THE INTEGRATION OF INFORMATION AND COMMUNICATION TECHNOLOGY INTO SECONDARY TECHNOLOGY TEACHERS' PEDAGOGY IN NEW ZEALAND

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ATTESTATION OF AUTHORSHIP

I hereby declare that this submission is my own work and that to the best of my knowledge and belief it contains no material previously published or written by another person (except where explicitly defined in the acknowledgements), nor material which to a substantial extent has been submitted for the award of any other degree or diploma of a university or other institution of higher learning.

Badr Almadhour…….

Date:……

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Abstract

The worldwide integration of information and communication technology (ICT) into education has advanced significantly over the last two decades. ICT has changed the quality of education, and it is clear that students now expect ICT as part of their learning experience. Many current forms of information and communication technology may be effective teaching resources if used wisely and meaningfully. It is therefore important for educators to understand how to best use ICT in teaching and learning.

Having ICT in the education environment does not automatically ensure that high quality effective teaching and learning take place. The teachers' role is all-important here. To improve the use of ICT in the educational environment we need to understand teacher perspectives so that we can improve teachers' ICT skills, and in many cases, change their perceptions about ICT.

This research sought to address the following research question: what are teachers' perceptions regarding integrating ICT with pedagogy in the technology classroom? The findings presented in this dissertation represent some New Zealand secondary technology teachers' perspectives on integrating ICT. The findings show that teachers use various ICT tools to differing degrees, depending on their perspectives relative to ICT and their level of professional experience in ICT use.

Teachers are integrating ICT in instructional processes and see the future as highly ICT-integrated. They use a variety of ICT tools, for example the Internet, digital cameras, video cameras and video players, computers, printers, scanners, data show, presentation, educational software, CAD and electronic boards.

In order to integrate ICT meaningfully into classrooms teachers need both the commitment and the technological skills to do so. Teachers understand their need for PD and believe in undertaking such development, but they have a lack of time to achieve it.

Chapter I: Introduction

1.0 Introduction

The worldwide integration of information and communication technology (ICT) into education has advanced significantly over the last two decades. People have always tried to use technology to meet their needs (Ministry of Education, 1995), and today new technologies appear almost daily. Educators, community, government and local authorities all place great importance on integrating ICT advances into education (Harrison, 2005). Much of the discussion concentrates on upgrading resources, rather than meaningfully integrating ICT in classrooms.

Many current forms of information and communication technology can become effective teaching resources if used wisely and meaningfully. If used ineffectively they will waste considerable amounts of money. Therefore it is important for educators to understand how to best use ICT in teaching and learning. If we do not understand the effective use of ICT in the classroom, expenditure on computers, software, whiteboards and the like will be meaningless in terms of teaching and learning.

Having ICT in the education environment does not automatically ensure that high quality effective teaching and learning take place. While it may change a teacher's role (for example, supporting students to use an individual computerised learning program), it will not alter pedagogy (Cuban, 2002). To achieve this, teachers must believe in ICT as a valuable educational tool, make a commitment to improving their ICT skills, and integrate ICT into their regular teaching practice.

Today's new technologies cannot be ignored in the school context. As I explore in Chapter Two, research shows that ICT integration in the classroom can influence learning and teaching. Modern communication technologies are an integral part of most students' lives, particularly in the case of secondary students who are often more ICT aware than their teachers. If educators embrace ICT, educational content and methodology may

become more relevant to students' actual lives and interests. Cox and Abbott (2004) found that students enjoyed using ICT to help them take more responsibility for their learning. Their commitment to the learning task and interest in the subject improved because using ICT allowed them to be more independent of the teacher.

In the case of young people who have lack of access to ICT technologies (like personal computers) it can be argued that schools should provide them with the opportunity to use and learn about them. Much economic and professional development depends on being able to confidently use ICT.

I am an educational supervisor from Saudi Arabia who specialises in ICT use in secondary schools, and the issue of how to effectively integrate ICT into the classroom is a key work challenge. Saudi Arabia seeks to build a people-centred, development-orientated information society. Currently, the Saudi Ministry of Education seeks to better incorporate ICT into our secondary schools.

My role is to consider how best to implement this plan. To assist me, I sought to gain an in-depth insight into how another country is achieving this goal. I chose to study this in New Zealand.

The subject of my thesis therefore, is: "the integration of ICT into secondary technology teachers' pedagogy in New Zealand". I have chosen this topic because it is relevant to my work, and currently not included it in the secondary curriculum in Saudi Arabia. I am professionally interested in the usefulness of the subject and may recommend its inclusion in the Saudi curriculum to the Ministry of Education upon my return. Because I am interested in studying how ICT is used in teaching and learning in any subject, I will be looking for insights that may be applied across the curriculum.

In this introductory chapter, I remark on the importance and nature of ICT in education before defining ICT in the New Zealand Curriculum. I introduce some of the ICT issues in New Zealand education and conclude with a statement of my research questions.

1.1 The Importance of ICT in Education

Educational technology is affected by many things, such as social, cultural, political, economic and educational changes. Hernes (2003) mentioned that computers were now being seen as essential family and workplace technologies due to our increasing reliance on them. Hernes also noted that the methods in which hardware has been produced and worked are expressions of globalisation and there is now widespread global recognition of brand names such as Microsoft, Apple, Panasonic, Sony, Intel and Nokia.

The use of ICT has become more common during the last two decades with the existence of the Internet and the World Wide Web. The Internet is fast becoming the largest collection of information in the world. Importantly, teachers can use the Internet to enhance teaching and learning, but this strategy needs to be well structured and sequenced (Pachler, 1999). Pachler suggested that pupils need to be prepared well for using the Internet. They need to be clear about intended learning outcomes and have clearly differentiated tasks to work on. Accordingly, students can develop as highly motivated and successful learners, provided that schools do not implement ICT superficially with existing classroom curricula and pedagogies, using it to make their schools appear modern without ensuring the efficacy of its usage.

ICT has changed the quality of education and it is clear for many educators that students are changing by using ICT tools (Finger, Russell, Jamieson-Proctor, & Russell, 2007). In Australia, a survey of the computer skills and knowledge of 6,213 students (Meredyth, Russell, Blackwood, Thomas, & Wise, 1999) tested four domains of ICT activity: creativity, information, communication, and educational programs and games. Teachers reported that ICT was most frequently used for information purposes (70% of teachers), creative purposes (50% of teachers) and educational programs and games (43% of teachers).

1.2 The Nature of ICT and its Integration in Education

Finger et al. (2007) stated that the term ICT is usually used to refer to computer-based and computer-related devices. However it also includes a variety of other devices that can be used for information and communication purposes. They describe ICT as a range of new devices such as the internet, mobile phones, digital cameras, plasma screens, digital video recorders, interactive whiteboards, and wireless technologies and networking. This approach enables me to consider a wide range of new technologies rather than to simply concentrate on the personal computer. Finger et al. (2007) observed that for more than two decades, ICT and education strategies have been essentially built around the personal computer tool, but that rapid change in the nature of ICT has expanded the use of ICT tools.

Finger et al. (2007) stated that "the evolution of computer technology can be described in terms of 'yesterday', 'today', and 'tomorrow'. This is helpful in reminding us where we have been and where we are today, and for alerting us of the importance of adopting a future perspective." In support of this view Forcier & Descy, (2002) commented:

> Any lasting changes and reforms will need to be preceded by a vision of what future learning environments will be like. What expectations will be placed on the learner? What will the role of the teacher be? What will the physical structure of the learning environment be? (p. 15)

Finger et al. (2007) also mentioned that the term ICT has recently become more widely used globally to replace earlier terms such as 'technology learning' and 'information technology'. However, in the United States instead of using 'ICT in education', educational technology is referred to as: integrating technology and curriculum to support learning; delivery, development, and assessment of instruction; effective use of computers as an aid to problem solving; school and classroom management; educational research; electronic information access and exchange; personal and professional

productivity; technical assistance and leadership; and computer science education (Jamieson-Procter, Watson & Finger, 2003, p. 1).

Australia's Department of Education, Training and Youth Affairs (2000) observed that ICT in teaching and learning "can influence changes in what and how learners learn, and be an integral component of the changes which will reform the organisation and structure of schooling itself" (p. 2).

My preferred definition of ICT is that of Betrus, Branch, Doughty, & Molenda, (2008) who provide a broad definition of ICT in a learning context as: "the study and ethical practice of facilitating learning and improving performance by creating, using, and managing appropriate technological processes and resources" (p. 1). I prefer this definition because Betrus et al. (2008) divided ICT integration into three levels: creating, using and managing. The concept of 'creating' allows me to focus on what technology teachers themselves are actually providing for their students to support their learning. This focus supports my investigation of their perspectives, and will help me when I return to my job in Saudi Arabia.

To discuss the term 'learning' in the context of this definition, it must be seen that learning does not currently connote what it did forty years ago when the first Association for Educational Communications and Technology (AECT) definition was developed. Betrus et al. (2008) suggested that there is heightened attention to the differences between the mere retention of information for testing rationales and the acquisition of knowledge, skills and attitudes used beyond the classroom walls. Technology is improving rapidly; thus learning strategies need to change.

1.3 The Position of ICT in Technology Education in the New Zealand Curriculum

I discuss the position of ICT in both the previous and current curricula.

1.3.1 New Zealand Curriculum prior to 2007

In the New Zealand Curriculum (Ministry of Education, 1993) there were eight essential skills. Two of them related to information and communication skills: communication skills and information skills. Patterson (2005) in his discussion of these skills stated "it is important to note all definitions refer to the word use, or using with reference to the ICT" (p. 2). Patterson (2005) believed that the role of ICT in this framework was about the development of information and communication skills, and it was expected that these would be developed by using ICT technologies in different places of learning.

There were issues about the position of ICT in the New Zealand Curriculum. For example, teachers and writers who wrote about the place of ICT in technology education were confused about its role (Patterson, 2005). This confusion appeared in the two curriculum documents: *The New Zealand Curriculum Framework* document (Ministry of Education, 1993) and the *Technology in the New Zealand Curriculum* document (Ministry of Education, 1995). Patterson (2005) stated that both documents included statements about the role of ICT in education but these statements were not clear to educators. Patterson observed that:

> …we are in danger of creating a whole generation of students who have little or no real technological knowledge associated with understanding and developing information and communication technological outcomes. (Patterson, 2005, p. 1).

In the New Zealand Curriculum areas (Ministry of Education, 1995), seven technology areas were identified in which "students will be expected to carry out their technological activities" (Ministry of Education, 1995, p. 12). Four were given to ICT and they focused on systems, for example "information and communication technology includes systems that enable the collection, structuring, manipulation, retrieval, communications, the use of electronic networks, and interactive multimedia" (Ministry of Education, 1995, p. 12). The curriculum also mentioned that ICT was an enabling tool in two senses: firstly, teachers would enable and empower young people to learn by improved methods (such as

using a software programme method for solving a problem), and secondly it encouraged schools to integrate technology into the whole school environment.

Hope (2007) commented that:

> nowhere in the curriculum is there any statement of the ICT knowledge and skills that should be taught, there are no achievement objectives addressing ICT directly, and only two of the forty-five suggested learning and assessment examples provided have an ICT focus (computers at level 5-6 for fifteen and sixteen year-olds, developments in ICT for seventeen year-olds) (p. 46).

According to Hope, the curriculum implied that an ICT component could be developed for many of the activities recommended, but the absence of any compulsory ICT achievement objectives denigrated the importance of doing so. Earlier, Brown (1997) similarly observed:

> ...it seems obvious why schools should include ICT as part of the curriculum. We are, after all, now in the information age! What is not so obvious though is the way that schools should go about doing it. (p. 253)

1.3.2 The Current New Zealand Curriculum (2007 onwards)

In the current New Zealand Curriculum (Ministry of Education, 2007), ICT has become one of the 'Key Competencies' central to all curriculum areas. The curriculum states:

> Students who are competent users of language, symbols and text can interpret and use words, numbers, images, movement, metaphor and technologies in a range of contexts. They recognise how choices of language, symbol, or text affect people's understanding and the way in which they respond to communications. They confidently use ICT (including, where appropriate, assistive technology) to access and provide information and to communicate with others. (Ministry of Education, 2007, p. 12).

Also, the effective pedagogy section (teacher actions promoting student learning) of the New Zealand Curriculum (Ministry of Education, 2007) states that ICT and e-learning have a major influence in students' learning. ICT is not treated as a subject in itself (as in

the previous curriculum) but it is integrated as a *goal*. Students must now be competent in ICT across curriculum areas. This may demonstrate a Ministry of Education intention to integrate ICT throughout the curriculum.

1.4 ICT Issues in New Zealand Education

In the current New Zealand Curriculum (Ministry of Education, 2007) the position of ICT appears to be explicitly stated that is as a goal across curriculum. While this provides teachers with plenty of freedom and professional choices, it provides little in the way of curriculum guidance, support or strategies. I consider the curriculum should contain more explanation relative to this issue.

Additionally, to improve the use of ICT in the education environment we need to improve teachers' ICT skills and, in many cases, change their perceptions about ICT. In order to help educators accept and integrate technology into their pedagogy, teachers need to reinvent their role and learn the fundamentals of ICT (Nina, 2002). Sani (2002) believed that education ministries should plan for training to make sure that teachers are encouraged to acquire ICT skills. Nina (2002) stated that the challenge of professional development is to educate teachers. Whilst Sani (2002) and Nina (2002) emphasised the need for teachers to improve themselves, they overlooked the responsibility of government. In contrast, Geoffrey (1999) clearly identified that government must support and drive this issue. Roberts (2001) stated that in the area of funding, most technology leaders expect to see the biggest budget increases applied to professional development. In future, this would be so in Saudi Arabia.

Many teachers believe that there are barriers to integrating ICT into their pedagogy; for example machine failure, an undependable infrastructure, a lack of access to ICT, the need for professional development and a lack of time, technical support and maintenance. For example, Mawson (2003) mentioned that when teachers integrate ICT in a technology subject, problems with ICT tools (such as trouble shooting, errors in the programme and a lack of access to ICT) can adversely affect students' confidence and

learning, and educators have clarified the importance of students' confidence. For example, the Digital Horizons project (Ministry of Education, 2002) is centred on the vision statement that "all learners will use ICT confidently and creatively to help develop the skills and to be full participants in the global community" (p. 3).

These barriers affect teachers' perceptions regarding integrating ICT and pedagogy in the technology classroom, making them reluctant to integrate ICT in education. Moreover, personal challenges and difficulties may make teachers unwilling to integrate ICT. For example, some teachers with skill levels lower than their students may avoid using ICT because they feel embarrassed in front of them. In talking with Saudi teachers, I found this to be a common theme.

1.5 Research Questions

Perhaps the most fundamental issue for ICT integration is that of teachers and their perspectives about the use of ICT. However, there is a gap between education curriculum documents such as the New Zealand Curriculum (Ministry of Education, 2007) and how teachers deal with the implementation and challenge of integrating ICT into their pedagogy.

Some teachers are not familiar with ICT tools, so they do not want to integrate ICT in their pedagogy. Thus professional development is a significant requirement to achieve the aim of integrating ICT in education. If educational ministries provide professional development, teachers are more likely to change their beliefs about using technology in education and integrate ICT in their pedagogy.

In this research I aimed to investigate New Zealand secondary technology teachers' perspectives on integrating ICT with their pedagogy. This research attempted to answer two questions:

1. What are teachers' perceptions regarding integrating ICT with their pedagogy in the technology classroom?

2. How do teachers integrate ICT in teaching and learning?

I carried out this research with secondary school technology teachers in Auckland. I chose the technology subject because we do not have this subject in Saudi Arabia. My research method was qualitative and exploratory. A small number of teachers (six technology teachers) were studied in detail. I chose the interview method because I hoped to obtain rich descriptive data based on the teacher's own perceptions of their work. I wanted to gain insights into teachers' experiences, opinions, thoughts, attitudes and feelings.

My dissertation is structured as follows. In Chapter 2, I discuss related literature including the necessity of integrating ICT with pedagogy; secondary students as a digital generation; research perspectives on integrating ICT into the school environment; attempts to integrate ICT into the New Zealand education system to date; Internet as the main tool in the integration of ICT; and ICT and professional development. Chapter 3 presents my explorative research methodology including the design of qualitative research; data collection and analysis. I present my findings in Chapter 4. Chapter 5 discusses these findings under the themes of technology teachers and the integration of ICT; teachers' perceptions regarding integrating ICT into pedagogy; New Zealand curriculum and teachers' perspectives; the future of ICT in education; a comparison between ICT in Saudi Arabia and New Zealand secondary education; and recommendations to the Saudi Arabian Ministry of Education regarding effective ICT integration**.** I offer my conclusions in Chapter 6.

Chapter II: Literature Review

2.0 Introduction

In this chapter I review the literature about the integration of ICT in secondary teachers' pedagogy. I also justify the research question that will be addressed by my research.

2.1 Need for Integration of ICT

Developments in ICT have affected all sectors of society, including the education sector and especially education curricula. Like their colleagues in other countries, New Zealand educationalists recognize the importance of ICT in the knowledge society (Hope, 2007). Numerous authors have argued that the integration of new technologies into education can improve students' learning (Bigum, 2003; Lankshear & Knobel, 2003; Gilbert, 2005). Khine and Fisher (2003) have discussed how the introduction of integrated ICT in education has led many educators to improve the way they teach and structure their pedagogy.

Many academics have argued that frequent use of digital technologies has the potential to empower secondary students to develop new ways of thinking, being, and acting in the world, and to gain learning goals that people in industrial generations may not have been able to achieve (Khine & Fisher, 2003). For example, students can search on the Internet and read on a topic, thus learning new information and becoming more familiar with accessing electronic information.

Much has been said about how the use of ICT can improve student performance. Harrison (2005) mentioned that students use ICT to plan and build models, and use the Internet to bring a new dimension to their learning. By using software and the Internet, students manage and reduce the time typically given to design a prototype. Also, students test out their ideas in a flexible way, for example, using a Computer-Aided Design

(CAD) package to design a house was easier than designing it by hand. Thus ICT can be used in technology pedagogy to find things out, develop ideas, make things happen, exchange and share information, and review and modify products (Harrison, 2005).

Globally, the number of computers in secondary schools has greatly increased in the last ten years. In the United States, the computer-to-student ratio in public schools increased from 1:9 in 1996 to 1:4.2 in 2001 (Market Data Retrieval, 2001). In addition, access to the Internet in public schools improved from 70% in 1997 to 92% in 2001 (Market Data Retrieval, 2001). New Zealand reflects global trends in the numbers of computers and internet access in secondary schools, and schools now appear to have adequate technology to support ICT integration. In New Zealand a recent study showed a computer-to-student ratio of 1:6.3 in secondary schools (Lai, Pratt, Trewern, 2002). In primary schools that ratio is 1:9.5 (Lai et al, 2002). The last[1] Educational Review Office (ERO) Report on ICT showed that 98% of all schools have internet connections, (the remaining schools likely to have chosen not to have internet access for philosophical or religious reasons) with students having access to the Internet in 61% of schools (ERO, 2001).

In New Zealand the government's vision has been well expressed:

> One of our key education priorities is to build an education system that will equip New Zealanders with 21st Century skills. ICT is an incredible tool for learning, and ICT skills are essential for work and for life in the modern world… We want everyone to have the ability to connect safely and securely, taking advantage of the vast online opportunities that exist. This budget initiative is an important step in delivering on that goal. (Mallard, 2003, p. 1).

ICT is therefore now more prominent in the curriculum and the New Zealand curriculum has changed during the last few years. Where once ICT was integrated as a subject (for example 'Computer Studies'), now it is a Key Competency and must be integrated across all curriculum areas. In the secondary school environment, the personal computer (PC) is

[1] Which was in 2001; there have been no ERO reports since.

now a common educational tool in classrooms, and the Internet is a primary information resource.

It could be argued that such self-guided ICT application provides chances for students to improve new skills and abilities that will enable them to learn more effectively in an ICT-rich world and workforce. However as Khine & Fisher (2003) said while a small number of evaluations of ICT initiatives in educational settings have developed research methodologies that facilitate deep analysis of the learning methods and outcomes that might be happening for students using ICT in these ways, after two decades of research we still have a very fragmented perception of these issues. Although teachers were continuously increasing the use of ICT in their work, researchers suggested that the level of ICT integration still remained too low (Lai et al, 2002).

Some researchers argue that there is no evidence that using ICT in education will improve student learning (Macho, 2005). Macho suggested that children's differences in achievement are more related to the qualifications of their parents than to the availability of ICT at home. Some in the literature have argued that we spend billions of dollars on buying new computers and software packages, which is wasteful. For example, Cuban (2002) argued that "…there is no clear, commanding body of evidence that sustained use of multimedia machines, word processing, spreadsheets and other popular applications have any impact on academic achievement." (p. 1). Cuban (2002) also argued that there was no clear evidence that revealed gains in academic achievement result from using ICT in the classroom: "computers have changed classrooms much, and they have hardly changed pedagogy at all." (p. 1). Khine & Fisher (2003) argued that ICT usage might lead students to become more inactive, more introverted, and less able to use their brains, set goals, concentrate, communicate, or improve their level at school. Others in the literature for example, Tranwell (2008) believe that we spend billions of dollars on buying new computers and software packages, but that is a waste. Tranwell agreed with Cuban, stating that teenagers use technology as a social positioning tool (for example getting a "cool" cell phone to be accepted in learning).

At the same time advertisements target education decision makers and parents, playing on their fears and proposing that their products will solve student learning and teaching problems (Hope, 2007). Such advertisements tell their audience that using ICT will necessarily develop students' learning.

Macho (2005) studied how family affluence improves children's learning and found that the highest level of education within the family was the only improvement factor of student performance. Parent's qualifications, rather than Internet access or household income, determine a student's level of success.

I argue that having access to ICT can improve student performance and can make a change in the nature of core subject practice and pedagogy, but only with the proper guidance. Educated parents or teachers will often be able to provide the best of such guidance.

2.2 Dealing with Today's Students

To understand the position of ICT in secondary technology teachers' pedagogy, we need to focus on the nature of secondary students and how their youth culture reflects the new environment of the 21st century, for teaching and learning.

Prensky (2001) has observed that:

> Today's students have spent their entire lives surrounded by and using computers, videogames, digital music players, video cams, cell phones and all the other toys and tools of the digital age. Today's average college graduates have spent less than 5,000 hours of their lives reading, but over 10,000 hours playing video games (not to mention 20,000 hours watching TV). Computer games, email, the Internet, cell phones and instant messaging are integral parts of their lives (p. 1).

Writing from New Zealand, Bolstad, Gilbert, Vaughan, Darr & Cooper (2006) stated that:

> the "digital generation" consists of anyone whose formative years coincided with the emergence and widespread uptake of today's digital tools such as personal computers, the Internet and mobile telephones. At its most inclusive, this includes everyone born between the late 1970s and the mid-1990s. At the upper end of this age range are those who recall a time earlier than the Internet; at the lower end are those for whom the Internet has always existed (p. 11).

Bolstad et al. (2006) stated that it should be noted that the concept of a "digital generation" is most relevant for Westernised, technologised nations where there is fairly widespread access to such technologies. The digital generation could be considered to be the first generation to grow up surrounded by digital environments (Tapscott, 1998). Also, Bolstad et al. (2006) added that even within western nations, there are questions about possible social and economic "digital divides" between those who do, and those who do not have easy access to technology tools. Many names have been applied to this generation (or sub-generations within it), including: 'the Net Generation'; 'iGeneration'; 'Digital Natives'; 'the Google Generation'; and 'Generation M' where M stands for 'multitasking', 'media', 'Me, Myself, and I', 'middle income', or 'millennium, marketing and media' (p. 12).

The impact of digital technologies in the last two decades has had such a profound impact on all aspects of individual life that it will inevitably have shaped the ideas, hopes and behaviours of those who have grown up before the digital age (Bolstad et al, 2006). They added that "This change made a massive impact on social, economic, and cultural development as these young people begin to assume situations of power and responsibility in their transition to maturity" (p. 12).

The popular media, market research, social science research and people's everyday experiences shape general ideas and beliefs about what today's young people do with ICT, or what technology is doing to them (Bolstad et al, 2006). They added that the prolific use of digital technologies for communication or entertainment has often been

represented in the media as harmful or at least contributing little towards the growth of young people's ability to think and learn [2] .

Many academics have commented in support of this view about the harmfulness of ICT. Sefton-Green, for example, suggested that opinions in favour of young people's ICT use "often float free from any discussion of the concrete realities of children's lives, or their actual uses of these new technologies" (Sefton-Green, 1998, p. 2). Discussions about the "digital generation" also have a tendency to homogenise students, implying that they act in particular ways. Betrus et al. (2008) argued against this and mentioned the advantages of ICT in education, highlighting the social nature of much of today's technology. Because technology like a cell phone or computer is useful to young people socially (in that it helps them communicate with others) they will learn more when they use it in an educational context. When learning is fun and relevant to one's life, more learning is done.

Bolstad et al. (2006) argued that "Yet, for every book, magazine cover, or headline that cautions about the risks that digital technologies cause for young people's health, development and education, there is a writer seeking to convey the opposite" (p. 14). This message holds that adults have it all wrong and that digital technologies (and the wider popular culture of which they are an integral part) are actually helping young people to become smarter, savvier and more powerful. Johnson (2005) argues that the much-maligned tools of popular culture like video games and television can be used to discover "order and meaning in the world" and make "decisions that help create that order".

Another supporter of the learning potential of popular forms of multimedia digital ICT is Prensky (2006). Prensky is one of many educationists who suggest that several answers to current problems in education (for instance students' disconnection from school

[2] In discussing this prevalent view, Wallis (2006) described a Time magazine cover depicting a pre-teen youngster staring ahead with a blank expression, his ears plugged with the headset of an iPod, while a swirl of electronic gadgets orbited his head. The headline asked: ARE KIDS TOO WIRED FOR THEIR OWN GOOD?

learning) could be solved if parents and educators would listen to what the children of the electronic age—whom Prensky calls "digital natives"—*already* know, can do, and can learn with technology.

Authors such as Gee (2003) and Lankshear and Knobel (2003) suggested that educationists should take a fresh look at the ICT that young people are already engaged with—such as video games and online forums—and consider how these embody principles of powerful and effective learning. They argued that educators need to lead secondary school students to integrate ICT meaningfully.

My perspective is that ICT can be used effectively to support student learning because it is interesting and relevant to today's generation, and it enables independent learning. However, parents and educators need to guide young people to ensure they are using today's technologies appropriately. This has significant implications for teachers and their use of ICT in their classrooms.

2.3 Teachers' Perspectives

There has been minimal research done into teacher perspectives on ICT integration. Some research suggest that teachers tend to use ICT to teach as they have always done, which undermines the potential for ICT use to improve teaching and learning, and therefore further study of teacher perspectives and support for change is needed. Hennessy, Ruthven and Brindley, (2005) identified that:

> The research literature offers little support for the popular (though perhaps unrealistic) rhetoric about technology revolutionizing teaching and learning or teachers fundamentally re-working their lesson plans and pedagogy (p. 156).

Cuban's (2001) study of Californian high schools and universities long exposed to ICT found that teachers actually used the new technology to do what they had always done, despite the fact that they often *claimed* to have transformed their practice. One possible reason for this is that classroom educators have previously had little say in implementing

development plans for integrating technology within their schools, and for defining its position within subject curriculum (Hennessy et al, 2005). Hennessy et al added that "this is especially true in England and other countries with a centralized curriculum and a corresponding lack of professional autonomy" (p. 186). Olson (2000) suggested that such policy decisions and change strategies are strongly politicized, and it is not highly connected to the culture of classroom practice and the essential role of the teacher in effecting change. Olson also added that integrating new technologies challenges teachers and, thus, leaders need to understand and "engage in conversations with teachers about their work culture, the technologies that sustain it and the implications of new approaches for those technologies" (p. 6).

Some researchers argue that few teachers are using ICT in classrooms in a way that encourages higher level thinking in the student:

> … A major English evaluation indicates that 'relatively few teachers are integrating ICT into subject teaching in a way that motivates pupils and enriches learning or stimulates higher-level thinking and reasoning'. As other studies have found, these few tend to be teachers with an innovative pedagogic outlook already. (Hennessy et al, 2005, p.156).

Hennessy et al. (2005) identified that the teachers who use ICT do so in order to support and expand their existing classroom practice. Primarily this expansion is in the area of student led investigative or experimental learning (where students can work by themselves to make sense of a much broader range of information and processes than they could without ICT). Teachers also expressed appreciation for the way that ICT mediums can allow them to present complex and even potentially dangerous issues in appropriate and attractive ways for students (using audio-visual presentations for example).

Becker (2000) noted that while technologies have allowed some teachers to put into practice a more student-centred pedagogy better attuned to their pedagogy, they have not changed the teaching practices of the majority of teachers, particularly secondary teachers. Likewise, in a study of two secondary schools with reputations for technology

incorporation, Cuban (2001) found that most teachers had integrated ICT to fit recognizable instructional practices, with only a few reporting that they had adapted their practice in many ways.

Alternatively, Hennessy et al. (2005) found that teachers did change their pedagogy and committed to ICT integration in their classrooms despite the difficulties of doing so (like the lack of adequate access to technology, experience, and confidence):

> Despite these constraints, the teachers we interviewed were, generally speaking, open rather than resistant to change, and committed to using ICT in the classroom (p. 185).

Teachers choose ICT applications and approaches to suit their own perspectives on teaching and learning methods (Niederhauser and Stoddart, 2001). Almas and Krumsvik (2007) noted that the teachers [in their study] were flexible enough to choose a teaching technique that did justice to their subject (cited in Hennessy et al, 2005). Thus, pedagogic perspectives that differ between subject disciplines will influence the evolution of a subject and the integration of technology within it.

Deaney, Ruthven & Hennessy, (2006) identified that:

> Several teachers described how the Internet had furnished new materials that brought 'the reality of outside' into the classroom; for example, online collections of war posters and paintings (History) …and 'wonderful, glowing pictures' capturing the topography and culture of the country being studied (Geography). Nevertheless, across cases, finding suitable materials often turned out to be unexpectedly problematic for both teachers and pupils (p. 473).

In order to integrate ICT effectively into their pedagogy teachers need both the commitment and the professional knowledge to do so (Finger et al. 2007) . Despite the presence of literature showing the cognitive opportunities that the ICT provides for learning (Lim & Khine, 2006), stories describing the difficult and ineffective integration of ICT in schools are common.

In teacher education, barriers to the effective integration of ICT include a lack of access to ICT, insufficient time to plan instruction and for teachers to familiarize themselves with ICT, inadequate technical and administrative support, the lack of training provided to teachers in integrating ICT, the pressure for students to do well on end-of-course examinations, and teachers' lack of belief in the worth of integrating ICT in education (Sani 2002). Falloon (2001) supported Sani and added that technical support for the ICT tools is one of the most significant barriers to the integration of ICT.

The literature shows a need for professional development (PD) for all teachers to equip them for the electronic age. Sani (2002) argued that acquiring ICT skills is imperative for development because most teachers are still at the infancy stage in using ICT applications. Therefore there is a need to conduct training for all teachers, and in New Zealand, the Government has recognised this for some time:

> The investment is also about improving teachers' skills and classroom practice in ICT to improve learning for students. Effective use of ICT needs to be part of each teacher's toolkit. (Mallard, 2003, p.1).

Today, the majority of teachers already know how to use some ICT, but they need to be more motivated and share their knowledge with other teachers locally and globally. If teachers do this, they can improve their skills and knowledge about the effective integration of technology. Teachers in PD are doing individualised or group learning in computer labs, and may be participating in interactive teleconferences and interacting from their homes and schools via the Internet. Lai (2002) found that in New Zealand the most effective and common PD approach was in-school PD because teachers have insufficient time when away from school. They are ready to learn, they have motivation during the weekdays and in the morning, and their children are in pre-schools or in schools during the weekdays.

The literature indicates that teachers' PD is one of the most important issues for integrating ICT successfully (Sani, 2002). This raises issues of teachers as adult learning.

Garrison & Archer (2000), as researchers in ICT, have a view of adult learning. Adults learn in a different way from children in that they are more autonomous and they have had more life experience. In the field of technology learning, Garrison & Archer (2000) comment that adults learn throughout their lives, with negotiation of the transitional stages in the life-span being the immediate causes and motives for much of this learning. We can see this occurring when teachers learn from one another about best practice. They exhibit diverse learning strategies for coding information, have different cognitive procedures, and learn in different ways, at different times and for different purposes (Garrison & Archer, 2000). They also like their learning activities to be problem-centred and to be meaningful to their daily life, and they want the learning outcomes to have some immediacy of application. The past experiences of teachers affect their current PD, sometimes serving as an improvement but sometimes as a hindrance. Effective learning in PD is also linked to the teacher's subscription to a self-concept of themselves as learners. Finally, teachers as adults exhibit a tendency toward self- directedness in their learning (Garrison & Archer, 2000).

Technology teachers must have the freedom to discover ideas and construct meaning. If learning is to be a process of inquiry it must focus on questions, not just on answers (Garrison & Vaughan, 2008). These authors stated that learners (teachers) must be free to follow new leads and to question public knowledge. They also stated that learners (teachers) must have an opportunity to explore questions, as well as to construct and confirm resolutions collaboratively. Any professional development that seeks to effectively teach adult teachers about ICT use needs to embrace this understanding about how adults learn.

2.4 Attempts to Integrate ICT into the New Zealand Education System to Date

Over the last few years there has been much public discussion on bringing New Zealand’s educational system into the digital age. In the Ministry of Education ICT Strategic Framework for Education (2006) it is stated:

> Used effectively ICT has the potential to bring about improvements in educational outcomes for all 21st Century learners. To achieve this, however, it is vital that ICT becomes better integrated with teaching and learning. Successful integration requires schools to plan and develop ICT systems around the needs of their students, teachers and their organisation (customisation). This needs to be combined with an understanding of effective teaching practice and ongoing access to high quality professional development (p. 2).

The New Zealand Ministry of Education (2006) has supported many effective projects to improve the integration of ICT in education including: the Information and Communication Technologies Professional Development (ICTPD) initiative for teachers; the Laptops for Teachers Project; and the Notebook Valley Project. The ICTPD School Cluster programmes in New Zealand are aimed at increasing teachers' ICT skills and instructive understandings of ICT, at increasing the integrating of ICT for professional and secretarial tasks in schools, and at increasing the frequency and quality of ICT incorporation to support effective learning methods.

These initiatives have provided a range of benefits for the teachers, students and schools, including increases in teacher and student skills and confidence using ICT, the acquisition of helpful ICT software and peripheral ICT equipment, and the development of school and departmental intranet systems. More ICT-based teaching and learning resulted from these useful measures. For example, in the Laptops for teachers scheme (Ministry of Education, 2004), the secondary school overall final report (Laptops for teachers scheme 2009 Survey Report) said that teachers' perception of the benefits that use of a notebook afforded were as follows:

- Laptops allowed flexibility in time and place of work;

- Use of laptops has led to improved understanding and use of IT professionally and personally;

- Use of laptops had contributed to teachers being better organized, saved time through reduction in duplication and paper work leading to greater efficiency of work;

- Laptops supported the development of greater teacher production and sharing of lesson materials that were easy to customize and adapt; and

- Teachers who used their laptops during lessons had found that the opportunity to introduce multi-modal materials that were well presented motivated students to engage creatively and critically in their learning.

The New Zealand Ministry of Education has supported several effected plans to develop the integration of ICT in teaching and learning.

2.5 Gaps in the Research

It is clear from the literature review that ICT is now a significant feature of education. Students use the Internet as a resource to improve their social skills and develop their knowledge. Young people are using technology every day, and often have good skills in ICT and high expectations that their learning will include ICT. Teachers need to be skilled in ICT in order to meet these expectations and national goals for ICT skills development education.

Teachers face challenges to meaningful ICT integration in the classroom, as Olson, (2000) and Hernes, (2003) identified. It is important that teachers and students use the Web effectively (Richardson, 2006). This is made more difficult to achieve given the limited time teachers are allotted for preparation (Sani, 2002; Falloon, 2001).

To achieve successful ICT integration, schools and teachers are required to change their beliefs and attitudes about using technology (Lai et al, 2002; Brown, 2003). To this end educators need to develop a better understanding of how to integrate ICT. Also, using ICT in daily teaching will develop their knowledge about ICT skills (Lai et al, 2002; Brown, 2003).

My review of the literature indicates that not much is known about the ways in which teachers integrate ICT pedagogy into the subject of technology in secondary school contexts in New Zealand. With regard to this particular subject, more research is necessary. School systems must change to ensure that ICT is integrated into the technology curriculum in a meaningful way and this research may provide useful information about this.

The literature focuses on the computer use and the types of applications used (Hennessy et al., 2005). As Hennessy et al. (2005) said, much of this literature is based on large-scale investigations; these tell us something about the scale of computer use and the types of applications used, but not about the nature and appropriateness of use. There are also in depth examples of innovative use in technology-rich environments. However, Hennessy et al added that there is "little research concerning integration with established practice in mainstream schools" (p. 160)

My research intends to address some of these gaps by investigating technology teacher perspectives about their use of ICT in their practice, and its integration into the technology curriculum.

Chapter III: Methodology

3.1 Introduction

In this chapter I describe and justify my research paradigm, methodology and approaches. This includes such matters as the selection of participants, data collection and analysis and ethical considerations.

3.2 The Interpretive Paradigm

Merriam (1998) described three research paradigms: Positivist, Interpretive, and Critical research. I chose to do Interpretive Research because I wanted to understand why and how teachers integrate ICT into their pedagogy. The interpretive social science paradigm is highly suitable to help me to identify the values and opinions held by technology teachers about integrating ICT into their teaching.

Neuman (2003) commented that there are several ways to understand interpretative research. For example, it is a basis for understanding social life because it focuses on the meanings humans use to make sense of their lives. Also, interpretative research is connected to social qualitative research, the purpose of which is to help people to interpret and understand reasons and causes for social behaviour and the construction of social meaning.

Neuman (2003) comments that "reality" is interpretive and subjective. In my research I focus on the teachers' reality. Multiple interpretations are a feature of qualitative interpretative research, and responsible social science must acknowledge them. This fits with my research because I want to investigate teachers' reality about ICT integration in their school settings. Such a paradigm naturally leads to qualitative methodology.

3.3 Qualitative Research and the Research Design

3.3.1 Qualitative Research Generally

"Qualitative research is an umbrella concept covering several forms of inquiry that help us understand and explain the meaning of social phenomena with as little disruption of the natural setting as possible" (Merriam, 1998, p. 5).

Generally speaking, qualitative researchers attempt to describe and interpret human phenomena, often in the words of selected individuals (the participants) (Merriam, 1998). Qualitative procedures stand in contrast to the methods of quantitative research. Merriam (1998, p. 9) described five characteristics of qualitative research:

- qualitative researchers are interested in understanding the meaning people have constructed.
- the researcher is the primary instrument for data collection and analysis.
- the researcher must physically go to the people, setting, and site (the field) in order to observe behaviour in its natural setting.
- qualitative research primarily employs an inductive research strategy.
- the product of a qualitative study is richly descriptive.

3.3.2 My Research Design

The research that I am going to carry out is generic qualitative research. Merriam (1998) refers to this method as:

> …studies that exemplify the characteristic of qualitative research… the most common form of qualitative research in education simply seeks to discover and understand a phenomenon, a process, or the perspectives and worldviews of the people involved. (p. 11).

I carried out a generic study of the kind that Merriam described, because it was the most suitable approach for my research question. This approach enabled me to gain new knowledge for my role as a secondary school teachers' supervisor in Saudi Arabia.

This kind of study helped me to understand technology teachers' perceptions and created useful and applicable knowledge for schools here and in Saudi Arabia.

3.4 Data Collection

In qualitative research, data collection occurs with a natural environment. The researcher in this methodology normally goes to the site (home or office) of the participant to guide the research. Therefore I met the technology teachers at their schools. This was suitable for my project because by directly meeting the participants at their schools I was able to get more in-depth information in their own surroundings.

Davies (2007) explained that qualitative research relies on a researcher's performance as an interviewer and on their skills as a critical interpreter of the data gathered. Davies added that qualitative research can be related to some complex areas of psychological, philosophical and sociological argument revolving around questions such as:

- how do we know what we know?
- how do we know what other people feel?
- is what people say different from what people do?
- how can researchers interpret their findings without bringing into play their own perspectives derived from their own gender, age or life experiences?

These questions were useful to me as I attempted to understand technology teachers' perceptions in the interviews, and then later in my analysis.

Purposive sampling is an important strategy in qualitative research. Purposive sampling selects for information-rich cases which can be studied in depth (Patton, 1990). This data came from four secondary schools in Auckland city; the deciles (socio-economic character) of these schools ranged from three to ten. My goal was to see ICT integration in different settings: how teachers used ICT tools and the quality and availability in these

schools. However, I found that these four schools were generally similar in their levels of ICT integration and infrastructure.

Also, I wanted to understand how teachers think about ICT integration in their work life during a normal working day. I wanted to identify the complex ways that teachers integrate ICT in their teaching and assess its effectiveness.

In qualitative research, data collection may be carried out through interviews (Merriam, 1998). Punch (2005) mentioned that the interview is one of the most important ways to collect data. The main purpose of an interview is to find out what is "in and on someone else's mind" (Patton, 1990, p. 278):

> We interview people to find out from them those things we cannot directly observe… The purpose of interviewing, then, is to allow us to enter into the other person's perspective. (p. 196)

There are many different types of interview, such as individual, group, face-to-face verbal interchange, mailed, self-administered questionnaires, and telephone surveys (Punch, 2005). They may be structured, semi-structured, or unstructured. My research interviews were semi-structured. A semi-structured interview falls between structured and unstructured interviews, achieving defined answers and including more open-ended questions. Williams (2005) said "the most important issue when you set up an interview is to know exactly what you want to achieve by it, and what you intend to do with the information gained, and to choose the appropriate structure of interview to achieve this." (p. 285).

However, as Merriam pointed out, an interview may improve the situation and the knowledge of participants, for instance, when they are asked to review their successes or are stimulated to act positively in their own behalf. Many people who agree to be interviewed enjoy sharing their knowledge and experiences. For others the interview may be therapeutic—which brings up the issue of the researcher's stance. Patton (1990) adds that the interviewer's task "is first and foremost to gather data, not change people" (p.

354). The interviewer is neither a judge nor a therapist nor "a cold slab of granite—unresponsive to the human issues, including great suffering and pain, that may unfold during an interview" (p. 354). Patton and others recommended being able to make referrals to resources for assistance in dealing with problems that may surface during an interview (Merriam, 1998).

I conducted the interviews for this thesis in October 2008. Once I had chosen the school, I approached teachers who might be willing to participate in an interview. Six technology teachers of students in years 9-13 were chosen from four secondary schools in Auckland. My study aimed to investigate the secondary technology teachers' perceptions of the integration of ICT into their pedagogy. Therefore I only interviewed secondary technology teachers.

In order to be a participant in my research, contributors needed to be:

- A technology teacher in a secondary school
- Working in Auckland
- Using ICT

I chose teachers who met this criteria and ensured that my sample of participants were from schools in a range of deciles.

Once I received ethics approval I visited selected schools to talk to principals about my project and gain their permission to interview teachers. With this agreement in place I then discussed my project with teachers and enlisted their participation. Confidentiality of both the school and the participants was provided. Each teacher received a Participant Information Sheet form. A copy can be found in Appendix A.

I interviewed six of the participants for about 55 minutes and one for 25 minutes. The Interview Guide can be found in Appendix B. I went to their schools to interview them at their convenience, and most interviews took place in their computer labs. In general

teachers were very busy and it was often difficult to meet them but they were very cooperative.

I recorded all that was said and the interviews were later transcribed. While I took a list of pre-prepared questions with me, I left space for spontaneous questioning. This semi-structured interview format allowed me to gain deeper insights into participants' opinions

3.5 Ethical Issues

The standard data collection techniques of interviewing in qualitative research present their own ethical dilemmas (Merriam, 1998). As Stake (1994) observed, "Qualitative researchers are guests in the private spaces of the world. Their manners should be good and their code of ethics strict" (p. 244). Participants may feel their privacy has been invaded, they may be embarrassed by certain questions, and they may tell things they had never intended to disclose.

Williams (2005) discussed various ethical issues which are critical to researchers, two of which were especially relevant here:

1. Harm to participants: Harm can mean a number of factors: physical harm, stress, harm to participants' development, loss of self-esteem, etc. For this reason, I did not disclose the name of any participant or his/her school when I was interviewing another technology teacher. School receptionists provided me with the name of their technology department manager, but I did not let them know who ended up participating. Also I was responsible for keeping information (including the identity of participants) confidential and secure from appropriation by unauthorised persons, or for purposes other than for the approved research. Thus, I coded data and I removed participants' identities from documentation. I kept all data in a secure place at AUT.

2. Informed consent: I asked the research participants for their informed consent before research began (see Appendix A for PIS). I gave teachers full information to make

an informed decision and asked for their consent to be interviewed in writing prior to interviewing. When participants had read the consent form and signed it, I started the interviews.

3.6 Analysis of Data

Bogdan and Biklen (1982, p. 145) defined qualitative data analysis as "working with data, organizing it, breaking it into manageable units, synthesizing it, searching for patterns, discovering what is important and what is to be learned, and deciding what you will tell others." Qualitative researchers tend to employ inductive analysis of data, meaning that critical themes emerge out of the data (Patton, 1990). "Qualitative analysis requires some creativeness, for the challenge is to place the raw data into meaningful categories; to study them in a holistic mode; and to find a method to link this interpretation to others." (Strauss and Corbin, 1990, p. 57)

Using the interview as a foundation, I analysed the teachers' comments for themes and patterns, and looked for similarities and differences in perspective (Punch, 2005).

I used my participants' quotes as examples and evidences of the findings. I also used the literature to analyze and discuss these themes that emerged. Finally, I identified gaps between the literature and my findings.

3.7 Research Quality

3.7.1 Internal Validity and Reliability

All research is concerned with making valid and reliable knowledge in an ethical manner (Merriam, 1998). Merrian added that being able to trust research results is significant to professionals in applied fields, such as teaching and learning.

There are some challenges to ensure trustworthiness of qualitative research (Merriam, 1998, p. 202):

-what is it worth just to get one person's interpretation of someone else's interpretation of what is going on?

-how do you know the researcher isn't biased and just finding out what people expect to find?

-doesn't the researcher's presence so alter the participant's behaviour as to contaminate the data?

-don't people often lie to field researchers?

-if someone else did this study, would they get the same result?

I dealt with these challenges in many ways. I chose six teachers from different decile schools to get a wider perspective and a variety of opinions about the role of ICT in education. Even though I regarded ICT positively, I tried not to communicate this to the participants in the interview, for example, I tried to ask neutral questions in the interview. The aim was to find out what teachers believed relative to my research questions. I told participants that this research will be confidential.

3.7.2 External Validity and Generalisability

External validity is "concerned with the extent to which the findings of one study can be practical to other situations. That is, how 'generalisable' are the results of a research study?" (Merriam, 1998, p. 207). External validity refers to the ability to generalise findings across different settings. Lincoln and Guba (1985) admitted that generalisability is "an appealing concept" because it allows a semblance of prediction and control over situations. Yet they suggested that the existence of local conditions that make it "impossible to generalize" (p. 124).

From my study, I would not generalize my findings to all secondary schools in New Zealand. Also, I interviewed technology teachers, so other subjects such as English and history may be different because technology is more naturally connected to ICT. However, my research can be used as an indicator for other research in this field; and for

schools and the Ministry of Education to consider the improvement of integration of ICT in teaching and learning.

I suspect that the perspective of New Zealand teachers relative to ICT integration in the classroom is different to that of their Saudi Arabian counterparts. The New Zealand teachers I spoke to believe in the significance of integrating ICT in classroom and the use technology tools in education, and accordingly accept the necessity and importance of PD. However, Saudi Arabian teachers I have spoken to reject the importance of ICT in the classroom, and they tend to refuse PD unless they are paid for it. The Ministry of Education in Saudi Arabia needs to work hard to change teachers' beliefs about educational technology.

3.8 Summary

I have described and rationalised my research paradigm, methodology and approaches. This generic qualitative study was carried out in schools by interviewing six technology teachers. The data was analyzed thematically. I considered the internal validity (how my research findings match reality) and external validity (the extent to which the findings of my study can be applied to other studies). I also conducted myself in an ethical manner.

Chapter IV: Findings

4.1 Introduction

In this chapter I begin by describing the background of each participant. Then issues common to participants are discussed, with supportive extracts from the interview transcripts. Differences in perspectives and multiple perspectives are also discussed and the participants' perspectives are summarised.

This data comes from six technology teachers (five women and one man) from four separate secondary schools in Auckland city; the deciles (socio-economic character) of these schools ranged from three to ten. I interviewed each teacher for about 55 minutes.

4.2 The Participants and their Backgrounds

All participants were teaching the technology curriculum in secondary schools in Auckland. They were interviewed in October 2008.

Participant A: Sarah

Sarah has been teaching graphics at a decile 10 secondary school (her first teaching position) for eight years. She likes her job and she loves the difference that she can make with her students. She particularly likes the creative side of teaching technology (solving problems, generating ideas) in secondary school.

Participant B: David

David has been teaching graphics at his decile 10 school for nine years. He spent 18 years working as a welder before he became a teacher. He loves his job as a teacher and particularly enjoys interacting with students, especially designing and coming up with solutions to problems. He is always looking for new ideas. He wanted to be a teacher when he was a young apprentice but didn't do anything about it until later in life, after he met a technology teacher who told him that he could do it. His wife supported him to get his teaching qualification and he has stayed at the school that first gave him a job, developing programmes with colleagues.

Participant C: Atheer

Atheer has been teaching for 18 years and currently teaches at a decile 10 school. She enjoys working with students to help them succeed. She has taught maths and computer studies. She is currently teaching ICT.

Participant D: Mona

Mona currently teaches at a decile 3 school. She has been a classroom teacher for 15 years, but has been involved in education ever since she trained about 35 years ago. She likes her job because it gives her opportunities to learn new things and especially from her students. She also appreciates being able to teach the future decision-makers of New Zealand. Mona initially taught at primary schools, and after a break to have her family, she retrained as a technology teacher and went into secondary teaching. She likes her job, saying it's about real-life solutions to problems.

Participant E: Eve

Eve has been teaching for nine years and currently teaches in a decile 4 school. She likes it because she enjoys the satisfaction of helping students develop their understanding, particularly in technology education but also in other subjects. She worked in industry for a number of years before she became a teacher, so she believes that she understands where students are heading and what the realities of the real world are. She likes teaching technology, saying that "it is exciting to see the development and innovation that is

coming through in the world and passing it on to students". She believes it is important to have students understand the requirements of today's society.

Participant F: Hana

Hana has been teaching for eleven years at a decile 7 school. She described teaching technology as always interesting, she is never bored when she is teaching and it is a very rewarding job. She worked in clothing and textiles and then about ten years later she became a teacher because she had enjoyed training adults. She started off teaching technology at a school in the North Shore for five years. She moved to this school about six years ago and at the moment she is teaching to the technology curriculum (soft materials).

In general, I obtained good data from all the participants. However, the quality of the data varies from one participant to another. Sara and David were interviewed for a shorter time owing to various time and other pressures, and this was reflected in their responses.

4.3 Emerging Themes

Several themes emerged from the data collected. It was very useful for me as the researcher to provide realistic pictures. In order to make my findings clear, I present as many relevant details as possible from the interviews. My purpose is to illustrate the teachers' beliefs about the integration of ICT in teaching and learning in secondary schools.

4.3.1 How Teachers Use ICT in Their Teaching and Learning

Varieties of ICT Tools

I asked participants this question:

Could you talk about the ICT tools that you are using and explain how you use them in your pedagogy?

Sarah, Eve, Mona, Atheer, David and Hana use a variety of ICT tools in their pedagogy and they use them in different ways depending on the subject and technology area. The range of tools is indicated table 1.

Teacher	ICT tools
Sarah	Projectors, software, laptop, CAD, graphics programmes, the Internet and PC.
David	Digital cameras, data show, computer software, laptop, CAD, graphics programmes, the Internet and PC.
Atheer	Cellphones, facebook, Moodle, email, data show, computer software, laptop, the Internet, PC and PC network
Mona	Digital cameras, videos, video cameras, video players, computers and printers
Eve	CAD packages, different software, projectors, Pro-desktop, and computers
Hana	Computers, email, data show, laptop, the Internet, PC network, presentation programmes, educational software, and electronic boards

Table 1: ICT Tools Used by The Teachers

Mona believed that Internet was an important tool in learning and teaching:

> The students in particular use them to access information because they don't have ready access to experts. So they go on to the Internet. I think the internet is probably one of our greatest ICT tools and has the greatest use.

Atheer said that she primarily used the Internet and projectors as research and presentation tools. Other powerful web tools mentioned by participants were Facebook and Moodle. Teachers described their use of a variety of ICT tools:

> We have a CAD room beside our classrooms and we use that for teaching, whether it's solid works, 3D modelling, vector works for architectural modelling or 2D layout programs, so probably in a year's program of graphics there would be at least one of those units that has some sort of CAD component to it in all levels. (Sarah)

> Over the past couple of years, with the advent of digital cameras we don't have to process photos anymore. So kids can take photos, download them, print them off, and put them into something else or whatever they want. We can use it for display; we can use it for printing a photo off to put in a book that they write against. In my subject they are the main ways I use technology and ICT. (David)

Frequency of ICT Use

My question was:

How often do you use ICT tools?

ICT tools and especially the Internet were used almost every day by all teachers in the study and their students.

> I would have students every day using the Internet, definitely. So the Internet we use several times a day. Probably the digital camera we use just about every day as well. (Hana)

> If we are running a digital camera we will be using it every day. With CAD it is taught in a unit that we teach, so it is used partway through the year. The same with Corel. For CAD probably about 5 weeks in a term. (David)

However, Atheer mentioned that there were a few teachers in her school who do not use the available ICT tools:

> You are always going to have people who are resistant to new things, so you have to find somewhere in their environment where technology has made such a significant improvement that they get buy in. We have several staff members whose laptops sit in their cupboards and don't get touched. But we have one who just for some reason decided to conquer this beast that she didn't really want to use, and once she started she got very enthusiastic and she became the most keen proponent of this tool.

Purpose of using ICT tools

All six teachers used ICT for a variety of purposes. It was often used to help them teach students to develop ideas quickly. Students worked with the tools to improve their understanding of the topic. In her subject of hard technology, Eve said:

> I use ICT as a tool for helping students to understand issues, for helping them develop ideas. So we use the computers, for instance, for researching, we use CAD packages to help them draw up their ideas if they're not very good at pencil work. We use a range of different software to assist them in developing an outcome.

Atheer said that she mainly used ICT as a research and presentation tool:

> Students use the Internet and create their work on a word processor at home, and because it is so easy to use this can mean that they use the Internet exclusively as an information source, neglecting other valid forms of information gathering like interviews, discussions, and reading.

Mona had a deeper perspective of the purposes of ICT integration:

> What is your philosophy in education? What is it that you are trying to teach the students? From my point of view it is about teaching students to think and to reflect constantly about what they are learning and how they are learning in order to get to the resolution of whatever it is.
>
> In terms of technology, it is about educating students so that they can develop their technological literacy in those three areas of technological practice, knowledge and then the nature of technology.
>
> Integrating ICT into those [areas], ICT is a tool to help students to develop their technological literacy so that they can be really good decision- makers in a future world.

Also, Mona connected integrating ICT to the main purpose of technology curriculum which is problem-solving:

> From my perspective students should have free access to computers, cameras, to those sorts of tools to use them as they need, to help them solve problems.

Sara mentioned that she used ICT for a graphics purposes:

> I guess from the graphics point of view it teaches them visual communication skills, whether it's ICT-based or through hand communication methods, it teaches them design thinking, it teaches them about design processes and principles.

4.3.2 The Necessity for ICT Integration

All participants had a clear opinion about the necessity of integrating ICT in learning and teaching:

> It is inevitable; it is just something we have to do ……I just think the possibilities with using ICT in the classroom are absolutely limitless. (Hana)

> In terms of what we are teaching in technology, we incorporate ICT wherever we possibly can, where it is appropriate. We don't do ICT just for the sake of it in our subject, we try and do it because it is important or useful and it helps the students as opposed to it is fun. In everything we teach we try to make it valid. (Eve)

Mona also clarified the importance of integrating ICT in learning through the New Zealand curriculum, saying:

> One of the government strategies is to ensure that all New Zealanders are familiar with ICT and are growing in their ability to use modern ICTs because they believe that's the way the future is.

Atheer mentioned that ICT had reduced the world to a small village:

> It makes the world a much smaller place because you can contact anyone anywhere in no time. The accessibility of information, the availability at your fingertips if you have a cell phone with internet access..... We don't want to be isolated.

Hana believed that students were more familiar with ICT than teachers:

> Students pick ICT up straight away and they show teachers things that teachers do not know and realise… I find in a lot of cases the students know more about ICT than I do, in fact in most cases. That is the other thing; teachers have got to understand that they will probably learn just as much off the students as the students will learn off the teacher when it comes to ICT.

Atheer talked about how ICT helps with the new assessment criteria. For example, she uses Internet research and Power Point for student evaluations.

Finally, teachers described the future of ICT in education as highly integrated:

> I think it will replace books and paper and all that sort of thing that we traditionally use. I would imagine very soon in the future, instead of students bringing a pen and paper to class they will bring their own laptop or whatever it is, or phone, and they will do their work on it. I already get students who instead of copying notes off the whiteboard take their phone up if they are running out of time and photograph them. It's only going to get bigger. (Hana)

4.3.3 Strengths and Weaknesses of ICT Integration

The data indicated that these six secondary school teachers thought that there were many opportunities for students learning in the electronic age.

<u>Opportunities and advantages:</u>

The six teachers were very optimistic about the benefits of integrating ICT in education in New Zealand:

> Endless opportunities really. It's all just expanding so quickly, it's very hard to keep up with. There are huge opportunities and I think the thing that limits it is the teacher really, just what the teacher knows is the only thing that limits it really… The opportunities that open up for them- students- are just incredible and really mind boggling. Just being able to access information from the other side of the world in a few seconds, the possibilities are just amazing. (Hana)

> Because we have our laptops that enables us to do all our resources and prepare ourselves for our lessons. We can communicate with our students. We are actually going to be moving towards Moodle, that is where our learning environment becomes online and so students can work online and submit their work online.

(Atheer)

> Huge opportunities! In electronics particularly... we use ICT wherever possible; it helps students to present work, for instance. (Eve)

Other beneficial opportunities were identified. For example, Sara remarked that:

> ICT helps students to achieve their work very quickly and it is easy to edit it. Also, it is an online environment so students can communicate with their teachers and classmates from their own places. ICT is amazing in graphics, which send [students] towards creative industries.

Mona also used video recordings to present expert opinion alongside her own. Instead of seeing the teacher as the only authority, students could see other experts. Mona found this "very, very successful for my students".

Recently, the Ministry of Education began giving teachers new laptops to help them better create resources and prepare for lessons. Teachers expressed appreciation for this and mentioned how it also helped them to communicate with their students by Internet. Some of the teachers I interviewed were moving towards using Moodle, an online learning website that enables students to work and submit work online[3]. Atheer believed that this system is more efficient than email because users can access the learning website from places other than school.

Atheer added more opportunities and mentioned that learning does not just happen in a classroom:

> About 97% of students at my school have computers and access to the Internet at home. Thus students can do their work at home and have flexible time to learn and achieve their goals. Learning does not just happen in a classroom. To reduce

[3] See http://www.moodle.school.nz/

> the gap (or digital-divide) between students who have home PCs and those who do not, school computers are available during the lunchtime and after school.

Mona, who has taught for 35 years, believed that the Internet gave her students a chance to access a huge range of knowledge and perspectives, thus learning processes can be different. Students do not need to learn information by rote because it is at their fingertips whenever they need it.

Challenges and disadvantages

Many challenges were identified by the participants. Teaches commented that technology was expanding so quickly it was very hard to keep up with everything; there is a need for Professional Development (PD) to improve teachers skills and integrate ICT meaningfully.

Sarah identified challenges relative to resources:

> So it's either buddied-up or alternate usage or we've had to book a bigger computer room within the school, which is problematic because it's difficult to get a booking. So we have to rely on the CAD room which we've got. We make it work. (Sarah)

Sometimes teachers had to teach the computer programmes all over again because the students had forgotten them.

Teachers discussed another challenge for new technology teachers. Mona identified challenges for teachers who have started teaching with ICT:

> Remember that the kids will know more than you in all probability. They are the best teachers; we are part of a community of learners. Use their knowledge. Keep your eye on them because they are so smart at using computers and using ICT that they can do all sorts of things that you don't even know about, like hacking and so forth.

Eve thought that the best way to start teaching with ICT is to work with what new teachers are comfortable with as a starting point, she added:

> Slowly but surely build up the amount of ICT that they are incorporating into their lessons. A new teacher coming in has to learn what old teachers have available and know how to [use] it before they begin teaching. So the advice would be to perform it slowly as confidence comes through.

Some participants identified challenges as a lack of infrastructure, PD and a lack of time:

> We are quite open-minded and realise that it's got its place, so probably the only challenges that we have are resourcing and PD and sort of factoring in time. (Sarah)

> I guess I would say insufficient (infrastructure) because my students don't always have access to the ICT that they need when they need it. It is improving all the time; it will be a gradual process. The expense in incorporating ICT, it is always a balancing act. (Hana)

Hana identified another challenge relating to her experiences and capabilities with technology:

> When I was at school, I never used computers so it's obvious that that was going to happen. That's fine, and the students are fine with that. They understand that I am old and don't know these things. That's fine. I will often use students to show other students in the class how to do things as well.

Eve thought that there was a challenge in keeping technology expertise within schools:

> People can make an awful lot more money out there in the other world than you can in teaching. If highly-qualified technology teachers leave teaching and find another occupation, the smart use of ICT will be affected. Thus, the Ministry of Education needs to treat this issue carefully. They need to set a special salary or awards for the teachers who are professional in technology.
>
> People come out of institutions of higher education and they are not attracted to teaching because there are so many other opportunities that are offered to them. I would struggle to recommend for any of my students to go teaching because I know how many other things they could be doing with the skills that they have.

Finally, when I asked Eve if she thought the curriculum was clear for a new teacher, she identified a further challenge:

> A new teacher is dependent on the support of experienced teachers in the department. The New Zealand technology curriculum is not prescriptive in any way, it generally is like an outline of what needs to be done in terms of the generic criteria and then we use that to assist us.

Sarah, Hana and David described secondary school students as a lot more savvy than teachers:

> ... so they come with a lot more skills from earlier education, so teachers are just really probably teaching more higher-end programs, so moving away from having to teach probably word processing-type things and moving more to the higher-end design packages, which is exciting. (Sarah)

There are further challenges for teachers. Hana discussed pornography and text bullying, or the problem caused by emailing or uploading embarrassing pictures of people to the Internet.

> There are obvious worries about accessing pornography and that sort of thing, and taking photos of people in embarrassing situations and texting them to everyone. That sort of thing is a real worry. (Hana)

Mona was also concerned that students will download useless information from the Internet:

> Students will go and download heaps and heaps of stuff which they have no idea what it is, they just cut and paste. That is a huge weakness. It requires a lot of time in terms of teaching to help them understand and that relies on the literacy programmes in the school.

Atheer identified that "the temptation to get distracted, and cyber bullying, particularly via email". Her school administration tries to minimise cyber bullying, but could not guarantee that it will not happen.

Moreover, all the six participants thought that home life was part of a child's learning environment. They all advised parents to learn about technology as much as they could, so they could know what children are doing with their computers.

4.3.4 Teachers' Perspectives of ICT in the Curriculum

All participants had a positive view of the New Zealand curriculum in general and technology in particular as a separate subject. Hana thought that the curriculum was very helpful and useful for preparing lessons. Eve and Mona believed that the New Zealand curriculum encouraged students to be innovative and to come up with their own ideas.

On the other hand, two teachers had negative views.

> [In general] With the new curriculum there are good and bad points. Some are good and some not so good. It works okay. (David)

Hana thought that there was a huge change from the old curriculum. She thought that the current curriculum was complex and needed more clarification. Thus, two teachers that I interviewed were still unsure and were still finding their way and developing ways to deliver the curriculum in the classroom. This has been a huge workload for technology teachers, "But we are getting there" (Hana).

One of the participants who teaches ICT in technology suggested:

> ... ICT would be better off as its own subject, but we can learn from some of the things we've gained while it has been part of technology. (Atheer)

When I asked the teachers whether learning technology as a subject influenced students' technological literacy, all of them agreed that it did. They commented that the technology curriculum is developing students' performance, and there is growth in student

understanding of the interaction between technology, the curriculum and their learning process. Students were developing critical thinking processes and were able to look at a technological product, for example a cell phone, and describe its nature and processes.

Also important was the need to understand how to best use and evaluate the Internet:

> [Using] the Internet means that students don't need to learn a lot of information, so the advantages of having ICT at their fingertips mean it's more important that they learn how to process information and to validate and to give opinions that are supported than to just find out facts … The Internet is a valuable tool, but it should be used as a tool to encourage thinking, not just to access a whole lot of information, copy it blindly, and not actually learn anything from it. (Atheer)

> The Internet gives my students huge access to a wide range of knowledge, opinion, material that they wouldn't easily find otherwise, so it's a really useful tool. However, the weakness is that the students often come across material that they don't find easy to use in a discriminating manner. They don't know what is real and what is not. (Mona)

Hana and Eve discussed the ideal setting:

> I think one of the real keys for successful technology teaching in the classroom is coming up with a context that works well. So giving the students a context to work within that catches their interest is really important. But one that is not so narrow that it limits their design ideas or so broad that it becomes too difficult to manage, is probably the real key to teaching technology successfully. (Hana)

> So really that's where we need to go next, to reduce our classes down to a more manageable size that recognises the amount of teacher input and individual teaching that goes on. Resource-wise there probably aren't enough resources out there for technology teachers. As I've said we have done quite a bit in developing some of those resources. In terms of technology education in New Zealand and anywhere else, the best thing to do would be to have more teachers. (Eve)

4.4 Summary

The findings summarized in this chapter have been presented thematically. Teachers use ICT every day in schools and see the future as highly ICT-integrated. They use a variety of ICT tools, for example the Internet, digital cameras, video cameras and video players,

computers, printers, scanners, data show, presentation, educational software, CAD and electronic boards.

The teachers in the study thought that there were many opportunities for students learning in the digital age. However, they identified few challenges to integrating ICT in their pedagogy. In order to integrate ICT meaningfully into classrooms teachers need both the commitment and the technology skills to do so. Teachers understand their need for PD and believe in undertaking such development, but they have a lack of time to achieve it.

These themes are discussed in the next chapter.

Chapter V: Discussion

5.1 Introduction

In this chapter important themes from the research data are discussed. These relate to the ways in which teachers are using ICT, strengths and weaknesses, integrating ICT into the technology classroom, the opportunities and challenges of teaching with ICT, and a comparison of the New Zealand curriculum with actual teacher practice. I also present the suggestions of the teachers I interviewed regarding how best to integrate ICT in teaching and learning. Lastly, I compare the experience of teachers in New Zealand with regard to integrating ICT with current practice in Saudi Arabia and make suggestions as to how the Saudi Ministry of Education could best integrate ICT into secondary education there.

5.2 Technology Teachers and the Integration of ICT

All participants mentioned that they integrated ICT into the technology classroom because they believed that ICT was an important tool in learning and teaching. Also, all participants thought that in future, ICT in schools will be central to every aspect of school life. ICT will change the way teaching and learning happens in the classroom.

Macho (2005) mentions that some researchers argue there is no evidence that using ICT in education will improve student learning. All participants disagreed with Macho and believed that integrating ICT does improve student learning. Arguably, technology teachers are particularly placed to approve of ICT use, because it is naturally part of their subject.

I considered the teachers' responses, using Betrus et al's. (2008) definition of using managing and creating appropriate ICT in learning see table 2 below. Interestingly, the teachers I interviewed talked about how schools integrate ICT through such words as “using” and “managing” appropriate ICT, but only one of them mentioned creating ICT. Betrus et al. (2008) point out that there are no resources to use or manage unless someone

first creates them, Betrus et al. (2008) stated that '*Creating* ICT' means creating instructional materials, learning environments, and larger teaching learning systems.

Three levels of integration	Teachers perspectives
Using ICT	All participants talked about "using ICT" in education, e.g. using CAD and 3D to design an architectural model.
Managing ICT	Two participants mentioned "managing ICT" in education, e.g. managing their class with the computer network.
Creating ICT	Only one teacher discussed "creating ICT" when she talked about the integration process, e.g. designing a computer programme or a website.

Table 2: Betrus's et al. (2008) classification applied to integration activities

Seels & Richely (1994) have a wider view, and use the terms "design", "development", and "evaluation" to refer to the function of *creating* resources for learning. They add that aesthetic, scientific, engineering, psychological, procedural, or systemic tools can be employed to generate effective materials and conditions for learning. There are many new types of effective learning materials. For example, people can *create* web-based learning (websites), hypermedia (digital documents which include text, audio and video), and mobile media.

Increasingly, teachers and students are using and creating with Web 2 technologies. "The Web has been transformed from a "read only" to a "read AND write" tool where everyone can all contribute information, thoughts and products" (Richardson, 2006). Richardson added that:

> The classroom of the Read/Write Web is going to be defined by two unstoppable trends in the use of theses technologies. First, with more than 10 billion pages already on the Web, more and more content both new and old will continue be to come online… The second trend is that, more and more, the creation of that content is collaborative (p. 125).

Thanks to such technology, learning can become increasingly collaborative and active for students and their teachers.

For teachers and students globally, there is no doubt that the development of such Web 2 tools as the Read/Write Web has the potential to transform learning (Richardson, 2006). However, Richardson added that the learning system has been slow to incorporate and integrate this technology in the classroom to date.

Moreover, *creating* is to clarify understandings and allow for innovation and creativity. For example, when students create a digital story or animation they need to apply complex skills to combine text, sound and images. Students could create multimedia slideshows and animation using programmes like HyperStudio, KidPix, AppleWorks Slideshows, SWiSH, and Macromedia Flash. Teachers might do this, and make opportunities for students to create as well, especially in the Web 2 world.

Blogging and Flogging are popular new forms of Internet usage (Lankshear and Knobel, 2003). For this reason I would argue that teachers consider the possible educational application of blogging and flogging as creative activities. Social skills are becoming ever more important, particularly in the electronic age. Students can develop such skills via online social activities. Blogging is a very social activity in that it revolves around the exchange of ideas.

Blogging is logging posts online to a weblog (usually shortened to blog, but occasionally spelled web log). Lankshear and Knobel (2003) considered blogging to be "a truly new literacy which has emerged from online social practices". Lankshear and Knobel added that blogging expands the idea that people, communication and audience are important sides of online education. Lankshear and Knobel suggested that the procedure of

blogging while learning would help young people to broaden their perspectives on new topics, events and issues.

Flogging is also discussed by Lankshear and Knobel (2003). It centres around cultural practices like TradeMe in New Zealand connected with online bartering and peer collaboration/co-operation systems (Bolstad et al, 2006). Lankshear and Knobel argued such changes in the way that people manage their online and offline community relations with unfamiliar persons who are potential co-operative partners has significant implication for education.

Young people in secondary schools more commonly use communication technologies such as instant messaging and text messaging. They apply complex language to talk and make conversations (Bolstad et al, 2006); for example they produce more interesting conversations with their friends but teachers may not understand these conversations. Students try to avoid boring and stupid conversations because they explain these discussions as very unproductive. Instant messaging interactions with friends are woven into a larger ongoing story about the events and exchanges among young people in these social activities (Bolstad et al, 2006).

Sefton-Green (1998) investigated young people's "creative" use of multimedia technology. Their starting point was the claim that digital technologies are likely to make students more creative. Sefton-Green wanted to find where students use technology creatively. From their research they suggested that schools could create a very authentic sense of audience by commissioning and showing students' multimedia work, thus encouraging more creative use of cultural production than most young people currently engage in as part of their schoolwork. This could be considered by New Zealand secondary teachers.

The Ministry of Education in New Zealand has clarified the importance of creativity and connected it with solving problems:

> Technology is a creative, purposeful activity aimed at meeting needs and opportunities through the development of products, systems, or environments. Knowledge, skills, and resources are combined to help solve practical problems. Technological practice takes place within and is influenced by social contexts (Ministry of Education, 1995, p. 6).

The Ministries of Education in New Zealand and Saudi Arabia could include creativity as an area for further PD for secondary teachers.

5.3 Teachers' Perceptions Regarding Integrating ICT into Pedagogy

The teachers I spoke to all considered that the principal goal for ICT use was the facilitation of more effective and higher value education in a shorter time period. The participants all identified the main ICT tool in secondary schools as the Internet, so when they spoke about the advantages and disadvantages of incorporating ICT into teaching and learning processes they often talked about the strengths and weaknesses of the Internet.

From the teachers' perspectives, the following perceived strengths and weaknesses of integrating ICT into pedagogy can be identified:

5.3.1 Strengths of ICT Integration

- ICT can be Student-Centred and involve active learning

The classroom environments of the teachers I spoke to seemed to be teacher-centred, however learning became more student-centred when ICT was used. This was most effective when the teacher-to-student ratio was low enough for teachers to be available to guide the students. When leaning becomes more student-centred, students will develop new ways of thinking, and acting in the education system (Khine & Fisher, 2003), for example, students may read more on the Internet than in books.

- Multiple Viewpoints Encourage Critical Thinking

With the Internet, students can see a multiplicity of viewpoints on a single issue or subject. Khine & Fisher (2003) and Bolstad et al. (2006) agreed with the participants that teachers can guide students to think more critically about information and to develop ways of assessing it. This encourages intellectual enquiry and evaluation skills. Many researchers have argued that regular use of ICT has the potential to empower secondary students to develop new ways of thinking, being, and acting in the world, and to gain learning goals. . However, Khine & Fisher argued that ICT usage may guide young people to become more inactive, more introverted, and less able to use their brains. My perspective is that integrating ICT encourages thinking if educators lead the learning processes.

- ICT can Promote Student Engagement and Encourage Participation in the Learning Process.

The teachers noted that multi-media programs (using sound, image and animation) were a lot of fun for students and as such engaged them fully. Students therefore spent more time reading and writing when using such interactive programmes than they would without them. This supports students' use of ICT and engagement with technology to plan and achieve education goals and to use the Internet to find new ideas (Harrison, 2005).

- Ready Access to Information Precludes Rote Learning

Because the Internet provides a ready source of information, students do not need to learn by rote. Rather they need to learn how to access information and how to distinguish between authoritative and bogus information. This encourages critical thinking, evaluation skills (Khine & Fisher, 2003).

- Students and Teachers Can Use PCs to Prepare Work Efficiently

Word programmes allow students and teachers ease and speed of use. Teachers mentioned that students appreciated being able to get their ideas down rapidly. Teachers

also appreciated the help PCs offered them with their large workloads. This reflects an increasing use of ICT in learning in the 21st Century (Lai et al, 2002).

5.3.2 Weaknesses of ICT Integration

- Social Problems are Harder for Teachers to Detect

Several teachers I spoke to mentioned the problem of cyber-bullying and how difficult it was to detect. Many students are on Facebook and parents need to be aware of what their children are doing. Parents and educators must be sure that children have Internet safety. Sexually explicit material or violent images can affect students negatively (Finger et al, 2007). Internet information may promote negative attitudes, such as hate or intolerance, and dangerous activities, such as gambling and illegal drug use. Thus, the critical thinking skills students learn in the classroom, library, and lab should be applied to Internet resources.

- Negative Online Content Can Adversely Affect Student Confidence

Negative online content like pornography can devastate students who are psychologically less mature than adults. Even when schools try to filter such content increasingly it slips in through hacking. Also students may access inappropriate materials outside school and bring this experience into the school. Research has shown that many of the sex crimes committed against minors that develop from online meetings follow this scenario (Wolak, Finkelhor & Mitchell, 2004). This will affect students' confidence.

- Online Time Can Be a Waste of Time

Many students spend computer time doing personal projects that have nothing to do with the learning task (playing online games when they are meant to be researching a topic, for example). Teachers can not oversee students at all times. Cuban (2002) has argued that there is no clear evidence that shows gains in students' improvement result from using ICT in the classroom, and using the Internet can be a waste of time.

5.3.3 Some Strengths and Weaknesses that Interview Participants Did Not Identify

The literature mentions other strengths and weaknesses which were not identified by the participants:

- ICT can be used to provide feedback to students (both gifted and low achievers) (Bolstad et al, 2006).
- ICT can be used to improve young peoples' social skills because it allows for information sharing (Garrison & Vaughan, 2008).
- Online PD (such as technology teacher forums) saves teachers time and means they can develop their skills by sharing their knowledge with other teachers. (Lai, 2002).
- ICT tools are expensive. ICT increases the digital divide between schools and parents who can afford expensive ICT upgrades and those who cannot. For example Prensky (2006) has spoken about useful online learning games which can improve student performance greatly but that are often prohibitively expensive.

Because the sample of the interviews was very small, I am not sure if New Zealand schools face these issues or not. There is a need to do further research about these issues and to do more classroom observations.

5.4 New Zealand Curriculum and Teachers' Perspectives

Overall, the teachers I spoke to regarded the current New Zealand curriculum positively, stating that they approved of the way it encouraged students to be innovative and think deeply about issues. They also spoke about the large degree of change that the subject of Technology has undergone. Some were feeling unsure about the new curriculum and were still developing ways of delivering it. They talked about what a huge workload this has been for technology teachers.

New teachers may be confused about what they should teach in the technology curriculum, and they need more curricular clarification from the Ministry of Education. This confusion may affect the integration of ICT. The Ministry of Education ICT Strategic Framework for Education (2006) states that the vision is to improve learner achievement in an innovative education sector, fully connected and supported by the smart use of ICT. To actually achieve this vision, all technology teachers need PD to construct their knowledge through experience and connect with other technology teachers inside New Zealand and all over the world.

To improve the use of ICT in the technology curriculum we need to improve teachers' ICT skills and in many cases change their perceptions about ICT. Researchers have emphasized that teachers must be equipped with the necessary knowledge and skills to achieve the effective integration of ICT in education (Galanouli, Murphy & Gardner, 2004; Jedeskog & Nissen, 2004; Cope & Ward, 2002).

5.5 The Challenge of Professional Development

All the participants believed that there were many opportunities to integrate ICT into the classroom and identified PD as a challenge. The literature identifies the necessity of PD and this research supports this. As Sani (2002), said that there is a need to conduct training for all teachers to equip them for the new generation. The literature agrees with that, much has been said about how integration of technology can develop student achievement (Khine and Fisher, 2003; Macho, 2005).

All the teachers in my study emphasised the importance of teachers improving themselves. All identified that the best way to improve one's teaching skills in ICT is to learn from other teachers working in the same field.

Technology teachers as adult learners need freedom to construct their understanding of ICT use. However, meaning and the understanding of ICT are not constructed in isolation. Consistent with Garrison and Archer (2000), I believe the ideal educational

process is a collaborative constructivist process which has inquiry at its core. Social interaction and collaboration shapes and tests meaning, thus enriching understanding and knowledge sharing (Garrison & Vaughan, 2008). Teachers can learn in this way in PD and use ICT to support this. Teachers can design a forum or "chat" to learn from each other in ICT environment.

From my data, all technology teachers talked about the importance of PD and mentioned the problem of insufficient funding. Participants did not talk clearly about self-improvement and how it is important to *construct* their knowledge. However, there is disagreement in the literature about who is responsible to support teachers' PD- the government or the teachers themselves. Sani (2002) and Nina (2002) highlight the need for teachers to improve themselves and they ignore the responsibility of government. In contrast, Geoffrey (1999) and Roberts (2001) clearly identified that government should support this issue.

Finally, in discussing their typical lessons, teachers said they integrated ICT into their pedagogy by introducing tools to students on a need-to-know basis. The teachers believed that they were not expert on ICT and that they could ask students for help, this was an additional source of development for some teachers.

5.6 The Future of ICT in Education

The teachers all had different perspectives about the future of ICT in education. However, they all thought that ICT tools would eventually replace books and paper.

The greatest opportunity for using technology in teaching and learning lies in the ways in which technology can improve students' learning not only within the school but also with the school and its educational partners such as parents and community (Finger et al, 2007). Thus, the role of the virtual learning environment will increase. Now digital natives use many ICT tools (Prensky, 2006) like games, email, searching, IM, blogs, wikis, podcasting, polling, PSP, networking, texting, digital cameras and GPS. While

these tools are largely used in social networking, they could be more integrated into the curriculum.

Mobile media raises the possibility of a new teaching and learning approach. Wagner (2005) summarized:

> …mobile learning represents the next step in a long tradition of technology-mediated learning. It will (incorporate) future new strategies, practices, tools, applications, and resources to realize the promise of ubiquitous, pervasive, personal, and connected learning. (p. 44)

Technology may also be used to manage student movements and performance. For example, students will have an electronic card to swipe when they arrive at school, and schools will send instant messages to parents to inform them of their child's truancy.

To sum up, I think the ICT integration in education will continue to increase. Internet tools like educational websites will continue to be useful for students and educators. New ICT tools such as Web 2 will transform learning and teaching methods and may improve students learning.

5.7 A Comparison between ICT in Saudi Arabia and New Zealand Secondary Education

The uses of ICT differ between developing counties such as Saudi Arabia and developed countries such as New Zealand. Many studies conducted in different schools in developing countries show that the use of computers and other ICTs varies due to differences in school and teacher quality (Usluel, Mumcu & Demiraslan, 2007; Askar & Usluel, 2003). A point often made in these studies was that teachers in developing countries mostly used ICT in administrative everyday jobs at schools, such as preparation of lessons and unit plans, organising scores and reports of students, but not in instructional tasks such as using a presentation tool during class or using ICT for experiments (Usluel, Mumcu & Demiraslan, 2007; Askar & Usluel, 2003).

In contrast with New Zealand, the main use for ICT in Saudi Arabian schools is to organise grades and records for students. The Ministry of Education in Saudi Arabia needs to realise that successful ICT integration will present a wide range of advantages for teaching and learning (Cope & Ward, 2002; Naidu, Cunnington & Jasen, 2002). They also need to realise that a failure to integrate ICT into Saudi classroom practice will lead to students being left behind their global counterparts. Thus research studies in ICT need to shift their concentration towards the whole configuration of technology activities in schools (Lim, 2002).

Although ICT has entered teachers' lives in all parts of the world, teachers in developing countries only use ICT as a teaching tool in a limited way (Martins, Steil & Todesco, 2004; Askar & Usluel, 2003). There are many barriers to wider use including the lack of technology in classrooms, lack of knowledge and technical support, and the shortage of in-service training which explain why teachers do not use ICT in their courses. However, the integration of ICT into teachers' pedagogy is a multidimensional task including many dynamics, such as ICT tools, school administration, teachers, students, educational programs, and school culture and philosophy (Sutherland, 2004; Lim, 2002; Kennewell, 2001).

5.7.1 Rationale for ICT Integration in Saudi Arabia

In Saudi Arabia, the current discussion centres on determining whether or not we need to integrate ICT into our educational context. Most arguments in favour of integrating ICT reflect a desire to use it so that our schools appear modern. While our infrastructure may look effective, often the actual educational application of the technology is lacking.

In my view, school systems in Saudi Arabia need to accept the necessity of ICT and instead begin to discuss how to best implement it throughout our educational system. A clear strategy needs to be developed in order to best help our teachers and use our resources wisely. The time for 'window-dressing' with ICT is over because our students will lead the country in the future and need a deeper and wider understanding of ICT. Sani (2002) suggests that the successful integration of the computer into the education

system can greatly contribute to the development of a nation's economy. This integration would create more capable employees. When I return to my country a major challenge will be changing the perspectives of some decision-makers about a new national role for ICT in education.

5.7.2 Teacher Perspectives

Teacher perspectives on the need for ICT integration are different in Saudi from those of New Zealand. Currently Saudi teachers tend to think that it will take a long time to integrate ICT and they assume that the required level of professional development will be too onerous. Many Saudi teachers do not see why they should work hard to develop professionally. Although some of the teachers I spoke in New Zealand said that they did not have time for ICT Professional Development, they could always see the point in doing it. Also, the Ministry of Education in New Zealand actually insist that all teachers do a certain amount of PD each year, while the Saudi Ministry treats PD as optional for its teachers.

Additionally, Saudi law is based on Islamic Sharia law. Many of our teachers suspect the Internet because of the negative information it can carry or support, such as pornography and unsupervised interaction between the sexes. The Saudi Ministry of Education has a significant shortage of ICT professionals. For this reason, it is difficult to filter unsavoury Internet content. However, New Zealand faces no such problems. I think the Saudi Ministry of Education needs to play a stronger role in encouraging teachers in my country to change their perspective on ICT.

5.7.3 Infrastructure

In comparison with Saudi Arabia, New Zealand has a good ICT infrastructure, and school systems encourage educators and learners to use it in appropriate ways, for example, one of the schools that I visited in Auckland has more than 500 computers for 2000 students.

Additionally the schools I visited have a variety of ICT tools aside from computers, including access to the Internet and an internal network.

5.8 Recommendations to the Saudi Arabian Ministry of Education Regarding Effective ICT Integration

Schools hold the responsibility to integrate ICT into education. Based on my research I recommend the Saudi school system take the following steps:

- Develop an ICT strategic framework for education and apply it in practice in schools. Unfortunately although the Saudi Arabian government has lots of funding, there is no clear sense of direction regarding equipping ICT teachers.

- Hire ICT professionals to support the necessary infrastructure implementation

- Establish links with the private sector at the highest levels, to ensure the best possible support (e.g. forging a partnership with Microsoft, getting ICT discounts etc.)

- Work to change teacher beliefs about ICT from a generally negative view to a positive one that understands the necessity for implementing ICT. It is the attitude and skill level of the teacher that determines the effectiveness of ICT integration into education. Therefore educators must be provided with the opportunities for lifelong training and development in ICT integration.

- Ensure Internet safety to soothe fears about the negative content that is available on the Internet (e.g. create filters to keep out materials that are incompatible with Islamic Sharia law)

- Provide the funds to create an effective infrastructure and develop teachers' capacity in ICT.

As one of the Organization of the Petroleum Exporting Countries (OPEC) nations, Saudi Arabia can make a good infrastructure, so the Ministry of Education needs to act more purposefully to create an effective infrastructure and change teachers' perspectives about integrating ICT in their pedagogy.

5.9 Conclusion

The teachers I spoke with were positive about integrating ICT into their technology classrooms. They integrated ICT into both their planning and their instructional activities in a way that enhanced student learning. They identified useful approaches for improving ICT integration in the future. Based on my conversations with teachers in this study and my reflections on the data I would recommend these measures for New Zealand:

- Government and schools increase opportunities for PD during school time.
- Teachers continue to improve their ICT skills, especially with Web 2 and mobile technologies and develop deeper understanding of appropriate pedagogical uses.
- Ministry of Education provides more funds for ICT infrastructure.
- More computer programmes and creative uses of ICT are planned for gifted students.
- Schools make ICT central to every aspect of their life to increase a successful integration of a wide range of new ICT tools for teaching and learning.
- The New Zealand Ministry of Education resolves confusion about the new technology curriculum by increase opportunities for training technology teachers.

In the next chapter I draw conclusions from such discussions, identify the limitations of my study, and present directions for future research.

Chapter VI: Conclusions

6.1 Introduction

In this chapter I discuss the significance and limitations of my research and the implications for decision makers in New Zealand of my findings regarding the position of ICT in the New Zealand curriculum. In conclusion I suggest avenues for future research.

6.2 Perceptions Regarding Integrating ICT and Pedagogy in the Technology Classroom

The findings presented in this dissertation represent the perspectives of six New Zealand teachers who work in technology classrooms across a range of deciles (deciles 3-10) in Auckland city secondary schools. The main findings from my research questions are presented next:

- *What are teachers' perceptions regarding integrating ICT with their pedagogy in the technology classroom?*

Participants believed that integrating ICT tools into education is very important and necessary because *has change the quality of education*. They used a variety of ICT tools in the classroom, particularly the Internet.

The data indicated that these six secondary school teachers believed that ICT extended opportunities for student learning in the electronic age, for example, ICTs help young people to achieve their work very quickly and it is easy to edit it. Also, students use the Internet for research and teachers can guide students to think more critically about information. Moreover, ICT can be Student-Centred and involve active learning. Participants also identified weaknesses to integrating ICT in the technology classroom which were the problem of cyber-bullying, negative online content like pornography, and

online time being a waste of time. They mentioned that ICT is expanding so swiftly it was very difficult to keep up; consequently there was a demand for Professional Development (PD).

The teachers I spoke to regarded the current New Zealand curriculum positively, stating that they approved of the way it encouraged students to be innovative and think deeply about topics. They also spoke about the great change that the subject of Technology has undergone. On the other hand, a minority (only David and Hana) thought that there was a huge change from the old curriculum and thought that the curriculum was complex and needed more clarification.

- *How do teachers integrate ICT in teaching and learning?*

The six participants said that they used the Internet almost every day, mostly as an information resource. They gave the students a chance to work with ICT tools to improve their performance. There were different levels of the integration of ICT in classrooms. Mostly, these were at the level of using and managing with far less discussion of creating ICT.

6.3 The Strengths and Limitations of my Research

There main contributions of my research are identified next:

- The study provides teacher perspectives which may be useful for schools and policy-makers on the position and ongoing integration of ICT in curricula.
- The study makes information about integrating ICT in education available for other teachers and may improve ICT pedagogy.

- My personal and professional learning and understanding of ICT has been extended, this new knowledge will be applied in my job when I get back to my country and conduct PD for the secondary school teachers.

This study might be the first in New Zealand to investigate the position of ICT in secondary technology classrooms. However the findings should be considered with some caution. The limitations of this research need to be noted, especially in relation to the level of transfer to other situations.

The limitations of this research are several: firstly, I only interviewed six teachers; and secondly, the interviews only provide insight into what teachers say, not what they do. Thirdly, this research investigated the integration of ICT in the subject of technology. Integrating ICT in other subject areas may be different because the discipline area is dissimilar, for example, in the technology curriculum CAD software is suitable for the graphics field but not English where other soft and pedagogies would be needed. Educators need to think and plan thoroughly before they integrate ICT tools.

Furthermore, the teachers interviewed were all experienced, with 8 to 18 years of teaching including at least 8 years teaching Technology. Beginning teachers could have different perceptions.

Comment should also be made about the other areas of New Zealand. I did my research in Auckland region which has a high proportion of multicultural teachers and students. The findings in other New Zealand regions could be different.

6.4 Implications

The necessity for Professional Development in relation to ICT skills and pedagogy is very clear. Leaders in education need to encourage teachers to improve their ICT skills and develop an in-depth understanding of the current curriculum and suitable pedagogies. According to Prensky (2001) this can be done in two ways. Firstly:

> ...teachers should improve their personal skills by using the available ICT tools at school and at home. Reflecting on practice greatly helps teachers construct

> their own knowledge about best practice. Success will come that much sooner if their administrators support them (p. 6).

This identified the importance of reflective practice and teachers as adult learners. Prensky's second form of PD is education programmes such as the ICT PD School Cluster programmes in New Zealand which are aimed at increasing teachers' ICT skills and increasing the frequency and quality of the use of ICTs for professional and administrative tasks in schools. Such programmes need to be strongly supported by the government, Departments of Education and schools. Participation in programmes like this will help teachers gain the required confidence to integrate and use ICT meaningfully with the digital generation.

Today's children use electronic technologies more than previous generations, and this creates different demands at school (Sefton-Green, 1998). Bolstad (2004) argued that the old ways are not working with young people and we need new ways of teaching and learning. Thus teachers need more PD to address this digital divide.

I believe that developing countries such as Saudi Arabia need to move from using ICT in administration to using, creating, and managing ICT in teaching and learning processes. A point made widely in the literature is that teachers in developing countries mostly use ICT in administrative everyday jobs at schools, such as preparation of lessons and unit plans, organising scores and reports of students, but not in pedagogy tasks such as using presentation software during class (Usluel, Mumcu & Demiraslan, 2007; Askar & Usluel, 2003).

In order to encourage students to *create* ICT tools and to support gifted students, both New Zealand and Saudi Arabian Education Ministries need to encourage schools to do more ICT activities and encourage competition between students in schools. For example, ICT coordinators could plan competitions between secondary school students to create and design educational computer programmes. The Ministry of Education could

expand such competitions nationwide and even internationally. Further to that, teachers also need to be encouraged to create ICT tools.

In order to further ICT there is a need to make some changes in the national curriculum framework. However as Begg (2008) mentioned, this is complex, because there are eight inter-related co-emerging activities, such as developing assessment, developing policy, and reflecting on practices. All need to change, and how each influences the other is not predictable.

6.5 Future research

Researchers could continue my study in this area by visiting teachers in the classroom and exploring how they practically integrate ICT. Future research could investigate the potential gap between what teachers think and what teachers actually do in using and managing ICT in the classroom, and use observational methods in technology classrooms.

Future research could also use larger sample sizes, reflecting the diversity of schools in the community, in order to provide more detailed prescriptions for effective ICT integration processes. When shortcomings are identified, further research that aims to improve the use of technology can be carried out.

A variety of alternatives and opportunities exist for other researchers as a result of this study. Other researchers might extend my findings into other areas of research about integrating ICT in secondary teachers' pedagogy. These could include:

- the study of possible improvements to professional development and the New Zealand curriculum

- in-depth research on how much student learning actually improves by integrating ICT

- research with a focus on the use of the Internet in the classroom, as this is the main ICT used in schools

- investigation of teachers' perspectives on the use of ICT in other subjects, such as maths and science.

- Study of the gap between "digital natives" and "digital immigrants".

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Appendices

Appendix A: Participant Information Sheet

Participant Information Sheet

Date Information Sheet Produced:

Project Title

The integration of ICT into secondary technology teachers' pedagogy in New Zealand.

An Invitation

My name is Badr Almadhour. I am on a scholarship from the Ministry of Education (Saudi Arabia). I have worked as a computer supervisor for secondary computer teachers Saudi Arabia. Now, I am doing a Master's degree in Education at AUT (Faculty of Applied Humanities, School of Education). This is part of the requirements of obtaining the degree. I intend in this research to investigate "the integration of ICT into secondary technology teachers' pedagogy in New Zealand" and this is the title of my project. I am pleased to invite you to be a participant in my research and your participation will contribute to develop my understanding of integrating ICT in technology pedagogy in New Zealand schools and help me in obtaining my qualification. I believe that your participation will be helpful for you in supplying an opportunity to reflect on your professional work.

What is the purpose of this research?

My aims in conducting this research are:

1- Understanding your general perception of integration of ICT into secondary technology teachers' pedagogy.

2- Understanding how you use ICT in you pedagogy.

3- Understanding how your integrating of ICT in technology Influences on students' learning.

4- Understanding the challenges and opportunities that might face you as a teacher of technology.

5- Identifying any gap between theory and practice concerning your teaching of technology.

6- Identifying your opinions on how the position of ICT in technology pedagogy might be improved in your school, nationally and internationally.

How was I chosen for this invitation?

You are one of the participants who have been chosen to be involved in this research. I have used a convenience sampling which means your school is reasonably near to my home, and I understand that your school integrates ICT in technology subject. This research is directed to technology teachers year (9-12) students. Up to 8 technology teachers will be involved from up to 5 schools.

What will happen in this research?

I will use interviews as my data collection method. During the interview, you will be asked some questions regarding this topic. You and I will discuss these questions in order to understand your perception of integrating ICT technology pedagogy in your school.

What are the discomforts and risks?

There are no known discomforts and risks.

How will these discomforts and risks be alleviated?

If you feel uncomfortable talking with me and you are free to withdraw at any stage, and your interview notes will be destroyed.

What are the benefits?

I think this study will contribute in evaluating technology in your school and in New Zealand. The results of my research will help me to understand your perception of integrating ICT technology pedagogy and to find some issues related to my study in your school and to suggest further solutions and help me gain a degree. Decision-makers in the Ministry of Education in New Zealand may benefit from this study in developing the position of ICT in technology subject in the future.

How will my privacy be protected?

All data will be saved in a locked cupboard for six years at Postgraduate program administrative office., Your consent form will also be stored for 6 years in another locked cupboard at the postgraduate office.

What are the costs of participating in this research?

.No costs are expected apart from the 50 minutes for the interview.

What opportunity do I have to consider this invitation?

I would like you to email me at (balmadhour@hotmail.com) within a week to tell me whether or not you are happy to be involved.

How do I agree to participate in this research?

If you agree to be involved in this research, you will need to sign a consent form. I will bring this form to the interview.

Will I receive feedback on the results of this research?

Yes, your transcription will be returned so you can make any changes you wish to, and then later on request I will provide you with a summary of the study.

What do I do if I have concerns about this research?

Any concerns regarding the nature of this project should be notified in the first instance to the Project Supervisor:

Associate Professor Andy Begg

Andy.begg@aut.ac.nz

9219999 ext, 7355

Concerns regarding the conduct of the research should be notified to the Executive Secretary, AUTEC,

Madeline Banda, *adeline.banda@aut.ac.nz* , 921 9999 ext 8044.

Whom do I contact for further information about this research?

Researcher Contact Details:
Badr Almadhour
021396944
Project Supervisor Contact Details:

Associate Professor Andy Begg

Andy.begg@aut.ac.nz

9219999 ext, 7355

Appendix B: Indicative interview questions

Indicative Interview Questions

Project title: The integration of ICT into secondary technology teachers' pedagogy in New Zealand

Research question: What is the position of ICT in secondary technology teachers' pedagogy in New Zealand?

Series	Questions	notes
1	How long have you been teaching?	
2	Do you like your job as a teacher and why?	
3	Could you tell me about your journey in teaching?	
4	How long have you been teaching technology in secondary schools?	
5	What are the interesting aspects in teaching technology?	
6	Could you talk about the ICT tools that you are using and explain how you use them in you pedagogy?	
7	How often do you use ICT tools?	
8	How do you integrate ICT in your teaching and learning?	
9	What are the opportunities to integrate ICT in your pedagogy?	
10	Could you discuss, in your opinion the strengths and the weakness of using ICT, and especially the Internet, in teaching and learning methods?	
11	Could you tell me about typical daily lesson?	
12	If the total number of your students is more than the number of computers, how do you deal with that?	
13	What do you think about the New Zealand curriculum in general and technology in particular as a separate subject ?	
14	Do you think that teaching technology influence students' technological literacy? If so, could you explain how?	
15	Is it easy to integrate ICT in your teaching and learning methods, and why?	
16	Could you give me some suggestions which might contribute in developing teaching technology in your schools or nationally?	

17	Would you please tell me about your general views about the future of integrating ICT in education?	
18	What are the challenges that you face in integrating ICT in your pedagogy?	
19	If you work with teachers who have just started teaching with ICT, what advice would you give them?	