Australia, n.d.; Victorian Curriculum & Assessment authority, n.d.).

In New Zealand, the beginning of 2018 has seen the revision of the technology learning area to place a greater emphasis on the use of digital technologies into the New Zealand Curriculum, with the goal of this change being to enable all learners to develop digital competencies and understandings (MOE, 2017b). The 2017 20/20 Trust report on digital technologies in NZ schools, acknowledges the increasing presence of digital technologies in New Zealand schools with the statement “Online and digital educational tools and resources are transforming the ways teachers deliver the curriculum and how students engage in directed and self-directed learning” (20/20 Trust, 2017, p. 10).

The intention of the revised curriculum document to emphasise the importance of integrating the use of technologies into other curriculum areas is made clear with the statement “At primary school, teachers will generally take a cross-curricular approach, with students learning in the technological areas as part of a topic or theme that encompasses several curriculum learning areas” (MOE, 2017b, p. 3). The revised curriculum document also emphasises the relationship between technology and the key competencies with the statement, “As they learn in technology, students draw upon and further develop the key competencies” (MOE, 2017b, p. 1).

The findings of two recent surveys suggest that digital technologies are considered to be beneficial to learning by New Zealand educators. The report ‘Digital technologies for learning: Findings from the NZCER survey of primary and intermediate schools 2016’ found that the majority of teachers surveyed generally considered that digital technologies had a positive effect on students’ engagement in learning and attitudes to learning (Bolstad, 2017). These findings were supported by the survey conducted for the 20/20 Trust in 2017 which reported that over 80% of schools surveyed agreed that digital technologies were “making learning more relevant and engaging for students” (20/20 Trust, 2017, p. 71).

2.3 Supporting 21st century skills

The contributions digital technologies are making to the development of 21st century skills are evident in much of the research reviewed. Gasparini and Culén (2011) noticed that the learning behaviours of the children they observed had changed and they were taking greater control of their own learning. Both Shannon (2014) and Masoumi (2015) also found that students demonstrated greater autonomy over their learning when working together on activities using digital technologies. Lynch (2017) found that early years literacy teachers were using digital technologies to support students to develop early research skills, stating that “purposefully and effectively locating information on the internet and being able to interpret and make use of it is an essential contemporary skill” (p. 195). Falloon (2015) asserts that depending on how iPads are used, they have the potential to support collaborative learning but if used as a one-to-one device there is the possibility that they could reduce collaboration between students. He suggested that when used to share work, iPads enable students to more easily get feedback at school or at home from each other, teachers and family members.

2.4 The challenges of change

Making use of digital technologies in teaching and learning programmes does not rely solely on the acquisition of the appropriate devices to use, but also requires a change in the pedagogy of teachers to ensure they are used effectively (Christensen & Knezek, 2017). Shulman, in his 1986 article ‘Those Who Understand: Knowledge Growth in Teaching’, defines pedagogy as “a description of the processes that teachers engage in when they are planning, teaching and evaluating their lessons and schemes of work” (as cited in Simpson and Walsh, 2014, p. 129).

Hoban (2002) suggests that teachers are often reluctant to make changes to existing practices due to social pressures to conform to those around them, the extra resources and time that changes may require and the lack of flexibility to explore new ideas due to other curriculum requirements. He also believes that the difficulties involved in educational change are underestimated by stakeholders who often do not understand the intricacies of teaching, described by Robinson and Lai (2013) as “a complex network of practices” (p. 17). Timperley,

Wilson, Barrar and Fung (2007) insist that “extended time for opportunities to learn” (p. xxvii) is necessary to effect change as the process often involves taking on new learning which can challenge teachers’ existing beliefs and understandings.

The 2016 OECD report, ‘Innovating Education and Educating for Innovation’, found that although education was sometimes perceived to be one of the most conservative social systems, teachers themselves felt they had too many changes imposed upon them, often with little consultation or without the necessary conditions for change first put in place (OECD, 2016). In New Zealand, the Curriculum Advisory Group Report on the proposed implementation of the Digital Technologies and Hangarau Matihiko curriculum identified the need to balance the pressure for change with the building of teacher capacity, noting that there was an increasing reluctance of teachers to add to their workload in order to satisfy external requirements (Curriculum Advisory Group, 2017).

Timperley et al. (2007) emphasised the importance of school leaders actively supporting the professional learning of their staff to develop the required capabilities for change and ensuring that relevant opportunities were provided for them. Uluyol and Şahin (2016) also discussed the importance of school leaders, asserting that their belief in, and commitment to technology in education was crucial to convincing and motivating teachers to implement change.

2.4.1 Changes in pedagogy

Several studies have discussed the importance of appropriate pedagogical support so that teachers will not only be aware of the value of digital technologies, but also understand how they might best use them for teaching and learning. Edwards and Groves (2012) suggest that in order to make effective use of digital technologies, it is important for teachers to be aware of the potential of the technologies they are using and the impact they could make, to have an understanding of “what digital technologies do for students and how they can use it in their lives” (p. 100).

Several studies have found that a large influence in the way digital technologies are used for learning is that of the teacher, with Karaseva, Siibak and Pruulmann-Vengerfeldt (2015) pointing out that “teachers’ beliefs about a variety of teaching aspects may affect their use of digital technologies in class” (p. 17). In Sweden, Masoumi (2015) found that some of the teachers felt that ICT was unsuitable for early years education, with one commenting that “ICT is not something that should be in preschool pedagogical practices” (p. 13). They preferred the emphasis to be on more traditional play activities and first-hand experiences. After interviewing teachers on the skills and knowledge their students had developed using digital technologies at home, Honan (2012) believed the teachers had some awareness of skills they possessed but placed little value upon them and did not appear to understand how they could contribute to classroom learning.

Teachers’ own competencies also appeared to have an influence on their use of digital technologies in the classroom. Prestridge (2011) identified a link between the personal competence of the teacher and their confidence when using ICT in their practice, finding that “as teachers expressed a greater personal competency with ICT, they were more confident to use ICT in the classroom” (p. 457). Similarly, Flewitt et al (2014) found that it was the expertise that teachers already had in using digital technologies that determined how they and the children used the iPad in each classroom and noticed that it was those staff who were more experienced in using iPads who were initially more confident using them in the classroom setting. In Ireland, “teachers’ knowledge and skills were found to be both the biggest barrier and the biggest enabler affecting their technology usage” (Young, 2016, p. 187). In Ontario, Chen (2015) noticed “substantial individual differences among teachers in terms of comfort levels with new technologies” (p. 12) and suggested there was a need for local school boards to ensure that all teachers received equitable opportunities for professional development which would assist them in the integration of digital technologies into their teaching.

Without making any significant changes to pedagogical methods, there is a danger that technologies could be used in a superficial way, “as tools to be put to the service of already dominant classroom literacy practices” (Lynch and Redpath, 2014, p. 170). However, Kervin (2016) suggests that ‘digital play with carefully selected apps, can provide active, hands-on, engaging and empowering learning opportunities’ (p. 70). Simpson and Walsh (2014) pointed

out the importance of any change being the outcome of new ideas, not devices. Flewitt et al. (2014) also identified the need for pedagogy to support the creative use of any new digital device. In New Zealand, the NZCER Digital Technologies for Learning survey of 2016 reported that only 56% of New Zealand primary and intermediate teachers considered themselves to have the knowledge and skills needed to use digital technologies for learning effectively (Bolstad, 2017). In response to this report, The Curriculum Advisory Group Report recommended that “a priority for the early stages of Professional Learning Development is to ensure more widespread digital fluency among teachers and leaders” (Curriculum Advisory Group, 2017, p. 12).

2.5 Professional Development

Professional learning for teachers is seen as a necessary condition to facilitate the process of change. The report ‘Creating Effective Teaching and Learning Environments: First Results from TALIS’ (2009) defines professional development as “activities that develop an individual’s skills, knowledge, expertise and other characteristics as a teacher” (OECD, 2009, p. 49). These include both formal and informal interactions between staff.

Several studies suggest that professional learning can take place in a variety of forms and settings, with Timperley et al. (2007) pointing out that “many valuable professional learning opportunities occur within schools” (p. 19). Grosemans, Boon, Verclairen, Dochy and Kyndt (2014) view formal learning as that which takes place in a structured and organised way while informal learning often arises spontaneously and can occur in collaboration with others or individually. As there can be a variety of ways in which teachers might acquire professional learning, including face to face scenarios and online environments, Christensen and Knezek (2017) suggested that it was important for administrators to be aware of teachers’ preferences, as responding to these could have an influence on the success of the learning undertaken.

Timperley et al. (2007) assert that it is usually necessary to engage the services of an external expert when implementing change. However, they point out that as well as knowledge of the

content of changes required, these experts also need to know “how to make the content meaningful to teachers and manageable within the context of teaching practice” (p. xxix).

In Singapore, the schools in the study of Lim and Khine (2006) used a variety of professional development approaches to help teachers use ICT effectively in their classrooms. These included demonstrations of exemplary lessons by experienced practitioners, so those new to the integration of ICT had opportunities to observe the possibilities it offered. The schools also identified those teachers who were willing and able to assist and encourage others and set up buddy systems, so the less experienced teachers had someone to turn to for assistance.

As Timperley et al. (2007) state, “within any group of teachers, there are diverse professional learning needs” (p. 6). The Curriculum Advisory Group Report suggests that continuous investment in teacher learning around the use of digital technologies would be needed due to the rapid growth in knowledge and skill development in this area (Curriculum Advisory Group, 2017). The need for continuous professional development for teachers was also identified in the studies of Chen (2015) and Young (2016).

2.6 Barriers to implementing digital technologies

The OECD report of 2016 suggests that “there seem to be very powerful barriers in place that prevent digital technologies from reaching their potential in educational institutions and teaching and learning practices” (OECD, 2016, p. 3).

Much research has been undertaken on the barriers to the effective integration of digital technologies into teaching and learning programmes. Ertmer (1999) has classified these barriers into two categories: extrinsic and intrinsic. Extrinsic barriers are those outside the control of teachers and include a lack of resources, insufficient technical support, lack of time and inadequate training. Intrinsic barriers include teachers’ attitudes and beliefs about teaching and learning (Ertmer, 1999, as cited in Uluyol and Şahin, 2016, p. 65).

2.6.1 Extrinsic Barriers

Access

Although there has been a reduction of extrinsic barriers in many countries, schools and teachers are still faced by problems outside their control when implementing the use of digital technologies (OECD, 2016). Significantly, issues of access rank highly in much of the literature associated with challenges. For example, the challenges reported by Ontario principals included the lack of network infrastructure and slow or unstable wireless access (Chen, 2015). This was also seen as problematic by 47% of New Zealand primary principals surveyed by the 20/20 Trust in 2016/17, with 7% still finding it to be a major barrier (20/20 Trust, 2017, p. 87). This is an improvement from 2014 when 59% of primary principals regarded network infrastructure as a barrier, with 24% considering it to be a major barrier. (20/20 Trust, 2014, p. 48). In Ireland, broadband and Wi-Fi connectivity were cited by 14% of the teachers surveyed as barriers to their technology use (Young, 2016, p. 187). A survey of Turkish primary school teachers in 2011 found that 73% had identified lack of hardware to be a problem. A lack of appropriate software was also a commonly identified problem with 67% of teachers finding this to be a challenge (Goktas, Gedik, & Baydas, 2013, p. 216).

Equity

The importance of developing digital literacy from an early age and ensuring equity when doing so is considered by Forzani and Leu (2012), who felt it was important that students were able to start learning digital literacy skills from a young age in order to gain the necessary skills they would need for adulthood. The researchers emphasised that for economically disadvantaged students, it was particularly important that digital literacy skills became part of classroom instruction. Similarly, in Sweden, the Swedish national curriculum for preschool “underlines the importance of providing all children with equal access to ICT (Masoumi, 2015, p. 6).

The 20/20 Trust report of 2017 found that 36% of all NZ schools considered the inequity of student access to technology at home to be a problem. However, there were significant differences noted according to the socio-economic areas schools served, as 69% of Decile 1-3 schools, those serving the lowest socio-economic areas, reported that inequity of student access to technology at home presented problems for teachers using digital technologies for learning (20/20 Trust, 2017). However, in a study based in Florida, USA, where it was found that from 2008-2014, the digital divide for modern computers that existed between schools in high and low socio-economic areas had virtually disappeared with all students having equitable access to modern desktops and laptops. What is important is that it is noted by the researchers that there was still a significant difference regarding software access at Elementary School level, with students from schools in higher socio-economic areas being able to access more software programmes than those attending schools in low socio-economic areas (Hohlfeld, Ritzhaupt, Dawson, & Wilson, 2017). In New Zealand, the Curriculum Advisory Group report of 2017 recommended that the plan for implementation of the revised curriculum include funding to ensure equitable access to resourcing for all schools.

Technical issues

Another common theme across many studies is the difficulties teachers experience due to insufficient technical support. This was still considered an issue by 62% of New Zealand primary principals in 2017, although this had gone down from the 78% who considered it to be a barrier in 2014 (20/20 Trust, 2017). Flewitt et al. (2014) also noted that teachers “encountered technical difficulties which sometimes interrupted the flow of learning-teaching episodes” (p. 302).

Technical problems were also encountered by Getting and Swainey (2012) who reported on their own experiences of integrating iPads into their reading programmes. As well as compatibility issues between their computers, iPads and interactive whiteboards, they also found that their software management programme had difficulties coping with a large number of devices and that these did not always sync properly.

Furthermore, Lim and Khine (2006) discussed the importance of providing teachers with technical support and helping them to trouble shoot ICT related problems so they could integrate ICT into their lessons effectively. They reported on the frustration experienced by teachers when computers were slow to boot up, and by the lack of compatibility between their hardware and software. Clarke and Zagarell (2012) said that “the lack of technological support, combined with initial apprehension, creates a situation whereby teachers are reluctant to try using the ICT provided for them” (p. 138).

However, technical problems were less of an issue in an Australian classroom of new students to school where iPads were used. The students reported that they could simply close the app and reopen it if they experienced problems, whereas if an issue occurred while using computers, they had to wait for the teacher to help them. The teacher also found that the iPads presented fewer technical problems than the classroom computers, which were causing her frustration owing to the time she was spending having to manage technical issues (Lynch and Redpath, 2014).

Cost

The cost of digital technology equipment was considered to be a major barrier to the use of digital technologies by the majority of the New Zealand primary principals surveyed, with 42% saying it was somewhat of a barrier and 53% considering cost to be a major barrier (20/20 Trust, 2017). This situation had changed little since 2014 when 97% of primary principals identified the cost of equipment as a barrier to their use (20/20 Trust, 2014).

Further financial barriers were identified by over half the surveyed principals, both for the cost of upgrades and for online services. These barriers were more likely to be reported as major by Decile 1-3 schools as 53% of Decile 1-3 schools compared to 37% of all schools reported the cost of upgrades as a major barrier, and 44% of Decile 1-3 schools compared to 25% of all schools reported the cost of online services as a major barrier (20/20 Trust, 2017). The cost of

digital equipment was also an issue for the teachers in the U.K. based study by Flewitt et al. (2014).

In contrast, the Swedish preschool teachers involved in the study of Masoumi (2015) stated that the accessibility of ICT technologies was not a problem for them as there had been a significant amount of investment in the provision of ICT resources for a large number of Swedish preschools. However, there was considerable variation in the way ICT was used by the preschool teachers in this study, and it was suggested that for these teachers, their expertise and pedagogical values played a significant part in the uptake of these technologies (Masoumi, 2015).

Time

The implementation of digital technologies for learning requires teachers to spend additional time learning how to use them effectively. In the United States, Clarke and Zagarell (2012) found that teachers were often undergoing technological training in their own time and at their own expense due to the lack of funding available in education budgets to meet this need.

In New Zealand, 54% of primary principals cited the time required for upskilling as a problem faced by their teachers (20/20 Trust, 2017, p. 93). Since 32 % of principals felt that the pedagogical change necessary for the successful implementation of digital technologies was also likely to be a problem for their teachers, the lack of available time for them to come to grips with these needed changes is truly an issue. This was acknowledged in the OECD Report of 2016, which stated that teachers “simply need more time to integrate new technology-enhanced educational models into their pedagogy” (OECD, 2016, p. 110).

Searching for the necessary resources was identified as another demand on teacher time in several studies. Flewitt et al. (2014) found that “teachers had to spend many out of school hours searching for appropriate apps to support learning objectives and they dedicated considerable effort and time in planning activities around apps” (p. 302). Young (2016) found

that 24% of Irish teachers also reported that lack of time was a barrier, specifically to prepare and to try things out. Lim and Khine (2006) also discussed the need for teachers to have time to explore available ICT software and resources and create new lessons as their typical workload did not provide the time for such additional activities.

2.7 Creative Uses

Many studies have examined the various ways digital technologies can be used to enhance learning. iPads in particular have been found to be attractive for young learners due to “their portability, their ‘touch’ interface, their simple navigation system” (Lynch and Redpath, 2014, p. 168) and much research has been focused on their use in a variety of educational settings.

Most studies have placed the apps used in one of two categories. Falloon (2013) has called these app categories content consumption and content creative. Content consumption apps, also referred to in other studies as closed apps, are those where users are directed through set content to reach predetermined goals. Whereas content creative apps provide opportunities for students to create original materials.

Content consumption apps can provide a degree of user choice, and interactive levels vary from one app to another, but the content is already formed. These apps are often selected by teachers for students to practise particular skills. Although some are able to do this effectively, “they position children as recipients of narrowly defined literacy knowledge, rather than as creative producers of original materials” (Flewitt et al, 2014, p. 297).

Content creative or open apps on the other hand, are those which enable the user to create a product. They can be used alone or involve the use of other apps to produce audio and video recordings, still images, links to other sites, and can also allow for the sharing of the final product. They can provide opportunities for students to be “producers and owners of their learning and as active participants in a learning community that extends beyond the walls of the classroom” (Lynch and Redpath, 2014, p. 165).

The new entrant students observed in New Zealand by Falloon (2013) used selected content consumption or closed apps. These particular apps had been chosen because it was considered that these students, who were new to school, “did not possess the literacy, numeracy or research capability, or sufficiently independent work habits, to facilitate unsupported content-creation tasks” (Falloon, 2013, p. 333). The chosen apps were intended to assist in the development of skills that would allow for more independent use in the future. Although the apps were all recommended for use by young children, several problems became apparent once they were being used by the students. Instructions were generally difficult for young children to access, they produced little formative feedback or other knowledge that would assist children as they moved through the app, and most apps did not have the capacity to store results or maintain a record of individuals progress. As devices were shared amongst several children, it became difficult to track student learning.

Lynch and Redpath (2014) found that the closed apps on the iPads, used at the beginning of their study “supported learners’ independent practice of basic alphabetic skills” (p. 168). When used in this way, the devices were used as a learning-centre activity during the class literacy block, reinforcing learning from previous teaching and allowing the teacher to engage with other students. Getting and Swainey (2012) also found that the closed apps used in their study made “a difference in sight word recognition, fluency, comprehension, and vocabulary recognition and meaning” (p. 27). In these studies, the content consumption apps were all used to support traditional literacy learning methods.

Content creative or open apps were able to be used in very different ways and by students of all ages. Although the teacher in Falloon’s 2013 study felt that her young students did not have the necessary skills to undertake unsupported ‘content-creative’ tasks, using iPads, a number of other studies suggest that iPads were well suited to independent use by younger users. Flewitt et al. (2014) found that open apps successfully “engaged children more creatively and deeply in learning tasks” (p. 297). In this study, observations were conducted in three settings; a nursery, a primary school reception class and a special school for children with learning disabilities. In all settings, children were motivated by the speed with which they could produce results. Reception class children were able to take photos using their iPad and import them into the ‘Our story’ app as the first step in creating their own stories. They were then able

to add voice recordings or typed text. In the special school, students used the same app to collaboratively plan, write and act out a play based on a school outing.

Lynch and Redpath (2014) also noticed in their study that the young children involved were planning their work and exploring a variety of apps, choosing the ones that would produce their desired results. They firstly used a drawing app to create pictures, then moved to another app to record voice-overs. The resulting work was later shared with the school community through the schools YouTube channel and Twitter page. Children were reportedly excited at being able to share the work they had planned and created with a wider community.

In the research of Kervin (2016), the way pre-schoolers engaged in digital play in the home was examined in order to investigate what opportunities for language and literacy development were provided. She suggested that “effective technology use connects on-screen with off-screen activities” (p. 68), citing an example of a child who used digital photos and voice recordings to create a record of an activity to then share with others. Another child used a puppetry app to create a presentation which he used to share his discoveries about his environment. Kervin said that “digital play sets a child up to engage with literacy processes because the child is deeply involved in the play situation” (Kervin, 2016, p. 72).

A study reported by Gasparini and Culén (2011) noted that older children of 8-9 years old in Norway also made use of storytelling apps. A puppetry and an animation app were used. Those children who had difficulties with drawing found the puppetry app avoided this issue and enabled them to express their creativity through the story itself. Although preselected images were available, many chose their own from a variety of sources.

Another group of slightly older students found having access to a variety of apps to show their learning opened up creative opportunities. Falloon (2015) investigated the collaborative possibilities of iPads when used by classes of middle and senior New Zealand primary students (Years 3-6). The students primarily used Google Docs for classwork but also had access to other apps, discovering which ones worked best for different purposes such as planning, writing

and producing slideshows. An Apple TV was used to share work with the class and gain feedback.

Masoumi's (2015) study of ICT integration in Swedish preschools showed technology was being used in a variety of ways. The story telling app 'Create your own fairy tale' was used by one child to create his own stories, and one teacher encouraged her students to take pictures and then use the app 'Photo Story' to create their own multimedia presentations. Children were encouraged to decide how they should create these presentations and to share their discoveries with each other (Masoumi, 2015).

A study undertaken by Shannon (2014) followed the introduction of iPads to a remote school in the Northern Territory of Australia with a predominately indigenous population. The introduction of iPads was targeted at year 1 students with the aim of improving oral language. Apps were selected that allowed for creativity, collaboration, audio capabilities and the capability for students to share their products with a global audience. A variety of story making, puppetry, movie making, book creation and multimedia apps were used for children to share their ideas and create presentations to show their learning. As well as detailing the improvements they had observed in the students' oral language, teachers noticed they were taking turns and working together collaboratively. They also observed students revising and refining their work, commenting that they were unlikely to do this when given pencil and paper tasks (Shannon, 2014).

The complexity of the task of using the internet to conduct research for their inquiry topics, for Grade 1 and 2 students in rural Victoria, Australia, was investigated by Lynch (2017). Students were shown how to use a range of tools to record information and manage their inquiries, including apps for concept mapping, digital scrapbooking and a multimedia app. An Apple TV was used for sharing work with the rest of the class. The class had a twitter account for sharing their learning with a wider audience. Findings from this study suggest that traditional literacy skills were not only essential to the internet inquiry tasks but were also reinforced by them. The importance of creating an authentic context so that the development of both

traditional and digital literacy skills could be done in a meaningful way was also noted (Lynch, 2017).

2.8 Other benefits of using digital technologies

2.8.1 Developing independence

The possibilities the iPads offered for independent work were a drawcard for the children observed by Flewitt et al. (2014). In the special school in particular, the mobility of the devices and touch screens made them more accessible to the students. An improvement in children's concentration levels was noted by staff in all settings as children worked through the various stages of writing, acting and recording in order to complete the tasks they had chosen to engage in. The findings of Lynch and Redpath (2014) also suggested that "iPads can support independent use by very young learners" (p. 168).

2.8.2 Developing Oral Language

Although it has been suggested that if technologies are used as one-to-one devices in educational settings, they can potentially reduce opportunities for students to engage in collaborative activities (Falloon, 2015), the study of Masoumi (2015) found that there was an improvement in the oral language of immigrant students when they used technologies for collaborative tasks. These findings were shared by Shannon (2014), whose research found that the largely indigenous student population in a remote community of the Northern Territory of Australia, had improved expressive and receptive oral language skills and were using more complex English sentences after participating in a project involving the use of iPads in year one classrooms.

2.9 Conclusion

Overall, the literature reviewed has emphasised the importance of digital technologies to the development of skills considered important for 21st century. Changes to education systems worldwide acknowledge the need for learners to become digitally literate and recent revisions to the New Zealand Curriculum have followed this trend. While many barriers to the use of digital technologies in education have been identified, there is also much literature which highlights the possibilities that technologies afford to educational settings.

CHAPTER THREE: METHODOLOGY

3.1 Introduction

This chapter describes the approach used in this research and the theory behind it. Davidson and Tolich (2003a) suggest that methodology “is about the logical and philosophical questions that particular methods assume” (p. 25). In this chapter, I examine my own ontological and epistemological position and how these have influenced the methods chosen for this research. The procedures used for collecting and analysing data are described and explained, along with the ethical issues which need to be considered. Also discussed in this chapter, are issues of validity and reliability.

This project initially aimed to examine how the policy-based requirement for incorporating digital technologies into the national curriculum could be met by a school with limited resources, particularly by those teachers working in the junior area of the school. The project was guided by the following research questions:

1. What are teachers’ technology practices and understandings in this school?
2. What do teachers in this school identify as important in their own development around digital technologies in teaching and learning?
3. How can this school best support teachers to implement the digital technologies content of the revised technology curriculum area?

The methodology selected to meet the aims of the project and answer the research questions is that of practitioner research, using an interpretivist approach.

3.2 Ontology and Epistemology

A researcher's ontological and epistemological positions have a direct influence on the methods chosen to conduct their research. Bracken (2010) suggests that it is necessary for researchers to identify their own ontological and epistemological beliefs in order to understand and justify the methods and processes they have used.

Ontological considerations are those which relate to the way the social world is viewed. From an ontological perspective, I share the view put forward by Bryman (2012) of the social world being something that people are constantly in the process of modifying, rather than something which is external and over which people have no control. This falls under the definition of a constructivist position.

Davidson and Tolich (2003a) define epistemology as "the philosophical theory of knowledge. The branch of knowledge that deals with how we know what we know" (p. 25). Kincheloe (2012) points out that "as the branch of philosophy that studies knowledge, epistemology addresses questions that surround the process of knowing" (p. 229). Bryman (2012) explains epistemological considerations as those which raise questions about how the social world should be studied. It is therefore important to establish what knowledge is being sought and the beliefs that lead to that knowledge being considered important.

As this research concerns people and the environment in which they are working, I feel it is appropriate that it has been undertaken from an interpretative stance, using a practitioner research approach. Interpretivism is a contrasting epistemology to positivism, a position that advocates the application of the same principles and procedures used to study the natural sciences to the study of the social world (Bryman, 2012). The suitability of the interpretative stance is reinforced by the views of Cohen, Manion and Morrison (2011) who suggest that the main purpose of this paradigm is to understand human experience. They state, "situations are fluid and changing rather than fixed and static: events and behaviour evolve over time and are richly affected by context" (p. 17). In my view, this description of interpretivism demonstrates

the appropriateness of its application to the constantly changing dynamics of the primary school setting.

3.3 Qualitative research

This research fits into the paradigm of qualitative research which uses a practitioner research approach. Qualitative research is described by Creswell (2009) as “a form of interpretive inquiry in which researchers make an interpretation of what they see, hear and understand” (p. 176). Bryman (2012) and Mutch (2013) both see qualitative research as that which seeks to discover the reality of the situations experienced by participants as seen through their eyes. In this research, the focus on qualitative, rather than quantitative data is consistent with an interpretative view.

Creswell (2009) identifies many of the features of qualitative research. The focus is on learning the meaning that the participants hold about the problem or issue. Data is collected in the field at the site where participants experience the issue or problem under study. Multiple sources of data are usually gathered, then analysed and organised into categories or themes. An important feature of qualitative research, and particularly relevant to this research has been the emergent nature of the design. As changes and unexpected events arise in relation to the situations and individuals being studied, research processes are able to be adjusted. The aim of the research is to learn about the issues from the participants.

Qualitative research has not been without criticism, particularly for the lack of data able to be measured in a scientific way. In quantitative research, the data which is sought for collection is that which can be accurately measured, and consistency when doing so is considered important to ensure reliability. Qualitative data has been criticised by positivists for its lack of consistency. However, because it is the meaning which people bring to their experiences that is valued in qualitative research, having the flexibility to adapt to change is considered by qualitative researchers to be one of the strengths of this approach (Davidson & Tolich, 2003a).

3.4 Practitioner Research

As a teacher in the junior area of my school, the questions this project seeks to answer were ones which I, along with my colleagues, faced in my own practice. Believing in an interpretivist approach, a methodology guided by the principles of practitioner research was selected for its closeness and relevance to practice. The relevance and value of involving colleagues in the research is outlined by Cochran-Smith and Lytle (2009) who insist “that teachers and other practitioners are the key to educational change” (p. 1). For this research it was seen as important to involve those who were also looking for answers.

Practitioner research acknowledges the uniqueness of each individual school setting. Robinson and Lai (2013) refer to the “highly contextual nature of practice” (p. 18) when discussing the value of practitioner research, suggesting that teachers are often doubtful that the research of others will have the same relevance to their own classrooms. They point out that practitioner research “takes into account the complexities of what teachers are up against in their own particular settings” (p. 18). Cochran-Smith and Lytle (2009) also see the relevance of research which is carried out in the organisation seeking information, stating that “the knowledge generated through practitioner inquiry is intended primarily for application and use within the local context in which it is developed” (p. 42).

In practitioner research, when answers are being sought, useful information is often possessed by those who are working within the situation being studied. Cochran-Smith and Lytle (2009) acknowledge the expertise of the people who are at the coalface, pointing out that “those who work in particular educational contexts have significant knowledge about those situations” (p. 42). This view is supported by Kincheloe, (2012) who regards teachers as “professionals who produce knowledge about their practice” (p. 8). Coleman and Lumby (1999) also recognise the value of involving those working at the heart of the problem, seeing site-based research as a ‘bottom up’ approach which focuses on the professional experiences of teachers and the processes they use. Cochran-Smith and Lytle (2009) note that collaboration among and across participants is a key feature of most versions of practitioner research (p. 41).

The above views support my own beliefs that many of the answers to my questions relating to my workplace can be found by the collective efforts of those who are familiar with that setting, and the possibilities and constraints it imposes.

Conducting research in one's own workplace has its own set of advantages and disadvantages, as discussed by Mutch (2013). It afforded me easy access to the research site and participants and, as a long-term employee, I had a knowledge and understanding of the history and culture of the organisation. In an environment where tasks often need to be juggled to allow for changing situations, it was useful to be on site and be able to easily rearrange the time for research tasks when necessary, and to be aware of the most suitable times to meet with people. Bryman (2012) identifies one of the features of the qualitative researcher as someone who tries to get close to their participants in order to understand their experiences, rather than maintaining the distance of someone conducting quantitative research. To be working with colleagues with whom I had already established relationships meant that I was in a better position to develop this understanding.

The main issue I needed to consider was ensuring minimal conflict between the two roles I had as researcher and colleague, a situation which Snook (2003) states can occur when professionals undertake research in their own workplace. To some extent, this was alleviated when I was granted a study award, meaning I was on leave from my usual teaching duties for the latter part of the research period, and my dealings with the participants during this time were when I came in as a researcher, rather than working alongside them as a colleague on a daily basis. It was important that I explained the procedures I needed to follow to establish the difference in the role I was undertaking. In a small organisation, it was particularly important that measures were taken to maintain confidentiality, issues identified by Mutch (2013) and by Coleman (1999). All participants were given pseudonyms and interviews were conducted in a private setting. To maintain the trust of my colleagues, all information they provided had to be accepted without judgement.

3.5 Data Gathering

The main data gathering activities associated with this research are semi structured interviews and the collection of documentary evidence. These methods were chosen because they were identified as being able to provide the researcher with qualitative information that would give insight into the experiences and perceptions of the participants.

3.5.1 Semi-structured Interviews

Research interviews can be broadly grouped into three general categories. The structured interview is usually favoured by those collecting quantitative data as it follows a series of prescribed questions and is similar to a questionnaire in format. To ensure reliability, it is important that the interview is administered in exactly the same way to all interviewees and there are no deviations from the script. Questions are often quite specific and offer a limited range of possible answers.

Kvale (2007) describes the qualitative interview as “a construction site for knowledge” (p. 7). In qualitative research, semi-structured or unstructured interviews are generally favoured. Semi-structured interviews feature a set of key questions which tend to be more open ended than those typical of the structured interview. The interviewer is able to vary the sequence of questions and ask further questions in response to the interviewee’s replies. Unstructured interviews begin with an open-ended which allows the interviewee to respond freely. The interviewer may have a set of prompts for topics to cover but is free to respond to points of interest. The intention of semi-structured and unstructured interviews is to gain an in-depth understanding of a topic or issue from the interviewee’s point of view (Bryman, 2012; Mutch, 2013).

Kvale (2007) identifies conversation as a basic mode of human interaction (p. 1). Through conversations, people are able to share and gather information and develop a greater understanding of each other and the experiences they have had. An interview conversation is

one with a specific purpose rather than an informal, everyday occurrence. It is a “constructed and usually a specifically planned event” (Cohen et al., 2011, p. 409). Kvale (2007) states that “an interview is literally an inter-view, an interchange of views between two people conversing about a theme of common interest” (p. 5).

In this study, semi structured interviews were chosen as the information being sought was related to the experiences and perspectives of the participants. The flexibility that the semi structured interview afforded was important in order to be able to respond to the interviewee’s replies and seek further information when relevant points were raised. The format also provides opportunities for respondents to talk freely which created possibilities for unexpected and valuable points to be raised (Coleman, 1999).

There can be disadvantages associated with interviews and these needed to be considered and strategies devised to reduce them. Interviews can be time consuming, both for the researcher and for participants (Coleman, 1999; Mutch, 2013). Kvale (2007) asserts that the knowledge produced can depend on the interaction between interviewer and interviewee.

Interviews with classroom teachers were undertaken at two points in the study, over the course of a six-month period. Initial interviews were intended to take place early in the fourth term, but, owing to other demands on teacher time during this period, these didn’t take place until the final few weeks of the term. At this point in time, the teachers had recently received three iPads to use in their teaching and learning programmes and were experimenting with the possibilities that these devices afforded their programmes. These interviews established the participants’ understandings of the requirements of the revised technological areas of the curriculum, their confidence in using digital technologies, the experience they already had in using them in their teaching programmes and their aspirations for using them in the future. The second set of interviews was intended to take place towards the end of the first term the following year. However, due to the limited opportunities teachers had to utilise the devices during this term, these interviews were rescheduled to the beginning of term two. These interviews were to investigate the ways in which teachers had used digital technologies in their

classrooms, to establish what they had found to be successful, the challenges they had faced, as well as gather their recommendations for future use.

The interviews with the classroom teacher participants were conducted on the following dates:

Participants	Interview 1	Interview 2
Amelia	8/12/17	17/5/18
Amy	12/12/17	10/5/18
Eli	29/11/17	16/5/18
Hannah	12/12/17	3/5/18
Isabella	29/11/17	3/5/18
Sophie	12/12/17	9/5/18
Sue	6/12/17	4/5/18

Two additional participants, who each possessed knowledge and expertise relevant to the situation of this school, were also interviewed so their unique perspectives and insights could be added to the information being sought.

A preliminary interview was conducted with a digital technologies facilitator who was approached directly by the researcher. This facilitator had worked with the school staff over a number of years, was familiar with the school's resources and the experience that the teachers had already had in using them. As an accredited Ministry of Education facilitator, she had knowledge and understanding of the content of the revised technology curriculum area and its implications for schools, which gave an additional perspective to the overall study.

During the first term of the following year, it became apparent that teachers were experiencing difficulties using some of the digital devices, as during the summer break, the setup of these had been changed by the technicians employed by the school. Therefore, a decision was made

to invite the school's digital leader to be interviewed at the end of the study to gain further insight into the reasons for these difficulties and the steps needed to overcome them.

These additional interviews were conducted at the following times:

Participant	Interview date
Digital technologies facilitator	18/11/17
School digital leader (Brittany)	23/5/18

3.5.2 Documentary evidence

Coleman (1999) identifies documentary analysis as a research tool often used as a supplementary means to interviews to gather information and also as a means of triangulation. Triangulation is explained by Bryman (2013) as a means of cross checking by using two or more sources of data. Campbell, McNamara, and Gilroy (2010) discuss the usefulness of keeping logs to record events significant to the research and suggest that these be recorded as and when they occur.

In order to assist with their recollection of events and to provide more information about the activities being carried out, participants were invited to keep logs recording their use of digital technologies. Blank logs were set up as google docs at the request of the participants, to be shared with the researcher (see Appendix A). Participants were invited to include reflections on teaching activities, identify problems they had encountered and make suggestions for future improvements to their own practice and recommendations for others intending to adopt the activities. For the practitioner researcher, the logs provided insight into the key area of interest, that of the teacher's practice. The logs were used as prompts during the interviews, so the researcher could gain clarification about documented teaching activities. They were also used by the participants to help them to consider their responses to the interview questions. The logs

were begun at the start of the first school term of 2018 and added to throughout the term as the participants attempted various activities using digital technologies in their classrooms.

During term one of 2018, the digital leader shared documents with the researcher relating to the school's plans for adopting the digital technologies content of the revised technology curriculum area, and those regarding issues identified with the set-up of the iPads. The information in these documents provided the researcher with insight into the issues which had been encountered and helped to guide the questions that were asked to clarify these issues. The researcher also kept a log of events affecting the research throughout the process.

3.6 Recruitment Process

All teachers who would be in the junior teaching team the following year, when most of the data collection would take place, were invited to participate. To avoid the possibility of collusion, the invitation was emailed by the school secretary, asking teachers to contact the researcher if they were interested in participating. Seven classroom teachers took up this invitation. The digital technologies facilitator and the school's digital leader were invited by the researcher as they each had unique perspectives to offer which related to the positions they held.

3.7 Ethical Considerations

Ethical issues affect all stages of a research project. Menter, Elliot, Hulme, Lowden, and Hall (2011) describe ethics as "the branch of philosophy that deals with defining what is good (and what is bad) and with distinguishing right from wrong" (p. 47). They also discuss the link between ethics and values and what constitutes moral behaviour. Bryman (2012) observes that writers often differ in their opinions of what is and is not ethically acceptable. Cohen et al. (2011) suggest that ethical principles need to be interpreted according to the research context and the values that are held so are therefore not fixed. Creswell (2009) advises that ethical dilemmas should be anticipated and addressed in the planning stages.

Kvale (2007) describes an interview inquiry as a moral enterprise and asserts that moral issues need to be considered throughout the inquiry. He reasons that interviewees are affected by the human interaction during the interview and our understanding of the human condition is affected by the knowledge an interview inquiry may produce.

For this researcher, the overriding ethical principle in need of consideration is best expressed by Cardno (2003) who states, “the ethics of research focus on the need to protect people taking part in a study from any possible harm” (p. 56).

In this research project, the following areas were identified as areas which required ethical consideration. The reasoning for this and the methods used to address these areas are as follows:

3.7.1 Site consent

In the early stages of planning a research project, Cardno (2003), Cohen et al. (2011), Creswell, (2009), and Mutch (2013), all recommend that permission is gained to access the research site from someone in a position of authority. Menter et al. (2011) point out that seeking site consent to carry out practitioner research creates an unusual situation as the site is already the researcher’s place of work. However, they assert that the practitioner’s additional role as researcher makes it important that permission is granted to legitimise the activity and ensure transparency about what is taking place.

Before undertaking this project, permission to conduct research within the school was sought from and granted by the principal.

3.7.2 Informed consent

The importance of informed consent is discussed by several authors, with Cardno (2003) emphasising that “the principle of informed consent is fundamental to ethical research” (p. 57).

Kvale (2007) recommends that participants are provided with information about the overall purpose of the research and the procedures which will be followed. He says that any possible risks and benefits to participants should be made clear and they should be made aware that their participation is voluntary and that they have the right of withdrawal at any time. Mutch (2013) adds the possible dissemination of the research to the information that participants should receive on completion of the research project. Bell and Waters (2014) suggest that participants require adequate time to read through the information they are given and consider the implications before they should be expected to sign anything. Snook (2003) argues that fully informed consent is seldom possible as for this to be achieved, participants would need to possess as much knowledge about research as the researcher. However, he concedes that it is usually possible to provide clear information about what will be expected of the participant and alert them to any potential risks which may be involved.

In this research project, because the researcher holds a leadership position within the school, although not directly in a position of power over possible participants, it was important to ensure that people did not feel coerced into taking part. As previously mentioned, in order to mitigate the possibility of this happening, invitations to participate (see Appendix B) were sent by the school administration to potential candidates, who were asked to contact the researcher for further information if they were interested in participating. Those that did so were given an information sheet (see Appendix C) which outlined the aims of the study, procedures which would be followed and the requests that would be made of them. They were informed of their right to withdraw from the project up until two weeks after their final data was collected and assured that any identifying information would be kept confidential. This information was also explained verbally. Before the start, participants who agreed to take part in the study were provided with consent forms (see Appendix D).

3.7.3 Anonymity and confidentiality

The issues of anonymity and confidentiality both need to be addressed before embarking upon a research project. Definitions of these two terms vary between authors. Cardno (2003) and Cohen et al. (2011) consider anonymity to be when the participant is not able to be identified by anyone, including the researcher. Confidentiality means not disclosing information that

enables an individual to be identified and not discussing them with others. Bryman (2012) points out that although it is often possible for anonymity to be achieved in quantitative research, where identities may not need to be disclosed in surveys and questionnaires, in qualitative research particular care needs to be taken to prevent the identification of individuals in order to protect their privacy. Cardno (2003) emphasises that it is not possible for interviews to be anonymous, but confidentiality means identities will not be made public. However, Cohen et al. (2011) argue that as qualitative data can be unique to individual cases, it is possible for it to be traceable, even if names are not used. They suggest that participants may need to validate and clear information for inclusion and thought needs to be given to who will perform transcriptions, as sensitive or personal information may have been revealed.

As this study falls under the category of qualitative research and involves the use of interviews, it was not possible for participants to be anonymous, however, steps were taken to ensure the confidentiality of all involved. Participants were informed that all data they provided will be kept confidential and stored securely by the researcher, their identities would be concealed, with pseudonyms used and any identifying features changed or removed. All transcribing was carried out by the researcher, so no third party was privy to any confidential information that may have been revealed. Copies of these transcriptions were shown to the participants for verification and approval before the information was used (Bryman, 2012; Coleman, 1999; Mutch, 2013).

3.7.4 Bias

Menter et al. (2011) discuss the issue of bias and suggest that research cannot be value free as the judgements of the researcher will reflect their own values. However, they advocate for as much transparency, clarity and explicitness as possible, so the reader is aware of the researcher's position and can make their own judgements accordingly. Throughout this research, it was important that I respected the values and opinions of others and made a conscious effort to maintain an objective stance to the information I was given.

3.8 Data Analysis

Once data has been acquired, sense needs to be made of what is collected. The process of data analysis involves several stages. There are variations in the processes involved, depending on whether quantitative or qualitative data is being examined, although both methods are about searching for and making sense of patterns (Bryman, 2012; Davidson and Tolich, 2003b).

3.8.1 Data Reduction

As researchers often collect large amounts of data, it needs to be reduced to a manageable amount before sense can be made of it. A coding process is generally used for this. For quantitative research, this often means coding the information acquired in numerical form. In qualitative research, the code is the name or label a researcher gives to a piece of text which allows the researcher to identify similar information and establish themes. This process is ongoing, and codes are changeable (Bryman, 2013; Cohen et al, 2011; Mutch, 2013).

3.8.2 Data Organisation

The next stage of the process is the organisation of the reduced data into categories or themes. Since quantitative data often reduces into numerical form, it is able to be organised using statistical techniques. Qualitative data is usually in textual form and is then organised into themes which have emerged from the data itself (Davidson and Tolich, 2003b; Mutch, 2013).

3.8.3 Data Interpretation

Interpreting both quantitative and qualitative data involves searching for patterns which relate to the original research questions, considering possible explanations and drawing conclusions. Quantitative researchers decide if the data supports or refutes their original questions or hypotheses, explain the results and suggest why they might be significant. Thematic analysis is considered by Mutch (2013) to be the most common approach for analysing textual data.

Often, multiple interpretations are possible for qualitative data (Creswell, 2009; Cohen et al., 2011; Davidson and Tolich, 2003b).

This research involved qualitative data in textual form which was unable to be measured by statistical methods. All interviews were voice recorded, then transcribed by the researcher, with possible themes being noted during this process. The transcriptions and practitioner logs were then coded according to the themes that emerged during this process. These codes were then re-examined at the end of this process to determine which were of most significance as Campbell et al. (2010) point out that this can change once the whole data set is examined. The data was then organised into categories and from there, into subcategories. The data was then questioned to determine what claims could be made in view of the findings, a process Campbell et al. (2010) refer to as interrogation of data. Finally, the main themes which had emerged across the categories were identified and used to describe the overall findings of the research.

3.8.4 Validity and reliability

In quantitative research, reliability refers to the consistency of measures with the following being the three main factors to consider; stability over time, internal reliability and consistency between observers. Validity in quantitative research refers to the suitability of the devised indicator to measure the concept in question (Bryman, 2013; Davidson and Tolich, 2003b; Mutch, 2013).

As qualitative data is often unable to be measured using scientific methods, validity and reliability are usually assessed using a different set of criteria in keeping with the principles of the research methods. The trustworthiness and credibility of the research become the main considerations when determining its quality (Bryman, 2013; Creswell, 2009; Mutch, 2013).

Mutch (2013) suggests that the trustworthiness requires clear documentation of all research decisions and procedures. Creswell (2009) recommends the use of rich, detailed descriptions

to portray the setting and convey the findings. Also suggested was taking the findings back to participants to check that they feel they are an accurate reflection of their experiences.

Triangulation is discussed by Bryman (2013), Cohen et al. (2011), Creswell (2009) and Mutch (2013) as a common technique for establishing credibility. This involves using more than one source of data to ensure multiple perspectives are contributing to the overall picture.

In this research, the junior classroom teachers who participated encompassed practitioners with a range of knowledge and experience in using digital technologies and included those at the beginning of their teaching career through to those of more than 20 years teaching experience. The experiences of the school digital leader were sought to provide further information about the technologies being used. The knowledge and insights of the external digital technologies facilitator provided an additional perspective to the research. The teachers also provided written documents detailing the activities they had carried out using digital technologies and their subsequent reflections on them. Information provided by the classroom teachers was also checked against the researcher's own log of events as they had occurred and the documents the digital leader had shared.

3.9 Ethics Approval

This research was conducted from an interpretive stance, using methods which aligned with a practitioner research methodology. Before the commencement of the project, ethics approval was sought from and granted by the Unitec Research Ethics Committee.

CHAPTER FOUR: FINDINGS

4.1 Introduction

This thesis explores the ways in which a low decile primary school might be positioned to implement the digital technologies content of the New Zealand curriculum. This chapter reports on the teacher's experiences using digital technologies, their attitudes towards using them and their suggestions for how future implementation could be achieved.

Aim and Research Questions

The aim of this project was:

To explore opportunities for the implementation of the digital technologies content of the revised technology curriculum area in a school with limited resources.

The project was guided by the following research questions:

1. What are teachers' technology practices and understandings in this school?
2. What do teachers in this school identify as important in their own development around digital technologies in teaching and learning?
3. How can this school best support teachers to implement the digital technologies content of the revised technology curriculum area?

As previously mentioned in the introduction chapter, these questions are highly contextual to the environment of a low decile school with limited access to digital technologies.

As outlined in the Methodology section, the findings of this study emerged from the analysis of data which was derived from semi structured interviews and documentary evidence. Two sets of interviews were conducted with seven junior class teachers. This group of participants

included both experienced and recently trained teachers. Most possessed little experience at using digital technologies in their teaching, although one had recently worked in a school with a high level of digital resourcing.

The first set of interviews took place towards the end of the school year, when participants were working with students who they had taught for most of the year. At the time, the participants had recently received iPads to use in their classrooms. At the beginning of the following year, all participants were teaching a new group of students who had not participated in their teacher's previous explorations with digital technologies. The second interviews occurred after the participants had worked with the new class of students for a term and had had opportunities to trial the devices with them and reflect upon their use.

The participants also provided logs of the digital activities they had carried out with their classes during the first term of the new school year. A template for the logs was provided to all participants (see Appendix A). A preliminary interview was conducted with the external digital technologies facilitator who had provided professional development to the school staff over a number of years. The recently appointed school digital leader was also interviewed towards the end of the study to gain additional information.

The main areas of interest I wanted to explore in this study were: The teacher's current practices and understandings around the use of digital technologies; the conditions that would support them to develop their practice in this area; and how the school could best provide opportunities for them to do this given the constraint of limited technological resources.

The analysis of the data gathered was guided by the research questions, as well as the themes that had been identified in the literature review and salient words and ideas identified in the data. All participants were provided with pseudonyms.

4.2 Current practices and understandings

In order to determine how the school could best support teachers to implement the digital technologies content of the revised technology curriculum area, it was important to establish what their current practices and understandings were around the use of digital technologies in teaching and learning and their knowledge of the curriculum document and its intended outcomes.

4.2.1 The digital curriculum

At the time of this study, the participants involved appeared to have little knowledge of the revised curriculum. During the first set of interviews, the participants outlined what they understood about the content of the revised curriculum document. Two participants said they were unaware that any new developments had taken place. The remaining five said that they were aware that a revision involving digital technologies was coming but hadn't seen it. They shared their ideas on what they thought the revised curriculum might require. Sophie said that "I think they want us to integrate...use more devices to help kids...they have to be computer literate. You have to be digitally competent...you have to incorporate that into your pedagogy" (I1). Thoughts of integration were echoed by Isabella who suggested that "it probably needs to dovetail with what we already do" (I1). Hannah said there were three strands, "probably going into designing, maybe a bit of programming" (I1).

4.2.2 Participants views towards digital technologies

The participants expressed their belief in the value of digital technologies in teaching and learning. Several participants reported that they had noticed high levels of student engagement, with Sue commenting that "there's not a single kid who isn't fully engaged when they're on the digital technologies" (I2). Amy also spoke about the positive reaction of her students when they were working with devices saying, "when I see the kids interacting on the iPads, I see them just light up" (I2). As well as noticing increased levels of engagement, Hannah said she saw technologies as providing a wider range of experiences for her students and felt that

“having different digital tools for the kids to use in class has provided more learning opportunities for them and they’re more engaged in what they’re doing...they can remember what they are learning also” (I2). Some teachers described improvements in students’ achievement which they attributed to technology use. Sophie said she had noticed a change in the attitude of her students towards writing after they began using Book Creator on the iPads. She explained, “they’re trying to write, that’s very positive...they look forward to it and they’re more advanced” (I2). Amelia said that she had seen significant acceleration in students’ reading levels through technology use. She also suggested that the students’ use of technology had created independence and had also helped them to develop early research skills.

Participants described ways they had used technologies to expose their students to the ideas of others and develop an awareness of happenings outside their immediate environment. Eli said technologies were “gifting them that outside world that they don’t see every day” and talked about how “things come alive in the classroom when you put that YouTube on” (I2), explaining how the students had made comments such as “oh, so these plastics are real” (I2) when they were able to see a video of plastics in the ocean after talking about the effects they were having on sea life. Eli then described how a discussion had followed, resulting in the children examining how much plastic was in their own lunchboxes and deciding they needed to talk to their parents about avoiding products with plastic packaging because as one child said, “I don’t like the sharks or the turtles to die” (I2). Eli reported that a considerable reduction in plastic packaging was noted over subsequent days, with one parent coming up to enquire about the source of information her child had been exposed to, so she could locate it herself and share it with the rest of the family.

Amy said that technology enabled the students to be “exposed to images and sounds and stories and information that they might not get without it” (I2) and suggested that viewing information on the television screen had a greater impact than images on paper. She also discussed the potential that technologies gave students to share their learning, talking about the discoveries her students had made about the impact of rubbish on the environment and how they were planning to use the subsequent videos they had made to share their new understandings with the wider school community.

These activities were promoting the development of the key competencies of the New Zealand Curriculum, particularly that of participating and contributing as students came to understand that their opinions and actions could make an impact on the wider community.

4.2.3 Integration of digital technologies

The external digital technologies facilitator emphasised that it was important that teachers did not treat the use of digital technologies as separate to other learning but needed to ensure that their use was “integrated across all the curriculum areas and just part of your daily learning” (I1).

The responses of the participants involved in this research suggests that they shared this view that digital technologies needed to be integrated into their existing teaching programmes rather than becoming a separate learning area. During the first round of interviews, Sophie spoke of wanting to extend her knowledge of “what programmes we can incorporate in our everyday lessons”. She said she wanted to know how “I can use it to enhance more of the teaching in my classroom” (I1).

Hannah’s searches for suitable activities also appeared to have her teaching programmes at the forefront of her mind as she discussed “finding the right apps that will relate to literacy” (I1), saying she wanted activities that reflected the specific objectives she was working on with her students, rather than having them engage in activities that did not relate to her programme.

Amy described her technology use as a way of “capturing moments and then presenting them back to the kids” (I1) to aid them in recalling and “retaining those experiences they have” (I1), while Amelia explained how she was helping her class to create their own movies to present their learning from other curriculum areas.

By the time the second set of interviews took place, participants were beginning to reflect upon the level of integration they had achieved in each curriculum area and identify those areas in which they wanted to make more use of digital technologies. Sophie reported that her students had mainly used the iPads during their literacy time, but she was now looking for ways to make use of them in other curriculum areas, particularly during Inquiry. Sue said that maths was an area where she wasn't happy with the digital activities that were available as she wanted ones that would reinforce "what I'm teaching at the time" (I2). Hannah explained that the reason it was time consuming to search for new activities was because she was after "things that really relate to what we're doing" (I2). A comment from Isabella sums up the views the teachers all appeared to hold towards the selection of suitable digital activities. She remarked "If it doesn't fit what we do then it's a misfit and it's not useful" (I2).

4.2.4 Teacher confidence

In both sets of interviews, all participants were asked how confident they felt they were using digital technologies in their teaching using a scale of one to five, with one being not at all confident and five being very confident. Despite the range of experiences across participants, they all rated themselves between three and four in both interviews. Three participants gave themselves the same ratings in both interviews and three had given themselves a higher rating in the second round. One participant had given herself a lower rating in the second round. From the explanations the participants gave, the ratings appear to reflect their perception of their classroom technology use in relation to their understanding of what the possibilities were. As Isabella remarked during the first interview, "If you don't know what you don't know, you don't know what you're not doing" (I1).

The participant who had given herself a lower confidence rating in the second interview had initially said she didn't know all the latest things but "I pick up fast if I learn it" (I1). During the second interview, after giving herself a lower rating, she explained "I could learn it, but I haven't" (I2), and went on to add that when hearing colleagues talking about new developments, she felt that "it sounds like too much to learn" (I2), describing it as a barrier she had put up for herself.

The participant who had previously worked in a digital environment and undergone extensive professional development in the use of technologies, rated herself as a four both times, explaining that “there’s still some things I need to learn” (I2), listing some of the recent developments she was aware of, but hadn’t yet had the chance to familiarise herself with.

Another participant who had rated herself as a four both times did so in the first interview because she described herself as a confident user of technology but felt she wasn’t able to describe herself as very confident as she felt she needed more knowledge on how to best incorporate it into her teaching. At the time of the second interview, she was still discovering new ways to use technology but felt that “I can learn very quickly about it” (I2) and had also realised that when she encountered challenges, she was able to find ways to work around them.

Two participants who had rated themselves as three during the first interview and four during the second, had similar reasons for doing so. They felt that although they were using digital technologies at the time of the first interviews, this use was limited “I use it every day but it’s the same kinds of things that I do over and over” (I1) and felt there was more for them to learn “I love how I use digital technology, the way I’m using it, but I know it can go a bit further” (I1). By the second interview, both felt they had learnt more about ways they could use digital technologies and were putting this learning into effect. However, like the two participants who had rated themselves as four both times, these participants felt they still had more to learn with one explaining that she didn’t think she had “all of the knowledge yet” (I2), while the other was more specific in linking the perceived gaps in her classroom use of technology to her personal use, explaining that she used a phone and laptop herself but “because I don’t own an iPad, I don’t really explore iPads” (I2).

These responses appear to suggest that participants were aware that they were on a learning journey and saw the responsibility for their continued progress on this journey as their own. Although their limited knowledge of the revised curriculum requirements meant that they were not always aware of exactly what it was they needed to learn, they were reflecting on their own practice and considering how their use of technologies might have shifted over time.

4.3 Participant Identified Needs for Development

Participants were asked to identify the factors which they considered would assist them in making effective use of digital technologies for teaching and learning. Although they were unfamiliar with the content of the revised curriculum areas, the participants were able to suggest and discuss methods which they considered to be helpful when undertaking new learning.

4.3.1 Models of Professional Development

Participants outlined that professional development which would enable them to make effective use of their resources was important. The teachers clearly identified aspects of professional development that they found helpful. All the junior class teachers participating in this study had received professional development prior to the second interview from the external facilitator in the form of individual sessions, generally lasting around three quarters of an hour. These sessions were generally agreed to have been helpful for meeting the individual needs of each teacher.

When discussing the benefits of the individual professional development sessions, the participants talked about how important it was for the facilitator to cater for their individual needs. During the first interview, Sue said she liked the fact that “it’s individual, tailored for you” (I1), and reported that she had been equipped with a lot of ideas and resources, remarking that “I learnt so much in such a short time” (I1). She explained during the second interview that not only had she been shown possibilities for using the technologies during the sessions, she had also been provided with links to sites that she could investigate to further develop the ideas she had been given. When discussing the professional development during the first interview, Sophie said that a feature she found helpful was the practical, hands on approach, as she was able to bring a device and sit alongside the facilitator and try things out for herself during the sessions explaining, “If you’re teaching me, you stop, then I do it myself. If I’m stuck, I can ask for help” (I1). After having a session with the facilitator at a time when the iPads were

being programmed by the technicians, she remarked in the second interview that “it was good, but it would have been better if I had the iPad” (I2).

Opportunities to immediately put new learning into practice in settings outside of the professional development also appear to have had a positive impact on teachers. Several participants described an activity the whole staff had participated in at the local marae. This occurred following the first set of interviews and prior to the second interview. After being shown how to create their own videos using Adobe Spark, they were given the task of making their own videos in small groups. Having the opportunity to follow the steps themselves appeared to provide the teachers with an understanding of what was involved and may have given them greater confidence to attempt the activity with their students. Isabella explained that “it didn’t require a lot of skill from us because what it does is it brings together the speaking, the writing and the imagery together... it appears skilful but really it’s the programme that does it for you”. She went on to add “It’s quite simple, so I could do that on an iPad” (I2).

After reflecting upon styles of professional development that they identified as beneficial, the teachers made a number of suggestions for ways they thought that future learning could be accomplished. Although they described themselves as competent in their personal use of digital technologies and quick to pick up new learning, Sophie and Amy were keen to have opportunities to see someone with greater expertise than themselves at using technologies in the classroom, working with their students. Sophie said that she thought this would have more impact for the children, with the added advantage that “we teachers can learn at the same time, helping the kids” (I2). For Amy, the value was in seeing someone putting an activity into action as she felt she would be more inclined to “go and do it because I’ve seen someone else do it” (I2).

Most participants had strong views about the features that would make professional development most effective for them, with an emphasis on practical sessions, and content relevant to their current needs. When Amy described her preferred approach to professional development she explained, “I watch and then I try it. If there’s too much talk, it goes in one ear and out the other” (I1). Sophie echoed these sentiments, stating that she also preferred a

practical, hands on approach, “not just talk, talk” (I1). The relevance of the information was crucial for Isabella who said that “I find that I learn best when it’s something that I’m going to use immediately” (I1). Brittany felt it was important that everyone had opportunities to explore the potential of new equipment before being expected to use it in the classroom and suggested hands on sessions involving the whole staff, saying “let’s have a staff meeting where we play and engage with tangible stuff” (I2).

4.3.2 Collaboration

The teachers viewed each other as a resource and felt there was potential for expanding their own knowledge by sharing with their colleagues. When asked what they would like to see happen in the future to further develop their own expertise, the teachers suggested that they were keen to have more opportunities to collaborate and to share ideas amongst themselves. Indeed, they considered this collaboration to be an important part of their professional learning. As Hannah stated in the second set of interviews, “We need to work together as a team” (I2).

There were a number of ways that the teachers felt this collaboration could occur. After trying out some activities with her own class, Hannah said she was keen to compare her experiences with her colleagues, to “talk to them about what they’re using in their classroom and what’s working for them and what’s working for me” (I2). Eli spoke of informal sessions with colleagues after school, where they tried out new ideas and learning together, working at their own pace and supporting each other as they explored the potential of unfamiliar technologies and activities, explaining that “we make mistakes, then we undo it” (I1). Amy suggested using the technology itself as a way for teachers to share their expertise. She went on to describe how she had used her phone to create a simple video tutorial for a colleague who had sought her assistance. She explained that “I figured it’s easier to watch the video than to read the instructions” (I2), and then contemplated the possibility of setting up a resource bank of tutorial videos that other staff could contribute to and use as a source of information. The value of having a key person to turn to for immediate help was also identified as important, with several participants explaining how they would seek the assistance of colleagues when trying to attempt an unfamiliar activity.

4.4 Conditions for curriculum implementation

The views of the participants and the external digital technologies facilitator were sought to discover what conditions, in their view, were required for this school to successfully implement the two technological areas relating to digital technologies which are: Computational thinking for digital technologies; and Designing and developing digital outcomes.

4.4.1 Knowing what to know

In terms of the best conditions for implementing a new and unfamiliar tract of educational work, it is suggested that teachers themselves are in a good position to name what they need in order to undertake that work. However, as demonstrated in the interviews, it also became clear that it can take some time for teachers to really fully come to terms with what they need and what they need to know.

The digital technologies facilitator identified three factors she considered crucial for schools to have in place in order to successfully implement the revised technology curriculum areas. They were: access to suitable devices, professional development for teachers to learn how to use those devices effectively in their teaching, and the drive from management to ensure that teachers did then use the devices in their teaching as they had been shown. For this school in particular, the facilitator suggested that the biggest challenge for implementation would be the limited number of devices available, recommending one device for every three students as a workable number for the junior classes.

Overall, interviews with teachers indicate that initially they placed great importance on knowing how to use the technology and ensuring the technology worked as they expected. Indeed, technical reliability was seen as very important in the early stages of the implementation of a technological resource. Once they had been shown the possibilities for the resource beyond 'how it works', and could ensure that it would work, teachers appeared to be comfortable exploring on their own.

Similarly, during the first round of interviews, when asked what they considered would best help them to meet the revised curriculum requirements, the participants identified that access to enough suitable devices was their main requirement, together with adequate professional development on how to use them effectively in their teaching programmes. Sophie expressed this clearly saying, “What would be helpful; if we have more digital devices, more PD on using these digital devices” (I1), while Amy, highlighting the fact that she, like the other participants, had not seen the revised curriculum document, suggested that “knowing what the requirements are first” (I1) was also important. At this point in time, the teachers were used to incorporating the three stand-alone computers which were in each room, into their programmes. However, they had only recently been issued with three iPads per class to use with their students and had just begun to experiment with ways they could make use of them in their teaching. They had each had a session with the facilitator to investigate the iPads and explore ways they might be used in the classroom.

By the time of the second interviews, the teachers had been issued with another iPad per class and had had opportunities to try out more activities with both the iPads and computers. They were able to identify some successful strategies they had each used, despite the small number of devices, and had considered a range of issues which they felt were affecting their ability to implement the use of digital technologies as effectively as they had hoped. Responses were more detailed and varied during the second interviews, although the desirability of more devices for each class to use, and more knowledge about how to make use of them across the curriculum, were still at the forefront of teacher’s minds. Hannah explained that with larger class numbers she needed “more iPads to use in the class” (I2), suggesting a one to five ratio, while Sophie said she wanted to “explore more and have more things to do on it” (I2). Most use of digital technologies had occurred during literacy and numeracy lesson times, and not only were teachers suggesting that their programmes would be enhanced if they knew of more activities to complement these areas, they were also wanting to know of ways they could incorporate technologies in other curriculum areas.

4.4.2 Access to digital resources

Access to enough digital resources was one of the conditions considered crucial by participants if they were to be able to implement the digital technologies components of the curriculum. Most participants were used to having very few digital resources and were excited to have the ones they had recently been given. Although several said it would be useful to have more devices in each room, they were also aware that the budget was not able to provide everything they wanted, instead using the limited number of resources they did have with smaller groups of children. As Amy said, “We’re limited with money, everyone can’t have as many things as they want” (I1). For the team leader, who had previously worked in a digital environment, the limited number of devices was a particular challenge. She said that “to go to three, from 28 to three has been very, very hard for me” (I2), explaining that in her previous school most of her students had been able to work independently when completing a variety of digital activities. The digital leader regarded having different kinds of devices as crucial to enthuse both teachers and students and was concerned about the lack of suitable resources available for the implementation of the ‘Computational thinking for digital technologies’ area saying, “it’s really hard to get the teachers engaged when there’s nothing ... for them to see, or to work with or to play with” (I2).

4.4.3 Management support

The external digital technologies facilitator stated that she considered it essential that the drive for increased use of digital technologies for learning, and implementation of the revised technology curriculum area came from school management. The teacher participants provided several examples of ways that management were encouraging staff to make greater use of technology. Sophie described how the senior leadership team’s use of digital technologies in meetings exposed the staff to new ways of working “so from the top it branches off to us” (I2). She said that seeing the way that the senior leaders made use of technology in the teachers professional learning time gave other staff the idea that “oh, we can use this” (I2), and promoted its use. Sophie admitted that with some developments “sometimes we don’t have a choice, but at the end of the day we come out clearer that okay, this was easy, we can use it now” (I2).

The junior team leader and the school digital leader were both seeking ways to encourage teachers to make greater use of digital technologies, with the digital leader wanting teachers to have opportunities to explore the devices, suggesting that if they had “time to play and experiment with, and then get the kids playing with them and experimenting with, and then things will just happen” (I2). The junior team leader expressed a wish for the team to receive more professional development “to be shown how to use class sites, how to use the iPads more effectively for learning time” (I2).

4.4.4 Professional Development

The external facilitator stated that teachers would need professional development to use devices in their programmes. As mentioned earlier, this was a need identified by the participants in this study. Although Amy had suggested that it would be useful to know what the curriculum requirements were during the first interviews, the focus of the participants appeared to be on developing their knowledge of the devices and their potential for use in the classroom, rather than the content of the revised curriculum areas.

4.5 Challenges

During the second interviews, the teachers identified a number of problems that they had encountered as they tried to introduce the technologies to their new classes. Many spoke of the pressures of time as they tried to fit in additional tasks related to the implementation of the revised technology curriculum area. Several teachers had found the new iPad set up to be a challenge as it was difficult for students to locate the apps that had been installed. They also reported that requests for new apps to be installed were often not met in a timely fashion due to the procedures that had to be followed as a result of the way the iPads were now set up. Also hampering the ability of teachers to make full use of the technologies they had were technical issues. In some instances, this was due to specific equipment that was not working properly as in Sophie’s case where she stated, “my computers are very slow, it just frustrates me” (I2), and for Hannah who reported problems with her class data projector, saying that “It’s quite blurry so I haven’t been using the board” (I2). Isabella explained how the positioning of her class

television made it difficult to use as “you need to tilt the screen down so there’s no glare” (I2), and Amy reported that “access to the power” (I2) was a problem with power points being difficult to reach in her room.

4.5.1 Mobile Device Management System

Although many of the technical problems experienced were specific to one or two participants, all made mention of difficulties they experienced after a change in the way the iPads were set up which appeared to have considerable impact on their subsequent use of these devices. During the summer break, the firm employed by the school to provide technical support had taken the iPads offsite in order to install a Mobile Device Management System (MDM) which would allow management of the growing number of devices on the school network, However, the teachers expressed considerable frustration with the setup of the iPads after this had been installed and identified several issues they had encountered which prevented them from using the iPads as effectively as they had wished.

If the teachers requested that an app be installed on the iPads, it was a lengthy process. Hannah described how the request had to go to the school digital leader and would then be passed on to the technicians, who would hopefully install it on their next weekly visit, emphasising that “it takes quite a long time” (I2). The digital leader was eventually given rights to install the apps on the devices but needed to manually install them on each device as the system did not allow this to be done remotely.

Some applications needed subscriptions in order for all their functions to be made available, yet these had not been set up when the apps were installed. This restricted what students were able to do within the app.

Several participants reported that the physical layout of the apps on the iPads made it challenging for students to locate the app they were supposed to be using. Some of the apps had been organised into folders to allow for easy access but many were scattered across several

pages. Sue said that she found it easy to explain to her class how to locate the maths activities which had been organised into folders by saying “this is the maths folder and you click on maths and you can use those ones” (I2). However, she felt that the layout for the rest of the apps was not as helpful and it was difficult to direct children to the various places on the iPads that they needed to go to find them. Amelia also spoke of the difficulty students were having trying to find the app they needed and felt that the layout was unnecessarily complicated, insisting that “kids shouldn’t be flicking up to eight times to find an app. It should be 1-2 clicks and that’s it” (I2).

The digital leader and the junior team leader had both recently worked in schools where digital technologies were well established and had clear ideas about how they wanted the iPads to be set up and managed, explaining that “decisions need to be from the digital leader who tells them (the technicians) what we want, what to do and then they help” (I2). They expressed their frustrations with the system that had been put in place, which they felt did not allow easy management of the iPads as it required the digital leader to go to each device physically each time an app needed to be installed or logged in. “I should be able to just do it from here (pointing to laptop)” (I2). The layout of the iPads had also required a considerable amount of the digital leader’s time as “they’re not set up how we’ve asked them to be set up” (I2), with each iPad having to be recalled so the apps could be arranged into appropriate folders to allow them to be more easily accessed by students.

4.5.2 Time

Most of the participants reported that finding the time they required to search for and familiarise themselves with appropriate activities, particularly apps and websites, was often a challenge. Sophie, Sue and Amy all stated that they were wanting to find more suitable digital activities for their students to use but as Amy said, “it’s making the time that’s an issue for me” (I2). She went on further to explain her perception of the problem. “I still haven’t made time to look in depth at what’s on there and all the benefits and things its capable of. So that barrier is mine” (I2).

Finding time during an already full school day to carry out digital activities that required teacher support, was also a challenge the teachers faced. Although she was keen to create videos with her class, Sophie wondered how she was going to fit everything into the school day when “I’ve got reading and writing to carry on” (I2), as she felt that considerable teacher direction would be needed to ensure that the activity was carried out successfully.

Amy and Hannah both described how they had shown their students how to use the video function of the iPads, resulting in footage being compiled which could potentially be shared with other students. However, because of the young age of these students, the editing required to arrive at a finished product needed to be done by the teacher, an additional task for the participants to try and fit in. When discussing the videoed interviews that her students had carried out Hannah admitted that “I haven’t had the time to actually put it together in iMovie and share it” (I2). Amy was also aware of the lengthy editing task she was facing after her students had created videos, explaining the process she needed to complete so they could watch the finished result. Although she said it was a lot to fit in, she acknowledged that “it’s always worth it...they love watching it, I love watching it” (I2), and expressed the wish that she could devote more time to it.

4.5.3 Monitoring learning

One of the concerns mentioned by several teachers was associated with the responsibility they had for ensuring that students were using digital technologies appropriately and working on the tasks they had been set. Although she was able to discuss many of the benefits that technology was able to bring to her teaching programmes and was keen to have more devices in her room, Amelia acknowledged that “on an iPad you can’t monitor what they’re doing” (I1). Sue also expressed her concerns about the potential for children to engage in activities other than what they had been assigned if she wasn’t able to see what each child was doing, although she said this had not yet occurred in her class. Hannah had found that she needed to monitor her students to ensure that they were not “changing activities while they’re using the things that I’ve set up for them cause sometimes they go off track” (I2). Sophie’s main challenge concerned the difficulty in establishing what work had been completed by individual students when they were using the iPads as there was no record of what one student had done

when the devices needed to be shared with others in the class. She wanted to ensure that her students were accountable for the work they had completed and was also keen to discover a system which would enable her to enter feedback on her students' work.

4.6 Opportunities

It is perhaps not unexpected that the participants encountered challenges while learning how to use the new technologies. However, there were several reported occasions when the challenges experienced appeared to become opportunities for both teachers and students to learn ways in which they could solve problems for themselves, rather than rely on experts for solutions.

4.6.1 Teacher creativity – discovering answers/solutions

Although participants reported several difficulties they had encountered when attempting to make use of digital technologies in their teaching programmes, they often appeared to regard these as challenges which they needed to overcome themselves, rather than barriers which would prevent technology use. Participant solutions appeared to be specific to problems individual participants encountered around technology use. Indeed, one participant gave her ability to find ways around technological difficulties and achieve her intended outcomes with her students, as one of the reasons she rated herself as a confident user of technologies.

Sue and Eli both initially found that some students struggled more than others with technological issues. Sue responded by identifying two students who displayed more confidence than their classmates when using the computers and appointed them as the class 'technicians'. They became the 'go to' people for the other students when they encountered problems, and often ended up teaching their classmates how to resolve simple problems as well. In Eli's class, each new entrant child was given a more experienced 'buddy' who was responsible for teaching them how to access the equipment and complete their activities.

During the first round of interviews, Sophie went into some detail about the features she would like in a writing app. By the second round of interviews, she had discovered one, Book Creator, that fulfilled the requirements she had identified. However, because only the free version had been installed on the iPads, the app would only enable one book to be created by her class. Rather than abandon her plans, Sophie explained that she had investigated the app further and discovered that there was no limit to the length of the book that could be created. Sophie described how her students continued to use the app, with each new piece of work becoming an additional chapter to the class book. “They use the same book, everyone uses the same book, just different pages. And that works. They do their writing, it’s saved, and they can go back to it” (I2). Sophie had managed to find a way for her students to benefit from the features she had sought in the app, despite the restrictions she had encountered.

Sophie also explained how she had devised a solution to another problem she had experienced, that of finding the time required to fully explore the functions of new apps she wanted her students to use. She said she had decided to reduce the demands on her own time by showing the children the basic functions of the apps, then sent them off to explore further possibilities saying that “If they find anything new, they come and show it to me” (I2). She would then ask the student to show the discovery to others so that any new knowledge was passed around the class.

4.6.2 Students taking ownership of learning

At times it appeared to be the students who proved themselves capable of solving problems and making new discoveries around the technologies. Several participants reported giving their students responsibility for investigating the functions of the technologies, solving simple problems and assisting their peers with Sue commenting that it was “amazing for five-year olds to teach another kid” (I2).

Sophie’s approach of getting her students to discover the functions of new apps is one the external digital technologies facilitator felt was important for teachers to be able to adopt, advising that “they’ve got to be able to let go and let the children investigate and find out for

themselves” (I1). Having faith in the students’ ability to accomplish tasks was also seen as important by Amelia who insisted that teachers should “give them a chance...they’re better at the iPads than people think they are”. She insisted that “just because they’re five doesn’t mean that they can’t do it” (I2).

The level of independence shown by the children when using the devices, appeared to be closely related to the expectations of the teacher. When children were given the opportunity to investigate new equipment or solve problems, they invariably rose to the occasion. Sue was another teacher whose solution to a problem, that of children interrupting her teaching to solve technological ‘glitches’, involved young students successfully taking on responsibility for a job that the teacher had previously done. Eli had also stepped back and expected more of the students, providing log on details but no longer logging on to the computer for them and found that the children quickly stepped up to the challenge. She explained, “I’ve gone out of it, preparing for them, now they’re taking over” (I2). This shift towards allowing students to take greater responsibility for their learning was seen by other teachers as something they wanted to happen in their classrooms. After reflecting upon her programme, Hannah said she had decided she needed to work on “getting kids to take ownership of the learning themselves” (I2). When introducing her students to new activities, she felt she needed to “let them use it and see what they can come up with” (I2), rather than showing them what she thought they needed to do.

4.7 Summary of findings

4.7.1 Teacher practices and understandings

The participants were positive about the prospect of using digital technologies in their programmes and were able to discuss the benefits they had seen their use bring to their students’ learning. Although they had limited knowledge of the revised curriculum, they were open to the idea of incorporating the new areas into their programmes but were largely unsure about what this would involve.

Participants appeared to view technologies as tools to be integrated into their established programmes rather than as stand-alone devices requiring specially allocated learning time for their use. Most of the digital activities the participants described their students' undertaking were related to class literacy and numeracy learning but there were some examples of technologies being used in other areas, particularly Inquiry. Most participants stated that they were keen to use the technologies more widely across the curriculum and were wanting more ideas for ways they could do this.

4.7.2 Conditions for implementation

Although most teachers accepted that digital resources were limited and had set up their programmes to make the best use they could of what they did have, they were hopeful they would have more in the future, so they could attempt a wider range of activities. For those teachers who had worked in digital environments previously, the limited resources presented a greater challenge as they were not able to utilise the knowledge and experience they possessed as fully as they would have liked. The digital leader considered that a greater variety of devices would be required for teachers to fully implement both of the technological areas relating to digital technologies.

Most of the professional development the teachers had received was delivered by an external facilitator and had been designed to meet their individual needs. Some further professional development had occurred in staff and syndicate meetings. The participants had a strong preference for practical sessions which covered learning relevant to their current needs. There was also a desire expressed for more collaborative opportunities, so teachers could share their expertise and learn from each other. Participants did not mention having received any professional development around the content of the revised technology curriculum area, although one suggested that this might be helpful.

Participants regarded management as promoters of the move to greater use of digital technologies. The senior leadership team led by example with their technology use in staff meetings and the junior team leader was showing team members new activities and supporting

them in their learning. The digital team leader was wanting to procure more devices for the school and provide teachers with the resources and support they needed.

4.7.3 Opportunities provided by digital technologies

Participants were innovative in the ways they worked around the barriers they were faced with, seeing them instead as challenges, and setting about creating ways they could still achieve what they had intended to do. There were several instances of participants devising solutions to the problems they encountered, rather than abandon the use of the technologies which were creating difficulties. In some instances, this involved allowing students to take on the responsibility of a problem solving or tutoring role. Many students showed their teachers that they were capable of more than they had previously thought when using digital technologies. If they were given opportunities to explore the technologies and extend their own learning, they generally went beyond what their teachers had expected them to do.

CHAPTER FIVE: DISCUSSION

5.1 Introduction

This chapter discusses the findings of the research in relation to the themes of the literature review and to the research questions.

5.2 Current practices and understandings

Although participants in this school demonstrated limited knowledge of the content of the revised technology area of the curriculum, their attitudes towards the use of digital technologies were generally positive. The studies of Honan (2012), Karaseva et al. (2015), and Masoumi (2015) suggest that this is a critical factor for successful implementation as they found that the teachers' beliefs about the value of digital technologies influenced how they were used.

5.2.1 The digital curriculum

At the beginning of this study, none of the participants had seen the revised technology curriculum document, although most were aware that there had been some revisions that involved digital technologies. Understandings of what these changes might involve were varied. Hannah's response, in stating that she thought designing and programming might be included, suggested that she had some awareness of the two technological areas which involved digital technologies which are: Computational thinking for digital technologies; and Designing and developing digital outcomes. Isabella expected that the revisions would require the integration of digital technologies with existing practices, while Sophie's thoughts that the new content was to meet the need for learners to be digitally competent, was in line with the goal described in the revised curriculum document (MOE, 2017b).

5.2.2 Participant views towards digital technologies

The participants in this school expressed their belief in the value of digital technologies in teaching and learning and gave several examples of positive outcomes that they attributed to their use. Several participants stated that they had noticed high levels of engagement when students were using digital technologies. The findings of Flewitt et al. (2014) also reported that students were more deeply engaged in learning tasks when using digital technologies. Some participants went a step further and were able to describe the benefits they had noticed in greater detail. Hannah explained that she felt that digital technologies, as well as increasing levels of engagement, provided her students with a wider range of experiences and more learning opportunities. She said that the technologies had provided additional ways to reinforce previous learning, and that the student's retention of that learning had improved. This was also noticed in the study of Getting and Swainey (2012).

Sophie said that she had noticed a change of attitude of her children towards writing when using technologies and also an improvement in their achievement. This was similar to the findings of Gasparini and Culén (2011), Masoumi (2015), and Shannon (2014), all of whom reported on changes in the learning behaviour of students when they were working together using digital technologies. In common with the findings of Lynch (2017), Amelia stated that she believed that the use of digital technologies was helping her students to develop early research skills.

The use of digital technologies appears to have provided opportunities for the development of the key competencies identified in the New Zealand Curriculum. These are: thinking, using language symbols and texts, managing self, relating to others and participating and contributing (MOE, 2007).

In this study, participants said that they had noticed students collaborating, developing problem solving skills and becoming more independent in their learning when using digital technologies, suggesting that the intention stated in the revised curriculum document of

students further developing the key competencies through technology learning was being achieved (MOE, 2017b).

In particular, the competency of participating and contributing appears to have been developed through the use of technologies, as students who may have little experience of the world outside their immediate environment appear to have been exposed to new ideas with technology, promoting a greater awareness of problems and helping them to understand the part they can play in solving them.

During an inquiry when the junior classes were researching the effect their rubbish had on the environment, use was made of digital technologies in Eli's class to show the students the effects of plastic rubbish in the oceans by viewing some carefully selected YouTube clips. The students then shared these messages with their families, and Eli reported that there had been a reduction of plastic packaging in the student's lunch boxes over subsequent days

Amy's students, as well as being recipients of information through the use of technology, were also beginning to use it as a way to share their messages by making their own videos. Her students were learning that they could play an active part as members of their community and technology could assist them in doing this.

The 2009 OECD report '21st Century Skills and Competencies for New Millennium Learners in OECD Countries' (Ananiadou and Claro 2009) discussed the need for learners to develop the skills to source information and use it to develop their own ideas. This report also emphasised the importance of learners being able to effectively communicate these ideas with others. In this school, it appears that participants saw digital technologies as a means to provide these young students with opportunities to begin to develop these information and communication skills.

5.2.3 Integration of digital technologies

The importance of the integration of digital technologies into existing programmes of teaching and learning was recognised by the teachers in this study and had been emphasised by the external digital technologies facilitator. The revised curriculum document conveys an expectation that teaching of the technological areas will be integrated with other curriculum areas in primary schools (MOE, 2017b). Participants in this school all viewed digital technologies as something they wanted to integrate into their existing teaching programmes rather than an area they would teach separately. When searching for suitable digital activities, the main criteria the participants had was for activities that would complement their programmes and enable and reinforce the learning they wanted to achieve in other curriculum areas.

At the time of the first set of interviews, the priority for most of the participants was to find out about suitable activities and websites that they could use to integrate into other learning areas. Sophie and Hannah spoke of wanting activities that would relate to and enhance their programmes. Amy and Amelia were both using technologies with their students to create a record of learning which had taken place.

By the second set of interviews, participants had had more opportunities to trial the various technologies and had taken the opportunity to reflect upon what was working for them and what they wanted to implement in the future. The focus on integration with other curriculum areas still appeared to be at the forefront of their minds when they discussed their future plans. Sophie and Sue both identified curriculum areas in which they felt they could make greater use of digital technologies, while Hannah and Isabella explained the importance of activities being relevant to their teaching programmes.

5.2.4 Teacher confidence

The studies of Flewitt et al. (2014) and Prestridge (2011) found links between the expertise of the teacher and their confidence when using digital technologies in the classroom. In line with these findings, some of the participants at this school, when describing their own confidence in using digital technologies in the classroom, referred to their own familiarity with, and competence in using the various technologies. One participant was quite specific in explaining that because she did not own an iPad herself, she had not explored these devices and made use of them in her teaching, unlike the other available technologies which she used in her personal life. However, several participants also linked their confidence ratings to their understandings and awareness of the possibilities for using digital technologies and whether or not they felt they had fully explored these possibilities.

5.3 Participant identified needs for development

The participants in this study all recognised the need for professional development to learn how to effectively use digital technologies in their teaching programmes. The Curriculum Advisory Group Report of 2017 had suggested this would need to be a priority for many New Zealand teachers as only 56% of those surveyed for the NZCER report of 2016 had considered themselves to possess the knowledge and skills to use digital technologies effectively.

5.3.1 Models of professional development

Several participants felt that opportunities to observe others using digital technologies with students would be helpful for their own learning. Sophie and Amy both expressed a desire to see digital technologies being used by others, so they could then transfer what they had seen into their own practice. Observing the lessons of experienced practitioners had been identified by Lim and Khine (2006) as an effective way the Singapore schools of their study had helped less experienced teachers become aware of the possibilities that technologies offered.

The individual sessions taken by the external facilitator provided teachers with opportunities to explore the new activities they were introduced to and discuss their potential uses for the classroom setting. Relating this learning to their own settings is important as pointed out by Timperley et al. (2007). The workshop at the local marae demonstrated the use of technologies in an authentic context, then provided teachers with an opportunity to put this new learning into immediate use. The study of Lynch (2017) noted the value of creating an authentic context for students to develop both traditional and digital literacy skills. For the participants in this study, having an authentic context in which they could develop their own digital literacy skills also appeared to be important.

5.3.2 Collaboration

The importance of, and need for collaboration amongst teachers, was a recurring theme throughout the study, with participants expressing a desire to share their experiences and learn from their colleagues. Indeed, this was seen by the participants as critical to their learning with Hannah explicitly stating the need to work together as a team. The benefits of this collaboration were identified by Timperley et al. (2007), who pointed out that valuable professional learning opportunities can occur when teachers have opportunities to interact and discuss their work. The report ‘Creating effective teaching and learning environments: first results from TALIS’ (OECD, 2009) also included the sharing of good practices as an identified method of professional development.

The participants discussed several scenarios in which collaboration had occurred, explaining how they had found them to be beneficial. One participant had mentioned the informal sessions that sometimes occurred at the end of the day, involving small groups of teachers who would come together to investigate activities on the iPads. She described how they would explore the possibilities of a new activity, share their findings and suggest solutions to each other when they encountered problems. The participants explained that they would often turn to their colleagues when they needed assistance. The teachers in the research of Grosemans et al. (2014) had also turned to colleagues when they had been unable to solve a problem on their own, and the schools in the study of Lim and Khine (2006) had taken this a step further by setting up buddy systems to support less experienced teachers. Flewitt et al. (2014) suggested

that people with expertise play key roles in educational settings when new developments are being introduced, and the participants in this study appeared to be utilising their colleagues who possessed some expertise with digital technologies.

The technologies themselves had the potential to open up new ways of collaboration amongst teachers. Amy had already started creating video tutorials in answer to a colleague's request to be shown how to accomplish a digital task. She suggested building up a resource bank of such tutorials so that staff could share their expertise with each other.

5.4 Conditions for curriculum implementation

The Curriculum Advisory Group Report of 2017, when considering the proposed introduction of the two technological areas relating to digital technologies, made several recommendations in relation to their implementation, identifying the conditions that were considered critical for its success. The three conditions which the digital technologies facilitator had identified as being important for implementing the revised curriculum were amongst those recognised in this report. They are: access to suitable devices, professional development for teachers to learn how to use those devices effectively in their teaching, and the drive from management to ensure that teachers did then use the devices in their teaching as they had been shown.

5.4.1 Access to digital resources

Most of the participants in this study had previously had access to very few digital resources and expressed their excitement at the ones they had recently acquired, although they suggested that it would be useful to have more devices in each room. However, they were also aware that the budget for more digital resources was limited. As 95% of New Zealand primary principals surveyed for the 20/20 Trust report of 2017 also identified cost as a barrier to the use of digital technologies, the financial constraints experienced by this school are typical of those experienced by many primary schools in New Zealand. Those participants who had previously worked in a digital environment appeared to find the limited number of digital resources a

greater challenge than those who were used to having very little. The digital leader expressed concern at the lack of resources suitable for implementing the 'Computational thinking for digital technologies' area, considering that it was important to have a wide range of digital resources in order to enthuse teachers about this technological area.

5.4.2 Management support

The importance of support from school leaders to ensure that teachers were provided with the necessary opportunities to effect pedagogical change was emphasised by Timperley et al. (2007). In this study, participants provided examples of ways in which they considered that the senior leadership team were encouraging them to make greater use of technology. Sophie described how they were leading by example in their use of technologies during meetings and showed staff new ways of working, explaining that she considered that this exposed them to ideas they could adopt in their own teaching.

Support for the use of digital technologies was apparent from other leaders within the school. The digital leader and the junior team leader both discussed ideas for encouraging teachers to make greater use of digital technologies. The digital leader wanted teachers and students to have more opportunities to explore the devices and experiment with them. The junior team leader had expressed a wish for her team to receive professional development which would show them ways to use the iPads more effectively for learning. The belief of school leaders in the value of technology in education was considered by Uluyol and Şahin (2016) as crucial in convincing and motivating teachers to implement change. In this school, the leaders appeared to be promoting digital technologies as beneficial to learning.

5.4.3 Professional development

As identified in the research of Timperley et al. (2007), teachers need time to come to terms with new learning. For these teachers in this school who are just starting out with the integration of digital technologies into their established programmes, this translates to a need for

opportunities to explore the devices and their potential. They need to be familiar with and comfortable using them if they are to successfully utilise them in their teaching programmes. As pointed out in the Curriculum Advisory Group Report (2017), and by the participants themselves, teachers also need time to become familiar with the revised curriculum and its requirements.

When discussing the professional development that they had received, the participants in this study talked about the ways it had increased their own digital fluency and given them ideas for implementing the use of digital technologies in the classroom, particularly the individualised sessions they had received from the external facilitator. However, they did not mention these ideas in relation to the progress outcomes of the technological areas of the curriculum. When asked about the support she considered she might need in order to implement the content of the revised curriculum, one participant pointed out that she would first need to be familiar with the curriculum requirements in order to know what support she would need to implement them. The Curriculum Advisory Group Report (2017) states that teachers would need training to develop their understanding of the curriculum document if they were to be able to implement it successfully.

5.5 Challenges

It is perhaps not surprising that the participants in this study encountered challenges as they began to discover ways that they could utilise the new digital resources. These included both technical issues and challenges related to the pedagogical changes required.

For teachers to effectively use the available digital resources, it is important that technical problems are minimised as these can create a situation whereby teachers become reluctant to use them. (Clarke & Zagarell, 2012). Several participants in this study stated that they had stopped using equipment that was not functioning in a reliable manner or set up in a user-friendly way.

5.5.1 Mobile device management system

A particular challenge identified by several participants in this school, was the mobile device management system which was installed in the iPads over the summer break. This appeared to have caused considerable frustration for the classroom teachers and the digital leader. Participants spoke of difficulties students were experiencing trying to locate apps due to the physical layout of the iPads and of the time involved for new apps to be installed and others to be updated. The digital leader described the time involved to reorganise each iPad's layout after they had not been set up as requested, and of the lengthy procedure required to install and update the apps teachers were requesting once the new mobile device management system had been installed.

Although some teachers wanted the freedom to choose and download apps to their class iPads themselves, it is necessary to have systems in place which enable schools to control how the devices are being used. For this school however, the system that was used appeared to limit the ability of the digital leader to carry out his role efficiently and of teachers and students to use the devices effectively. The junior team leader and the digital leader both expressed their views that a mobile device management system needs to be user friendly and one which makes it easy for someone within the school to control devices remotely. It is common in primary schools for a classroom teacher to take on the role of digital leader in addition to their classroom responsibilities, with technical support being provided by an outside agency. However, the system in place needs to be able to meet the needs identified by the school and allow designated personnel within the school to easily manage issues which do not require the skills of a technician.

5.5.2 Time

The new digital resources meant that students needed suitable activities to work on using the devices. In common with the findings of Flewitt et al. (2014), Lim and Khine (2006), and Young (2016), participants in this study found that the search for appropriate digital activities was an additional load on top of their already busy schedules. To some extent, Sophie had

managed to alleviate this by encouraging students to explore new apps and report their discoveries to her and their classmates. However, there were some activities, notably editing video footage, that required teacher input in order to get a finished result and participants indicated that trying to accomplish these extra tasks was proving to be a challenge.

5.5.3 Monitoring learning

Several of the participants in this study expressed concerns about the difficulties of monitoring the activities their students were engaged in when they were using the iPads. Amelia, Hannah and Sue all acknowledged the need to ensure that students were appropriately engaged and working on the tasks they had been set, and the challenges of doing this when students were using iPads. Sophie discussed the problem of tracking the learning of individual students as the limited number of devices meant that they were shared amongst several children throughout the day. This was also found to be a problem in the study of Falloon (2013). Sophie also talked about the difficulty of providing feedback to individual students when they had worked on the shared iPads.

However, Falloon (2015) suggests that iPads, when used for collaborative activities, actually make it easier for students to receive feedback. Students in this study were able to share their work and gain feedback from their peers using an Apple TV. The use of an Apple TV to share work with larger groups was also a feature of the study of Lynch (2017). It appears that the purpose that the technologies are used for is linked to the ease in which feedback is able to be given.

5.6 Opportunities

As mentioned in the previous chapter, the use of digital technologies provided both teachers and students with opportunities to discover new ways of working and to find innovative solutions to problems they encountered.

5.6.1 Teacher creativity/solutions

Much of the literature had classified barriers to as extrinsic or intrinsic, for example Uluyol and Şahin (2016). It is interesting that the participants in this study took ownership of many of the barriers seen in other studies as extrinsic and often devised ways in which they could work around them. Although there were factors over which they had little control, they tended to see most barriers as challenges to be overcome, rather than obstacles which prevented them from carrying out their intended plans.

When Sophie encountered an app, 'Book Creator', that met the requirements she was after in a writing app, but wouldn't let her students create more than one book per device without a subscription, she investigated the app further and when finding there was no limit to the length of book created, encouraged her students to make each new piece of writing a new chapter of the original book.

Other solutions to problems involved giving the students greater responsibility for solving problems and investigating the possibilities afforded by the devices.

5.6.2 Students taking ownership of learning

Several participants discussed ways that students had risen to the occasion when they had given them responsibilities for solving problems and investigating the possibilities of the technologies they were using. Like the teacher in the study of Lynch and Redpath (2014), Sue had initially been frustrated by the time she was spending managing technical issues, but after encouraging some of her more able students to assist their peers, also discovered that they were able to solve many of the problems themselves.

Students involved in the studies of Falloon (2015), Masoumi (2015), and Lynch and Redpath (2014) were all encouraged to explore the apps available to them, share their discoveries about their possible uses, then decide which ones were best for specific purposes. When Sophie asked

her students to investigate new apps and share their findings with their peers, these students also discovered many functions that they were able to share with each other and use to produce their digital creations. Hannah was also considering this approach, stating her intention to encourage students to take greater ownership of their learning and explore the possibilities themselves, rather than showing them what she thought they needed to do. The digital technologies facilitator also felt that this was an important approach for teachers to adopt.

CHAPTER SIX: CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction

This study came about because of the alignment of several factors. Throughout New Zealand, there has been a growing trend to incorporate the use of digital technologies into teaching and learning programmes across all levels of the education system. The revision of the New Zealand Curriculum to include digital technologies has acknowledged their importance as part of the future of our learners. At the same time, a change in management has seen a shift in direction for one school which had previously made little use of digital technologies, possessed few resources, and lacked knowledge about how they could best be used. For the teachers of this school to acquire the skills and knowledge needed to implement this revised technology curriculum area, the challenges involved more than the development of an understanding of the curriculum document, they also needed to develop an understanding of the potential of the technologies that could be used to assist them in this delivery. The research questions were formulated to explore the challenges faced by the teachers of this particular school. They are repeated below:

Research Questions

1. What are teachers' technology practices and understandings in this school?
2. What do teachers in this school identify as important in their own development around digital technologies in teaching and learning?
3. How can this school best support teachers to implement the digital technologies content of the revised technology curriculum area?

The summarised answers to these questions are now provided.

What are teachers' technology practices and understandings in this school?

This research found that although, at the beginning of the study, the majority of the participants possessed limited experience using digital technologies in their teaching programmes, they all believed in their potential to add value to teaching and learning. As the studies of Honan (2012), Karaseva et al. (2015) and Masoumi (2015) all suggest that teachers' beliefs around digital technologies affect how they are used, this positive view of the participants would appear to be a critical factor for their successful implementation.

When discussing the benefits that they believed digital technologies brought to teaching and learning, participants spoke of noticing increased levels of student engagement. This was a finding also reported on by Flewitt et al. (2014). Some participants were able to provide more detail about the benefits they had noticed with a few saying they had noticed improved attitudes towards learning and higher levels of achievement. These findings were similar to those in the studies of Gasparini and Culén (2011), Masoumi (2015) and Shannon (2014). More specifically, one participant talked about noticing improved retention of literacy learning when technologies were used to reinforce her teaching, as Getting and Swainey (2012) had found in their study. Also mentioned by another participant, was the development of early research skills, a finding shared by Lynch (2017). This study finds that although the participants in this school all believed that digital technologies were benefitting their programmes, their understanding of how this might be happening showed considerable variation.

In view of the importance of learners developing the skills to source information and develop their own ideas, as discussed by Ananiadou and Claro (2009), the connection between the use of digital technologies and the development of the key competencies of the New Zealand Curriculum (MOE, 2007), is an important finding. Participants spoke of students collaborating, developing problem solving skills and becoming more independent in their learning when using digital technologies. Two participants discussed how technologies were being used to expose students to new ideas and to share their own ideas with others. In this school, in line with the stated intent of the revised technology document, it appears that the use of digital

technologies is enabling students to use and further develop the key competencies (MOE, 2017b).

This research found that the participants in this school place great importance on the integration of digital technologies into other curriculum areas, something the external facilitator also considered essential. As mentioned in the previous chapter, the revised curriculum document also conveys an expectation that the teaching of the technological areas will be integrated with other curriculum areas in primary schools (MOE, 2017b). When investigating ways in which they could use digital technologies, the participants all talked about the need for activities that would reinforce the learning that was taking place in their established programmes. This study concludes that for these participants, in this school, the relevance of an activity to the intended learning in other curriculum areas was of paramount importance when selecting digital activities.

What do teachers in this school identify as important in their own development around digital technologies in teaching and learning?

This study found that the participants recognised the need for professional development to help them to effectively use digital technologies for teaching and learning and had clear views about the methods that they considered would be helpful. Several participants spoke of the individualised sessions they had received from the digital technologies facilitator. This external expertise was an important condition for professional learning identified by Timperley et al. (2007). Participants reported that these practical, hands on sessions allowed them to immediately try things out for themselves, as well as giving them ideas and resources they could use in the classroom. Being able to relate this new learning to their own context was another condition Timperley et al. (2007) viewed as important.

Further methods of professional development the participants suggested they would find useful, also highlighted the importance of context. Sophie and Amy both expressed a wish to observe experienced practitioners using digital technologies, so that they could view

approaches they could then use with their own students, a method used by the schools in the study of Lim and Khine (2006). Isabella said that she felt that she learnt best when she could utilise the new learning immediately, a condition that the professional development at the marae had met.

Timperley et al. (2007) state that teachers have diverse professional learning needs. Although the participants of this school had a range of suggestions for the professional development that they felt they would find most effective, they all placed great importance on being able to relate it and apply it to their own setting. This study concludes that in order for professional development to have value for these teachers, its relevance to their own context is critical.

The research found that the participants in this school valued opportunities for collaboration with their colleagues. The research of Timperley et al. (2007) and the report “Creating effective teaching and learning environments: first results from TALIS’ (OECD, 2009), both identified collaboration amongst teachers as a valuable form of professional development. The research findings show that for the teachers in this school, collaboration occurred in several ways. These included informal sessions at the end of the day when small groups would come together to explore the technologies, individuals seeking out the assistance of another colleague when attempting an unfamiliar activity and using the technologies themselves to create video tutorials which could then form a resource bank for others to use as a source of information. The research of Flewitt et al. (2014), highlights the importance of people with expertise when new developments are introduced. In this school, the research concludes that teachers are aware of the expertise their colleagues possess and are comfortable to approach them for support and assistance.

How can this school best support teachers to implement the digital technologies content of the revised technology curriculum area?

To answer this question, it is necessary to revisit the factors that were identified as being necessary for the successful implementation of this curriculum area by the Curriculum

Advisory Group (2017) and by the MOE accredited facilitator who has worked with this, and numerous other schools to assist teachers to implement digital technologies into their programmes. They were access to suitable devices, professional development for teachers and a drive from school management for this implementation to take place.

As identified in the Curriculum Advisory Group Report (2017), and further explained by the school's digital leader, adequate resourcing of this technological area is critical to engage both teachers and students.

Although the junior class teachers in this school were generally excited to have access to digital devices in their classrooms, particularly the recently purchased iPads, they all acknowledged that it would be useful to have more. It appeared that the limited number of devices presented a greater challenge for the participants who had previously worked in a digital environment with a large number of devices than for those who were used to having very little. Both the NZCER survey of 2016 and the 20/20 Trust survey of 2017 reported that nearly all principals who replied had identified the cost of digital technologies to be a challenge when trying to provide adequate resources for all classes, particularly in decile 1-3 schools, so this school was not atypical in this respect. However, the digital leader considered that a variety of other devices were needed, particularly to help teachers implement the computational thinking for digital technologies area of the curriculum. This research concludes that for this school to fully implement the revised curriculum, an increased number of digital resources will be needed, particularly as teachers become more aware of ways in which they could be used to enhance their teaching and learning programmes.

The digital technologies facilitator had emphasised the need for school management to be the drivers of change towards greater implementation of digital technologies into classroom practice.

In this school, the implementation of digital technologies appears to be a focus of the senior leadership team. The principal had driven implementation of digital technologies at previous

schools she had worked at and had identified this as an area of need upon her arrival at the school. Recent appointees to team leader positions are teachers who have had experience in using digital technologies in their previous schools. Members of the senior leadership team were perceived by the participants to be leading by example in the way they made use of digital technologies in staff meetings and had introduced digital systems for many everyday tasks. Although some participants said they had initially found these changes challenging, they reported that they had come to trust that the new methods would be effective and ultimately make their jobs easier.

The junior team leader and the digital leader were both focused on ways that they could encourage teachers to utilise digital technologies more effectively in their classrooms. The digital leader had identified the need for teachers to have opportunities to explore the devices and develop their own digital fluency, while the junior team leader was wanting her team to receive professional development which would enable them to use the devices to better support learning in their classrooms.

This support from school leadership was identified by Timperley et al. (2007) as an important factor for successful change to be implemented. Uluyol and Şahin (2016) had also emphasised the importance of school leaders believing in the value of technology in education if teachers were to be motivated to implement change. The research concludes that in this school, the use of digital technologies in teaching and learning programmes is valued by school leaders and they are identifying ways to support teachers to use them.

As recommended in the Curriculum Advisory Group report on the development of the Digital Technologies and Hangarau Matihiko curriculum (2017), in order to effectively implement the digital technologies content of the revised technology curriculum area, teachers would require professional development to develop their own levels of digital fluency and to develop their understanding of the revised curriculum and its requirements.

In this school, the junior teachers had received professional development designed to improve their own digital fluency from an external facilitator as well as a whole staff session at the local marae and support from the junior team leader during syndicate meetings.

As mentioned earlier, aspects of professional development that participants valued were: individualised sessions with external experts that catered for their specific needs, opportunities to try things out and put new learning into place immediately, and links to sites that would provide them with information, so they could further explore on their own.

The participants also had ideas for further professional development, suggesting practical ‘hands on’ sessions, opportunities to view experts using digital technologies with the students and more opportunities for collaboration with colleagues to share information about successful practices and find solutions to challenges they may have encountered.

This research concludes that in this school, the need for professional development to develop digital fluency has been identified by school leaders and by the teachers themselves. Participants in this study have reflected on their own individual needs and considered ways in which these might be addressed, and school leaders are also aware of the teachers needs and have plans for how these could be met.

However, the research found that at the beginning of this study, the participants in this school had little knowledge of the revised curriculum document. Most were aware that some revisions involving digital technologies had taken place, expecting that these were likely to involve integrating the use of these technologies into established teaching practices, but none had actually seen the document.

Throughout the study, participants did not mention any professional development on the digital technologies content of the revised technology curriculum area. The Curriculum Advisory Group Report (2017) emphasised the critical importance of such professional development if teachers were to understand the curriculum and teach it effectively. Currently, teachers appear

to be experimenting with the use of digital technologies in their teaching programmes without understanding how their use might link to the revised curriculum area. Although most of the activities they are carrying out are integrated with other curriculum areas, a practice suggested by the revised curriculum document (MOE, 2017b), and some of these activities may support students in working towards the progress outcomes, it is not clear whether this link is understood. Professional development will be essential to ensure that teachers do understand the intended outcomes of these technological areas and can plan programmes to enable students to meet them. This research concludes that this is an area that the school would need to address in the immediate future if the revised curriculum is to be implemented successfully.

The research found that participants encountered a number of challenges as they attempted to use digital technologies in their teaching and learning programmes. It is important that these challenges are considered and addressed if the teachers of this school are to successfully implement the use of digital technologies into their teaching and learning programmes.

The mobile device management system which had been installed on the iPads had caused considerable frustration for both the digital leader and the classroom teachers. Problems encountered included difficulties locating apps due to the physical layout of the iPads and lengthy procedures that were required to install or update apps. These issues impeded the ability of the participants to utilise the potential of the iPads and achieve the learning they had intended for their students. Some participants reported problems with unreliable or malfunctioning equipment, which they had then become reluctant to use. The study of Clarke and Zagarell (2012) also found that teachers were reluctant to use unreliable resources. This study concludes that it is necessary for this school to find solutions to these technical difficulties, as teachers need to be assured that the resources that they wish to use can be relied upon to function as intended.

Many of the problems encountered by participants during the course of this study had been resolved either by the participants themselves, or by the efforts of their students after they had been encouraged by their teachers towards greater independence when using the devices. Most participants were surprised at what their students were able to achieve when given the

opportunity to investigate the possibilities the devices offered and to solve problems themselves. This study concludes that this approach of giving students more responsibility for solving problems and allowing them to take greater ownership of their learning has resulted in positive outcomes for learning and for developing independence and should be further encouraged.

6.2 Recommendations for practice

The following recommendations are applicable to the school of study but may be of interest to other schools in the early stages of implementing digital technologies into their teaching practices, particularly those with limited digital resources.

6.2.1 Recommendations for professional development

1. As recommended by the Curriculum Advisory Group (2017), professional development to increase digital fluency should be ongoing and provide opportunities for participants to put their new learning into immediate effect. It is suggested that the teachers in this school would respond best to professional development which has a ‘hands on’ approach and is relevant to their immediate needs.
2. Professional development options which provide teachers with an understanding of the digital technologies content of the revised technology curriculum area should be investigated and undertaken as it is critical that teachers understand this content if it is to be taught effectively. This is also recommended by the Curriculum Advisory Group (2017).
3. Opportunities to observe experienced practitioners using digital technologies with students would be valued by teachers in this school and ways of achieving this should be investigated.

6.2.2 Recommendations for professional practice

1. Teachers at this school value opportunities to collaborate and see this as an important way to improve their practice. There are many ways in which collaboration between teachers could be used to enhance the future use of digital technologies and it is suggested that the school consider the following:
 - a. The professional development delivered by the external facilitator was valued for the way it catered for the individual needs of the teachers. One outcome of this individualised way of learning was that teachers came out with a variety of skills and ideas. Providing opportunities for teachers to share these ideas would mean that the benefits of this professional development would go further.
 - b. Individual teachers found successful ways to overcome the challenges they had encountered. As well as sharing successful practices, as most teachers had expressed an interest in doing, it could also be beneficial for them to share their challenges as a possible way of finding solutions.
 - c. As teachers become more familiar with the potential various technologies offer, and more aware of apps and websites which will enhance their learning programmes, it could be helpful for them to create a list of those which they have found useful for different purposes, so they can be made available on the relevant devices and used by others wanting to achieve similar outcomes.
 - d. One participant had already created a video tutorial in response to a colleague's request for help. Her suggestion of creating and building up a resource bank of video tutorials, so staff could easily share their expertise, is worthy of consideration.

2. Participants who gave students responsibility for investigating the possibilities of the devices and for solving simple technical problems, invariably found that these students proved themselves capable of more than they had expected. In line with the approach suggested by the digital technologies facilitator, it is recommended that teachers encourage students to take greater ownership of their own learning and allow them more opportunities to investigate the possibilities of the devices themselves.

6.2.3 Recommendations for resourcing and technical support

1. This school should continue to prioritise the building up of resources which will support the implementation of the digital technologies content of the technology curriculum area, particularly those which will enable the computational thinking for digital technologies area to be delivered. It is suggested that teachers are given the opportunity to explore the potential of new resources before using them with their students, so they can develop an understanding of how they can be best used to support learning.
2. Technical problems were the cause of frustration for both teachers and the digital leader throughout this study, and there appeared to be some misunderstandings regarding the requests the school had made for the setting up of devices and what the technicians perceived the needs of the school to be. It is important that the school has the autonomy to identify their needs and that communication between the school and the technicians is clear, so that these needs are able to be met in a way that makes it easy for the designated experts within the school to carry out their responsibilities.

6.3 Limitations

There are several limitations to the findings of this study. Firstly, it only involved one school during a time when digital technologies were in the early stages of being implemented. Only the junior teachers of the school were involved in the study and it is possible that teachers working in other areas, most of whom were new to the school, could have possessed a vastly different range of skills and experiences.

This study only investigated the perceptions and experiences of teachers as they themselves reported them. Although teachers kept logs of the activities they had carried out, these were a record of their own interpretation of events.

The time frame for teachers to try out new ideas with the available digital technologies was limited and for a considerable portion of this time, many of the new technologies, specifically the iPads, were unavailable due to the new set up being installed.

Although this study focused on the implementation of digital technologies within the school, there were other initiatives taking place at the same time which often required the time and energy of the participants and did not allow them to devote as much time to digital activities within their classrooms as had been originally anticipated.

6.4 Recommendations for further study

Because this study was conducted at a time when digital technologies had only recently been made available for integration into classroom programmes at this school, the findings have focused on teachers developing their own digital literacy and learning how the devices could potentially be integrated into their current teaching and learning programmes. Participant knowledge of the revised technology curriculum area was limited so they were not yet in a position to ascertain what support they might need to meet its requirements.

Areas worthy of further research could be:

1. An examination of the requirements of the digital technologies content of the revised technology curriculum area and the ways in which teachers of this school could meet these requirements when faced with limited digital resources.
2. An investigation into the most effective forms of professional development in the use of digital technologies for teaching and learning, suitable for these teachers in this school environment with limited resources.
3. A longitudinal study on the pedagogical changes which occur as the level of resources are increased and digital technologies are implemented across all levels of this school.

6.5 Further developments

The school is going through a period of rapid change and further developments are continuing to occur. Since the collection of data, funding has been acquired for the purchase of devices to help teachers to implement the computational thinking for digital technologies area of the curriculum.

Malfunctioning data projectors are being replaced by televisions and fixed classroom computers are being upgraded to portable, multifunctional laptops.

This research occurred during the early stages of the implementation of digital technologies into teaching programmes. The need for teachers to become familiar with the new areas of the curriculum have been acknowledged by the Digital Technologies Curriculum Team and steps have been taken to access suitable professional development to address these needs.

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APPENDICES

Appendix A: Digital technologies log

Digital Technologies Log

The activity	What was involved	How it went	The future	Other issues!
What was used? (Device, app etc) How many students? Where and when was it carried out?	What was the purpose? Were students working independently or under teacher direction? Was there a finished product? (e.g. art, writing, movie)	Was the activity successful or not? Which parts worked? Which parts didn't work? Suggestions why!	What would I do differently next time or suggest to others?	E.g. Child behaviour, interruptions, technological failings, all the other issues that can be part of a typical school day.

Appendix B: Email invitation

Invitation to participate in a research project

In 2018, digital technologies will become part of the New Zealand Curriculum, beginning at year 1. You are invited to participate in a project which intends to examine the Ministry of Education expectations for the implementation of digital technologies and how these expectations can best be met in the junior school with the resources currently available.

The information gathered during the project will help identify successful strategies which could then be shared for the benefit of all.

Participation would involve being interviewed at the beginning and end of the project, taking part in the usual school professional development in this area and keeping a log of the ways you have used digital technologies in your teaching programmes.

For further information, and to participate in this research, please contact Jenny Corkill. jennyc@favona.school.nz

Your participation would be greatly appreciated and will help to identify how the revised curriculum could be successfully implemented at [Favona Primary School](#).

Appendix C: Participant information sheet



Information for participants

Research Project Title Implementing digital technologies in one New Zealand school. Challenges and opportunities.

Synopsis of project: This project intends to examine the expectations of the digital technologies content of the revised technology curriculum area and how these expectations can be met by our school. It will involve the collection of information about successful approaches used and challenges that need to be overcome so that the school has a better understanding of how we can successfully implement this new curriculum.

What I am doing: I will be gathering data, through interviews and teacher logs to establish what teachers currently understand about the digital technologies content of the revised technology curriculum area and what their current practice is, the different ways teachers make use of digital technologies and the challenges they may face. I will be investigating successful approaches that have been used and barriers that need to be overcome to identify how the school could best use the resources available for the benefit of students.

What it will mean for you: At the start of the project, you would be interviewed to establish what you already know about the digital technologies content of the revised technology curriculum area, your experiences using digital technologies in the classroom and your views on challenges and opportunities that implementing this revised curriculum area may present. You will be receiving regular professional development to assist you in the use of digital technologies in your teaching. You would be asked to keep a log throughout the course of the project, detailing occasions when you have used digital technologies and the outcomes of these

occasions, with any suggestions for improving the way they are used. At the end of the project you would be interviewed again to find out what has been successful for you, learn what challenges have been overcome and how you have done this, and what you would suggest for future development.

If you agree to participate, you will be asked to sign a consent form. This does not stop you from changing your mind if you wish to withdraw from the project. However, because of my schedule, any withdrawals must be done within 2 weeks after I have interviewed you.

Your name and information that may identify you will be kept completely confidential. All information collected from you will be stored on a password protected file and only you, myself and my supervisor will have access to this information.

Please contact me if you need more information about the project. At any time if you have any concerns about the research project you can contact my supervisor:

My supervisor is Lisa Maurice-Takerei, phone 815-4321 ext. 7338 or email lmauricetakerei@unitec.ac.nz

UREC REGISTRATION NUMBER: *2017-1068 Corkill*

This study has been approved by the UNITEC Research Ethics Committee from *28/09/2017* to *28/09/2018*. If you have any complaints or reservations about the ethical conduct of this research, you may contact the Committee through the UREC Secretary (ph: 09 815-4321 ext 8551). Any issues you raise will be treated in confidence and investigated fully, and you will be informed of the outcome.

Appendix D: Participant consent form



Participant Consent Form

Research Project Title: Implementing digital technologies in one New Zealand school
Challenges and opportunities.

I have had the research project explained to me and I have read and understand the information sheet given to me.

I understand that I don't have to be part of this research project should I chose not to participate and may withdraw at any time prior to the completion of the research project.

I understand that everything I say is confidential and none of the information I give will identify me and that the only persons who will know what I have said will be the researcher and her supervisor. I also understand that all the information that I give will be stored securely on a computer at Unitec for a period of 10 years.

I understand that my discussion with the researcher will be recorded and transcribed.

I understand that I can see the finished research document.

I have had time to consider everything and I give my consent to be a part of this project.

Participant Name:

Participant Signature: *Date:*

Project Researcher: *Date:*

UREC REGISTRATION NUMBER: 2017-1068 Corkill

This study has been approved by the UNITEC Research Ethics Committee from *28/09/2017* to *28/09/2018*. If you have any complaints or reservations about the ethical conduct of this research, you may contact the Committee through the UREC Secretary (ph: 09 815-4321 ext 8551). Any issues you raise will be treated in confidence and investigated fully, and you will be informed of the outcome.

Appendix E: School information sheet



Information for [REDACTED]

Research Project Title Implementing digital technologies in one New Zealand school. Challenges and opportunities.

Researcher Jenny Corkill

Synopsis of project: This project intends to examine the expectations of the digital technologies content of the revised technology curriculum area and how these expectations can be met by [REDACTED]. It will involve the collection of information about successful approaches used and challenges that need to be overcome so that the school has a better understanding of how we can successfully implement this revised curriculum.

What I am doing: I will be gathering data, through interviews and teacher logs to establish what teachers currently understand about the digital technologies content of the revised technology curriculum area and what their current practice is, the different ways teachers make use of digital technologies and the challenges they may face. I will be investigating successful approaches that have been used and barriers that need to be overcome to identify how the school could best use the resources available for the benefit of students.

What it will mean for [REDACTED]: At the start of the project, junior teachers would be interviewed to establish what they already know about the digital technologies content of the revised technology curriculum area, their experiences using digital technologies in the classroom and their views on challenges and opportunities that implementing this revised

curriculum area may present. They will be receiving their planned, regular professional development to assist them in the use of digital technologies in their teaching. They would be asked to keep a log throughout the course of the project, detailing occasions when they have used digital technologies and the outcomes of these occasions, with any suggestions for improving the way they are used. At the end of the project they would be interviewed again to find out what has been successful for them, learn what challenges have been overcome and how they have done this, and what they would suggest for future development.

Participating teachers will be asked to sign a consent form and will have the right to withdraw from the project up until 2 weeks after the final data has been collected.

All names and information that may identify individuals and/or the school will be kept completely confidential. All information collected will be stored on a password protected file and only participants, myself and my supervisor will have access to this information. However, although the school will not be named, the New Zealand education community is a small one and it is possible that the school may be able to be identified. All care will be taken to avoid using information that would enable this to happen. The senior management team will be provided with a summary of my findings and an electronic copy of my thesis when it is completed.

Please contact me if you need more information about the project. At any time if you have any concerns about the research project you can contact my supervisor:

My supervisor is Lisa Maurice-Takerei, phone 815-4321 ext. 7338 or email lmauricetakerei@unitec.ac.nz

UREC REGISTRATION NUMBER: *2017-1068 Corkill*

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Appendix F: Email invitation

Invitation to participate in a research project

In 2018, digital technologies will become part of the New Zealand Curriculum, beginning at year 1. You are invited to participate in a project which intends to examine the Ministry of Education expectations for the implementation of digital technologies and how these expectations can best be met in the junior school with the resources currently available.

The information gathered during the project will help identify successful strategies which could then be shared for the benefit of all.

Participation would involve being interviewed at the beginning and end of the project, taking part in the usual school professional development in this area and keeping a log of the ways you have used digital technologies in your teaching programmes.

For further information, and to participate in this research, please contact Jenny Corkill. jennyc@favona.school.nz

Your participation would be greatly appreciated and will help to identify how the revised curriculum could be successfully implemented at [Favona Primary School](#).

Appendix G: Questions for digital technologies facilitator

Interview Questions – External Facilitator

What do you see as the biggest challenges for schools implementing digital technologies as part of the revised technology curriculum area?

What do you see as the biggest challenges for implementing the revised curriculum in this school?

Can you describe the particular goals you have for working in this school?

What, in your view, provides the best support for teachers?

Appendix H: Questions for teacher participants – Interview 1

Initial Interview (November/December 2017)

What do you understand about digital technologies in the revised technology curriculum?

How confident would you say you are in using digital technologies in your teaching?

(Not at all → very confident)

1 2 3 4 5

In what ways have you already used digital technologies in your teaching?

Is there anything in particular you are planning to do with digital technologies?

What do you think would be helpful in supporting you to meet the requirements of the revised technology curriculum?

What PLD do you feel works best for you?

What PLD have you already had and how did you find it?

Do you have any concerns about the use of digital technologies in the classroom? What are they and do you have suggestions about how they could be addressed?

Appendix I: Questions for teacher participants – Interview 2

Final interview Questions (May 2018)

What activities have you carried out using digital technologies?

What has worked well?

What has not worked so well?

Can you suggest ways things could have worked better?

Were there any particular difficulties you needed to overcome when using digital technologies and if so, how did you manage to do that?

Is there anything you have not been able to accomplish?

What was of benefit in the PLD you have received?

What was not of benefit?

Are there things you would do differently in the future?

What were the main challenges of using digital technologies in your classroom?

Are there barriers which still need to be overcome? What are they?

What opportunities has the use of digital technologies provided to your programme?

How confident would you say you are in using digital technologies in your teaching?

(Not at all → very confident)

1 2 3 4 5

What would you say has been the most positive influence in your experience with using technology?

Are there any recommendations you would make for the future use of digital technologies?

Appendix J: Questions for school leaders

Additional Questions - Team Leader and Digital Leader (May 2018)

What issues have you identified with the setup of digital technology in the school?

Have these issues been overcome? What has been required to do this?

What still needs to be done?

What suggestions would you make for setting up digital technologies in the future?

Do you have any suggestions for how better use could be made of digital technologies in the junior classes?

Are there any other suggestions or recommendations you would like to make?



Full name of author: Jennifer Carroll Corkill

ORCID number (Optional):

Full title of thesis ('the work'):

Implementing digital technologies in one New Zealand school: Challenges and opportunities

Practice Pathway: Te Miro Postgraduate

Degree: Master of Applied Practice

Year of presentation: 2018

Principal Supervisor: Dr Lisa Maurice Takerei

Associate Supervisor: Dr Jo Mane

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Declaration

Name of candidate: Jenny Corkill

This Thesis entitled: **Implementing digital technologies in one New Zealand school: Challenges and opportunities** is submitted in partial fulfilment for the requirements for the Unitec degree of Master of Applied Practice.

Principal Supervisor: Dr Lisa Maurice-Takerei

Associate Supervisor: Dr Jo Mane

CANDIDATE'S DECLARATION

I confirm that:

- This Thesis represents my own work;
- The contribution of supervisors and others to this work was consistent with the Unitec Regulations and Policies.
- Research for this work has been conducted in accordance with the Unitec Research Ethics Committee Policy and Procedures, and has fulfilled any requirements set for this project by the Unitec Research Ethics Committee.

Research Ethics Committee Approval Number: 2017-1068

Candidate Signature:  Date: 10/12/2018

Student number: 1454183