THE STORY OF WIRED SCHOOLS:

A STUDY OF INTERNET-USING TEACHERS

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CANDIDATE'S DECLARATION

This is to certify that the research carried out for my Doctoral thesis entitled "The Story of Wired Schools: A Study of Internet-using Teachers" in the Department of Learning and Teaching, Massey University, Palmerston North, New Zealand is my own work and that the thesis material has not been used in part or in whole for any other qualification.

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ABSTRACT

The story of wired schools addresses the lack of critical debate over the adoption and implementation of the Internet in New Zealand schools. It is set in the backdrop of rapid technological change and growing international concern over the wisdom of the substantial investment in new computer technology in the education system. The study addresses the problem that the hype surrounding the Internet in schools is potentially diverting much attention away from its real pedagogical value. Thus, the research objective investigates how teachers believe the Internet has affected learning and teaching—for better and worse. In the context of this objective, a number of methodological issues related to conducting research in the area of educational technology are considered and a multi-paradigmatic framework is adopted utilizing both quantitative and qualitative research techniques.

The research consists of three phases over a period of three school years. It reports a process to identify and systematically investigate a purposive sample of proficient, accomplished and experienced internet-using teachers. The first phase involves a survey in which a written questionnaire gathers baseline information on the background characteristics, experiences, perceptions and practices of a group of teachers nominated as proficient in using the Internet for learning and teaching. In Phase Two, the survey is repeated through a follow up questionnaire and informant interview with a refined sample of perceived accomplished internet-using teachers. The final phase culminates with narrative-biographical and micro ethnographic case studies of three teachers judged to be experienced in using the Internet for pedagogical purposes.

An analysis of data shows that the advent of the Internet has clearly had an impact on the nature of teachers' work. The standout effects of the Internet are reported under the themes of: (a) school organization and classroom management, (b) displacement costs, (c) collegial relationships, (d) workload considerations, and (e) teachers thinking more globally. Notably, the research shows that teachers do not simply experience the Internet, they reshape and reframe it based on their pedagogical beliefs and lived experiences. Thus, teachers have equally affected the Internet and these effects are reported under the themes of: (a) differential uptake, (b) limited local action, (c) teaching is messy, (d) computer as tool, and (e) technology as progress. The key lesson is that the implementation of an educational technology is a mutually adaptive process full of conflicts, tensions, and contradictions that simultaneously give rise to positive, negative, and unknown effects. Accordingly, the effects of the Internet on teachers' lives and work culture can not be analysed in terms of simple dichotomies of good and bad as a more dialectical perspective is required of the relationship between technology and society.

A rough portrait of the educational technology landscape is sketched from the tensions and individual mindsets embedded in the research sample, and the shape of the topography is shown to amplify rival theoretical positions in the literature. From a post-technocratic political economy perspective, the new digital landscape consists of a number of competing and coexisting discourses that borrow and co-construct a socio-cognitive language of persuasion to advance their own hegemonic agenda. Such an analysis brings into question the hidden curriculum behind the new ways of enterprise constructivism promoting the adoption of information and communication technology (ICT) in New Zealand schools. The ensuing discussion endeavours to reframe the teacher's role around critical pedagogy and the need for pedagogical activism in the backdrop of a number of potential dark clouds looming on the digital horizon. Finally, the story of wired schools is brought together through the metaphor of planes, trains and automobiles in which a lot of misinformation, dissembling language and even propaganda is claimed to prevent teachers from understanding the meaning and non-educational intention of the ICT-related school reform movement. A number of implications arise from the explanation of how things have come to be this way and these are presented for teachers, researchers and policy-makers.

The central thesis is that teachers need to approach the ICT movement as problematic and a deeper level of critical dialogue is required over the move to plug New Zealand schools into the Knowledge Economy. In short, wired schools require wired educators capable of reading and responding to current efforts to boost capacity, increase bandwidth and catch the knowledge wave—for better and worse.

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This research was inspired by the commitment that many teachers have made over more than 20 years towards integrating new computer technology into the classroom. Much of this work has gone unheralded. The rapid growth of the Internet over such a short duration has demanded a great deal from teachers. Without their experience and willingness to take on this challenge, the use of new educational technology would not be so prevalent in New Zealand schools.

I owe a particular debt to the teachers who participated in this study for their time and willingness to converse with me. The research was dependant upon their participation and I sincerely thank the teachers for sharing so much rich and often sensitive information about their teaching practice. In particular, I would like to thank Andrea, Barry and Catherine from whom I learnt so much. I hope other people will learn from their experience as I have in the dissemination of the research findings.

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LIST OF ABBREVIATIONS

AUP = Acceptable Use Policy

ACOT = Apple Classrooms of Tomorrow

BECTA = British Educational Communications and Technology Agency

CAI = Computer Assisted Instruction

CBAM = Concerns-based Adoption Model

ERO = Education Review Office

ICT = Information and Communication Technology

ICTPD = Information and Communication Technology Professional Development

IFIP = International Federation for Information Processing

ISTE = International Society for Technology in Education

ITAG = Information Technology Advisory Group

LAN = Local Area Network

NZEI = New Zealand Education Institute

NZCTU = New Zealand Combined Trades Union

OECD = Organisation for Economic Cooperation and Development

OFSTED = Office for Standards in Education

PAR = Participatory Action Research

PC = Personal Computer

PDA = Personal Digital Assistants

SITES = Second Information Technology in Education Study

TKI = Te Kete Ipurangi

TOP = Terrain of Online Pedagogy

UK = United Kingdom

US = United States

WWW = World Wide Web

CHAPTER ONE

Introduction

'Every great transformation leaves social debris in its wake' (Rosen, 1998, p.37).

1.0 INTRODUCTION

On Friday, 19th November, 1998, The Honorable Wyatt Creech, Minister of Education, launched with much fanfare *Interactive Education—An Information and Communication Technology Strategy for New Zealand Schools* (Ministry of Education, 1998a). This Strategy was the first serious attempt for almost 20 years to address the role of educational technology in compulsory schooling. Since its release, the profile of Information and Communication Technology has significantly increased in the professional discourse, evidenced by the rapid adoption of the "ICT" acronym in the New Zealand educational lexicon. The publication of the ICT Strategy heralds a new era in the history of educational technology and coincides with the rapid growth of the Internet. It arose out of concern from groups such as The Education Review Office (ERO) (1997) that a more strategic approach was required to take advantage of the "tele-learning revolution" (MacKenzie, 1997).

This was the first step towards wiring New Zealand schools to harness the benefits of the Internet as a social, economic and educational phenomenon. At the time, the "dot.com" phenomenon was sweeping the country and there was unprecedented enthusiasm for the potential of the information highway. The Internet was the topic of rampant speculation in which the level of exaggerated hype over the brave new electronic frontier was likened to revivalist fervor (O'Hare, 1996). A great deal of uncritical rhetoric infused discussion of the issues (Butler & Zwimpfer, 1997), goals (NZPF, 1998) and strategies (ITAG, 1998a) surrounding the development of the ICT Strategy. The key point is that this policy initiative was shaped in the "mad rush" to connect schools to the Internet (Noble, 1996). The Information Highway was 'the new blackboard of the future' (U.S. Department of Education, 1996, p.3). It was seen as a *fait accompli* that schools must embrace the Internet to reap the benefits of the Learning Society. In the policy discourse, there was absolutely no critique of the risks and rewards of rushing to wire New Zealand schools. Instead, the introduction of the ICT Strategy followed the lead of the United Kingdom (UK) where the:

> *... recommendation to Central Government is that they must make the act of faith and encourage the education sector to start using technology rather than talking about it (Stevenson, 1997, p.6).*

This research takes the opposing view that more talk and critique is required before blind faith in the potential of the Internet steers the teaching profession further away from the real goals of education—that is, promoting learning, equality, fairness and social justice. It is potentially dangerous for educational policy to invest in this latest technological innovation in the absence of sound research evidence. Of course, lack of critique is nothing new in educational policy. In the past, the policy texts have tended overwhelmingly to spin:

> ... *technoromantic, future-orientated abstractions concerning the potential of the computer to effect vast and positive changes on public education (Bryson & De Castell, 1998a, p.546).*

History has shown that policy-makers are enamored with the seductive appeal of new computer technology as the solution to the deeply-seated problems confronting the education system (Nash & Moroz, 1997). As Joseph Weizenbaum once said: 'If technology is the solution what is the problem' (cited in Roszak, 1994, p.51). While this quote has become a cliché, there is little or no attempt in the ICT Strategy to address the social and educational problems that teachers experience on a daily basis. In the words of Steven Jobs, founder of Apple Computer, 'What's wrong with education cannot be fixed with technology' (cited in Oppenheimer, 1997, p.61). Yet, with the advent of the Internet there is a real danger that technological solutions continue to (re)shape the direction of educational policy.

Over the last 20 years, three myths have infected the policy discourse (Nash & Moroz, 1997). First, computers should be brought into schools simply because they are there. In the academic literature, this is known as the Everest Syndrome (Maddux, 1988). Second, mere exposure to computer technology will be beneficial to students and teachers. The assumption is that technology is inherently good and valuable skill and knowledge will accrue automatically from computer use. Last, if schools can obtain a sufficient quantity of hardware and software, the quality of educational outcomes will take care of itself. This myth assumes that lack of resources and inadequate infrastructure are the major barriers to the effective integration of technology in the school curriculum. What the policy discourse fails to acknowledge is the deeply contested nature of the curriculum itself and the competing forces behind the educational computing movement. According to Goodson (1996), the drive to upskill teachers with new computer technology is about ideology as much as pedagogy. It follows that a central tenet of this study is that neither the curriculum nor educational technology are neutral and the rush to wire New Zealand schools must be located in a wider social practice. The study is framed by concern that the ICT Strategy promotes the overselling of the Internet without sufficient regard for the equivocal nature of the research. On the whole, it ignores the growing debate over the way in which new educational technology may affect teachers' lives and work culture—for better and worse.

1.1 THE TECHNOLOGY DEBATE

There is no doubt that the Internet is one of the most spectacular technological phenomena of the last century. A new revolution is underway that hi-tech proponents proclaim is poised to transform our classrooms and prepare the "Net Generation" for the real world of global telecommunications (Tapscott, 1999). As Bill Gates (1995), President of Microsoft Corporation, pronounced:

> *We stand at the brink of another revolution. This one will involve unprecedentedly inexpensive communication; all the computers will join together to communicate with us and for us. Interconnected globally, they will form a network, which is being called the information highway (p.3-4).*

In all of its manifestations, the Information Highway is part of a new epoch of human civilization that is expanding our traditional concept of literacy (Lankshear et al., 1997). It has huge implications for schools and enormous potential as a pedagogical innovation. This is without dispute. However, the Internet is far more problematic than is evident in most newspapers, popular magazines, and policy briefs, which typically celebrate the benefits of new computer technology in schools. In recent years, there has been a rise in the number of people and publications beginning to question the wisdom of the substantial investment in educational technology (e.g., Talbott, 1995). Armstrong and Casement (1998) believe that it is scandalous so much money has been allocated for computers and Internet access with so little serious evaluation. In their view:

> *A generation of children have become the unwitting participants in what can only be described as a huge social experiment (Armstrong & Casement, 1998, p.2).*

They go on to observe that our insatiable appetite for new computer technology is such that one would think nothing else worthwhile is happening in schools. Although no empirical evidence is offered to support this conclusion, they believe some basic questions about the educational value of computers remain unanswered. In their words, we suffer from illusions of progress. Armstrong and Casement (1998) claim that for the most part the questions themselves have never been asked; it is only now that more people are beginning to express serious reservations over the large investment in technology. The level of public concern was heightened when the *Atlantic Monthly* first attacked the spurious evidence supporting the "computer delusion" in schools (Oppenheimer, 1997). After an exhaustive investigation Oppenheimer (1997) concluded:

> *There is no good evidence that most uses of computers significantly improve teaching and learning... (p.45).*

There is a grain of truth in this conclusion but it exaggerates the evidence in the opposite direction (Reeves, 1998). Such a blanket statement gives insufficient attention to the instructional context as the computer is not a monolithic machine that teachers use in a uniform manner. Put bluntly, it is technocentric to think that technology alone can significantly improve learning. Ironically, Oppenheimer (1997) exposes this flaw in his own analysis when he dismisses the success stories as the result of improved pedagogy rather than the technology itself. What he also fails to acknowledge is '...that such pedagogical enhancements would often be impossible without the capabilities of new technology' (Reeves, 1998, p.52). Although Oppenheimer (1997) may have provided the ammunition for a neo conservative backlash against the use of computers in schools, this seminal article contributed greatly to further critical analysis.

The infamous *Computer Delusion* article was a timely reminder of the need for teachers to continually question and justify the faith they place in new educational technology. In this sense, attacks on the use of computers in schools offer teachers a rich source of critical reflection and thus should not be dismissed out of hand. Above all, Oppenheimer (1997) helped to reveal the fragility of the pedagogical rationale and the serious flaws of the social, economic and vocational rationales, which together combine to form the language of persuasion championing the educational use of technology.

In terms of the pedagogical rationale, the article puts the spotlight on an alternative body of literature claiming that computer use may be detrimental to our brains, bodies and spirits (Healy, 1998). It highlighted concern in some quarters that new computer technology jeopardizes the physical, intellectual and emotional development of today's youth. Healy (1998) taps deep into our psyche and appeals to traditional values when she questions whether spending hours in front of a screen is good for students' long-term development. This type of analysis, which lacks solid research evidence, is supported by Stoll (1995) who argues that computers send the wrong message by making learning appear colourful and fun when it actually requires hard work and discipline. Of course, there is an element of a new moral panic embedded in this recall to the protestant work ethic and both authors are guilty of assigning too much attention to the technology itself, which is exactly what they accuse the proponents of the digital revolution of doing. In spite of this criticism, Healey (1998) rightly asks if we are grasping at a technocentric "quick fix" for the multitude of problems we face.

On another front, Oppenheimer (1997) reminds us that it is extremely shortsighted to focus on today's idea of what tomorrow's jobs will be. Stoll (1999) takes the critique of the vocational rationale—a growing proportion of the workforce will require computer skills—one step further by illustrating how the adoption of new computer technology has resulted in the deskilling of many jobs. So-called hi tech jobs involve little more than

passing a tin of baked beans over a bar code scanner in the supermarket. In a less emotive analysis, Armstrong and Casement (1998) claim that far from being skilled technicians the vast majority of computer operators are little more than typists doing mundane repetitive work. This line of reasoning suggests that the information highway has created the demand for a large technical class that is highly trained to do "mind-numbingly boring" work (Roberts, 1998; cited in Healy, 1998).

While the Internet is a powerful icon of the new economy, Kirkpatrick and Cuban (1998a) question whether computers will help create the type of critically informed students and citizens we seek. They point out that schools are not simply an agent of social and cultural reproduction where future workers learn how to earn. Put another way, rather than prepare students to make a living, the curriculum should educate young minds to make a life (Postman 1996). In a similar vein, Postman (1996) draws an analogy between the computer and the invention of the motor vehicle:

> *...what we needed to know about cars—as we need to know about computers, television, and other important technologies—is not how to use them but how they use us (p.44).*

This analogy rejects technology as neutral. Postman (1996) writes what we really needed to think about when the motor vehicle was first invented was not how to drive them but what they would potentially do to '...our air, our landscape, our social relations, our family life, and our cities' (p.44). He also argues that if schools did not teach computers then most of the population would learn how to use them anyway just as most people learned how to drive cars without formal school instruction. While arguably the roads might be safer if driving instruction was compulsory, this analogy strikes at the heart of the debate over the adoption of new computer technology in schools.

In the backdrop of this debate, few New Zealand principals have complained about the millions of dollars from vote education being spent on the implementation of the ICT Strategy. Instead, it would appear that the vast majority of parents and caregivers think that all this new computer technology is a good thing. As one principal is quoted as saying:

> *One of the main reasons we have them is parents expect them. If they came into the school and we didn't have them they would go to another school (Macfie, 1999, p.99).*

The pressure from parents highlights yet another force that is shaping the drive to reform schools through ICT. As Postman (1996) warns, it is almost as if the computer has become the new God for us to follow; it has all the features of a dangerous cult. Roszak (1994) first drew this parallel when he wrote:

Like all cults, this one has the intention of enlisting mindless allegiance and acquiescence. People who have no clear idea of what they mean by information, or why they should want so much of it, are nonetheless prepared to believe that we live in the Information Age, which makes every computer around us what the relics of the True Cross were in the Age of Faith: emblems of salvation (p.x).

Following on from this, those who oppose *technology as progress* are typically portrayed as neo-Luddites—that is, people who defend the retention of old methods and make dire predictions about the effects of new technology. The term Luddite has its roots in the Industrial Revolution where Ned Ludd is reported to have smashed factory machinery fearful that new equipment would destroy traditional livelihoods (Graham, 1999). Another term sometimes used to describe the so-called resisters to technological innovation is *technophobes*. These are reactionaries and nostalgic opponents of change who reject the use of new educational technology in favour of time-honored approaches. In the extreme, the technophobes adopt a demon perspective, which is based on an emotive and illogical response to the threat of a technocratic nightmare. Bigum (1995) refers to this group as "Doomsters" in his attempt to map the four main perspectives and relationships evident in the educational computing discourse, as depicted in Figure 1.1. The Doomster is the closest to the Luddites of the 19th century as they fervently oppose technology-driven school reform in favour of traditional teaching practices.

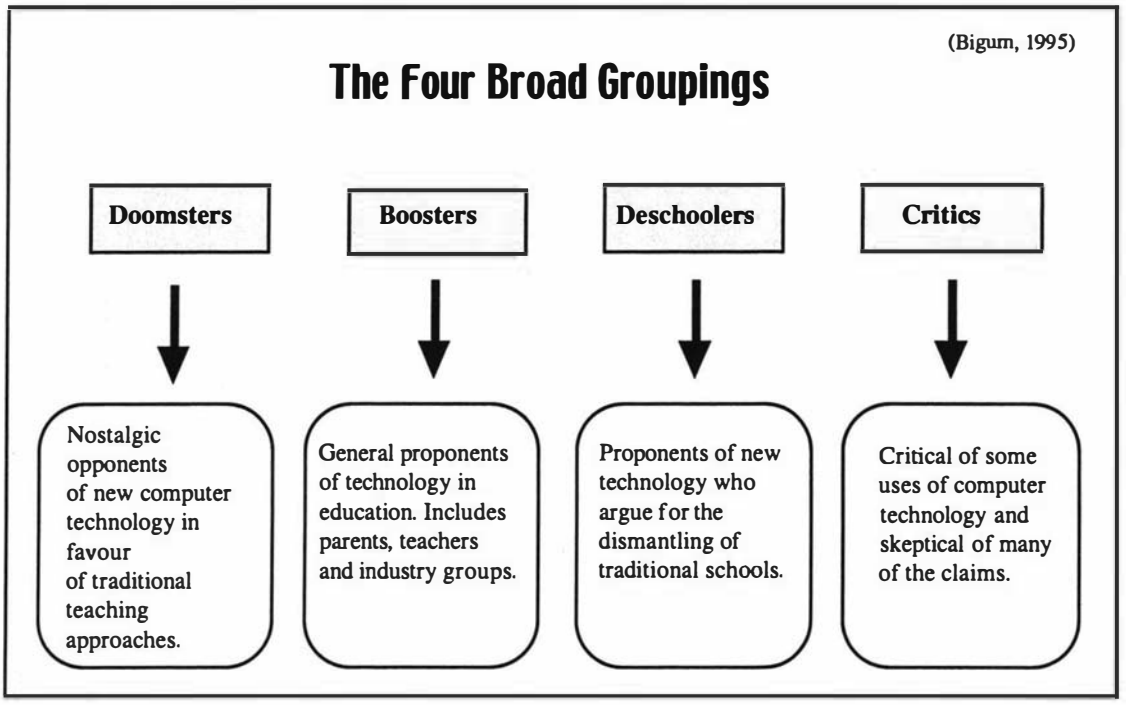

Figure 1.1 The four broad groupings in the educational computing discourse

On the other hand, the proponents of new computer technology have been coined the *technophiles* (Postman, 1993). Graham (1999) reports that these people revere technology and worship it as the remedy for all ills. In the literature, the technophiles are often dismissed as a group of uncritical advocates of technology in search of yet another silver bullet solution to the deeply-seated problems of schools. They are widely criticized for their technological determinism—a perspective that attributes far too much significance to the technology itself rather than people and culture (Bromley, 1998). This perspective naturalizes technological change, implying inevitability, and ignores the role of social processes and the impact of the surrounding educational culture. Over the years, technological determinism has dominated the educational technology literature.

According to Bigum (1998), most of the people who are strong advocates of the use of new computer technology in schools can be classified as "Boosters". This category is used to describe a large group of general proponents of technology—parents, teachers and industry stakeholders—who uncritically see new technical developments as the solution to many of their problems. The Booster is claimed to be by far the largest group numerically (Bigum, 1995). They hold a panacea perspective that does not always promote technology *per se* but manifests itself as uncritical support of the learning through technology movement. In this typology, another group of people fall within the "Deschooler" category. This category is used loosely by Bigum (1995) to describe those who are proponents of technology as the solution to dismantling the social institutions of schools—as we know them today. These people believe schools are relics of the past and the curriculum needs transforming to bring it into the Information Age. Suffice to say the Deschoolers see educational technology as a vehicle for wider social and educational reform.

According to Bigum and Kenway (1998), the smallest group is the "Critics" who do not automatically oppose all aspects of computer use but challenge the unrealized promises and taken-for-granted assumptions about the potential of educational technology in schools. In short, they are the sceptics. However, this group does not define the computer in a binary fashion as demon or panacea following either a utopian or dystopian perspective (Kenway, 1996). Such dyadic thinking is not overly productive. Rather the Critics are concerned with issues of choice, freedom and democracy. They question proponents who justify the use of technology in schools just because it can be done (Bigum, 1995). The Critics ask: Why ought it be done and who will benefit from its use? This critical perspective evokes a much deeper response to the ICT-related school reform movement than that encapsulated by Healy (1998) asking the question of whether or not schools should invest in cello lessons or video games. Such a bifurcation is overly simplistic and stifles deeper analysis of the complex forces behind the drive to reform schools and workplaces through new computer technology.

1.2 TELLING THE STORY OF WIRED SCHOOLS

This research tells the story of the introduction of the Internet in New Zealand schools in the critical tradition. It is based on the assumption that previous ways of telling stories about the use of computers in schools have failed to yield valuable insights into how teachers are affected by, and reshape the impact of, the implementation of a new educational technology (Bryson & De Castell, 1998b). In the tradition of Foucault (1980), this perspective recognises that the job of the researcher is to seek out those stories that are not being told and circulated about the use of the Internet in schools. Thus, the study is framed with the words of Shakespeare in mind, 'I am nothing if not critical' [OTHELLO II.1]. The research asks five basic questions from this critical perspective:

1. Who is telling the ICT story and why?
2. How are they telling the ICT story?
3. What is it they are telling/ promoting about ICT?
4. How will different people understand and respond to the ICT message?
5. What is missing? Whose voice is not being heard? Whose story is not being told?

Like any story, there is a storyteller (Christie, 1997). The author is that storyteller. This is not an objective story, as no story is. Thus, the study reflects the researcher's beliefs, biases and assumptions about education and the role of new computer technology. There are four core assumptions that underpin the research narrative. First, schooling is not neutral and ICT is part of a wider social practice. Second, teaching is inherently a political activity as the curriculum—that is, content, pedagogy and assessment—lies at the heart of a political struggle over what teachers should do in the classroom and how the curriculum should be taught. Third, education is a public good and moral endeavour, not a commodity or service to be traded for profit and measured by economic success. As Snook (1996) reminds us, the central function of schools in a democratic society is 'the creation of critical thinkers, critical consumers and critical citizens' (p.55). Finally, research is a subversive activity. The role of the researcher is to challenge and, if necessary, change conventional wisdom rather than report what we already know.

This is a complex and multi-layered narrative. Like the steam engine, the Internet is both symbol and trigger of major social, economic and educational changes (Drucker, 1999). Therefore, borrowing Becker's (1998) analogy, from the outset the research process was like running to catch a moving train. The Internet is a dynamic multifaceted phenomenon with many interwoven factors driving its expansion for educational purposes. In the past, the main rationales behind the use of computers in education have been summarised as: (a) social; (b) vocational; (c) economic; (d) commercial; (e) marketing; (f) cost effectiveness; (g) transformation; and, (h) pedagogical (Pelgrum & Plomp, 1993).

This chapter has already introduced some of these rationales—however, to recap, the social rationale is based on the view that students must be prepared for the new digital world in which they will have to live. The belief that computers enhance employment prospects in an increasingly competitive labour market is described as the vocational rationale. At a macro level, the economic rationale is founded on the tenet that high levels of technological literacy are vital for a country to successfully compete in the new global market. The commercial rationale relates to the benefits that arise from the ongoing supply of computers to schools and the profits that accrue from a large number of technologically fluent consumers. A desire and visionary enthusiasm to steer the traditional curriculum in bold new directions is known as the transformation rationale (Pelgrum & Plomp, 1993). The marketing rationale is a response to the new competitive environment where schools must cultivate their brand to attract sufficient students and thereby get adequate funds. In contrast, the cost effectiveness rationale is grounded on the premise that computers can substantially reduce the cost of education by making schools more efficient. The pedagogical rationale, of course, is built on the assumption that the use of new computer technology offers an unprecedented potential to enhance the learning and teaching process.

In sum, the story of the Internet in schools is complicated and tightly interwoven with the researcher's own narrative. There is no question that ICT can be used as a powerful context for better learning and teaching. The key point is that the pedagogical rationale is not the sole engine of the ICT-related school reform movement. A combination of forces and factors simultaneously operate to make the presence of new computer technology desirable in New Zealand schools. Right from the beginning of this story, the researcher was mindful of the pressure teachers are under from different stakeholders to adopt the Internet in their teaching practice. For this reason the research set out to critique the competing rationales and to provide critical insight into how teachers are experiencing and reshaping the global phenomenon of the Internet. Broadly speaking, the story of wired schools is an attempt to unravel the complex educational technology landscape which impacts on teachers' lives and work culture—for better and worse.

1.3 THE IMPORTANCE OF HEARING TEACHERS' VOICES

The teacher has a key role if the Internet is to enhance the educative process. However, the history of educational technology is characterised by many failed innovations that take insufficient account of teachers (Cuban, 1986). As Collis (1996) writes:

> *Many voices have told teachers about the potential of the computer in their classrooms, about what they must know, about how they should proceed. But how often has the starting point been teachers' own voices about their problems and needs (not with respect to computers, but with respect to the teaching and learning situation in their own classrooms)? (p.25).*

Although teachers usually have a lot to say, their voices have been surprisingly quiet at the policy level (Aikin, 1998). Of course, educational policy is made at several levels: (a) national policies made by government, (b) local policies made by school boards and, (c) implementation policies made within schools. Teachers' work is affected by decisions made at all three levels. Yet, the teacher remains a neglected voice. Much of the rhetoric about the Internet comes from anecdotal evidence, lighthouse projects and policy initiatives that bear little resemblance to the conditions of the regular classroom. Few studies document how teachers are grappling with technological change in the regular context of their work.

The hype and the hope surrounding the Internet may well deceive us. Arguably, teachers' prior experiences, perceptions and practices are more important in determining the success of an innovation than the technology itself (Miller & Olson, 1994). A study needs to be made of teachers' own theories and the way that their perceptions and beliefs mediate the use of new computer technology in schools. One of the problems is that the Internet is in rapid and continuous process of development but there is not a corresponding rate of development in understanding the teacher's role. As new kinds of learning activities emerge offering new educational possibilities, there is increasing need to understand how good teachers are using the Internet well. This question gives the opportunity to evaluate the claims about the Internet in the context of what constitutes good teaching *per se*. It may help to answer the question of whether or not technology has become synonymous with good teaching in the Information Age (Pepi & Scheurman, 1996). Irrespective of the technology debate, it is abundantly clear that 'simply wiring schools is not enough' (Becker & Ravitz, 1998, p.5). As Cuban (1998) writes, hi tech schools require hi tech teachers.

1.4 STATEMENT OF PURPOSE

This research investigates the impact of the Internet on teachers' lives and work culture—for better and worse. It is set against the backdrop of recent ICT policy initiatives and the rapid growth of the Internet in New Zealand schools. A critical approach is adopted in light of the growing technology debate in the academic literature. The study describes a systematic sample selection process that documents the experiences, perceptions and practices of a purposive sample of proficient, accomplished and experienced internet-using teachers. It adopts a multi-layered approach to the study of teachers Internet use involving three phases over a period of three calendar years, which culminates in three biographical narratives supported by micro ethnographic case study material. The research objective is not to judge the practice of individual teachers, nor to provide any definitive answers, but simply to learn from the valuable experience and collective wisdom embodied in those people already using the Internet in their professional lives. Overall, the intention is to follow a direction of inquiry that will be fruitful in understanding the risks and rewards of Internet adoption in schools under naturalistic conditions.

1.5 STRUCTURE OF THE DISSERTATION

The dissertation is divided into 11 chapters. This chapter has introduced the significance of the topic and the debate surrounding the increasing use of new computer technology in schools. Chapter Two raises the problem of terminology and outlines different theoretical conceptions of the Internet as a pedagogical innovation. It then reviews the literature on the teacher's role and highlights the problematic definition of good teaching in the context of educational technology. The research problem and the specific questions that the study was designed to address appear in Chapter Three. This chapter also considers a number of methodological issues related to conducting research in the area of educational technology. Chapter Four provides a detailed account of the method and procedures used throughout each phase of data collection. The results of Phase One are presented in Chapter Five and interpreted in Chapter Six. Similarly, Chapter Seven presents the results of Phase Two, which is followed by an interpretation of the findings in Chapter Eight. Chapter Nine presents the results of the final research phase. A synthesis of the emergent themes appears in Chapter 10 along with discussion of the findings in the wider socio-political context of ICT policy and the changing nature of teachers' work. Finally, Chapter 11 provides a summary of cogent points including the implications of the study for teachers, policy-makers and researchers interested in reforming schools through new educational technology.

1.6 SUMMARY

This chapter has introduced many of the uncritical assumptions implicit within recent ICT policy initiatives. It has described the growing technology debate that is absent from the policy discourse and shown the use of new computer technology in schools is far more problematic than portrayed in the public and professional discourse. A number of competing rationales are behind the drive to wire New Zealand schools and these require careful scrutiny. The metaphor of story is used to justify the researcher's critical approach to the study of the Internet in schools. A strong emphasis is placed on the teacher's role in the successful adoption and implementation of a new educational technology. With the focus squarely on the teacher, the purpose of the study has been clearly established. Finally, the chapter concludes with an outline of the structure of the written dissertation.

The following chapter presents the review of the literature that informed the scope and breadth of the research.

CHAPTER TWO

Literature Review

'There is no good educational software, only good teachers using software well' (Ham, 1989, p.14).

2.0 INTRODUCTION

This chapter reviews the literature relevant to the rapid growth of the Internet in schools. It begins with the problem of terminology by revealing the lack of consistency in the nomenclature used to describe the study of technology for educational purposes. The chapter then traces the evolution of computers in schools through a number of distinct educational technology waves leading to the advent of the Internet. It outlines different theoretical conceptions of the Internet as a pedagogical innovation and links these to developments in contemporary learning theory. The importance of the teacher's role is established and a critique is undertaken of the research literature on so-called good computer-using teachers. Consideration is given as to what constitutes good teaching both with and without the use of educational technology. The study of internet-using teachers is shown to be a fruitful area of inquiry, especially when research is informed by a critical and multi-dimensional definition of good pedagogy *per se*. Finally, a synthesis of emergent themes is provided to draw attention to the key findings and current gaps in the literature, which underlie the definition of the research problem.

2.1 THE PROBLEM OF TERMINOLOGY

This first section addresses the problem of terminology that has plagued research on the use of new educational technology. It attempts to disentangle the confusing and inconsistent nomenclature in the professional discourse to clearly establish the parameters of the present study. A common flaw of prior research is the lack of consistency of terminology used to describe the concepts and phenomena under investigation. Why one term is used and not another is rarely explained in the literature. The different terms are used often in a loose, uncritical way that lacks precision. Too often researchers have assumed their choice of a term is unproblematic and that their interpretation has agreed terms of reference when it does not. They fail to disclose what influenced their choice or acknowledge the socio-political context within which the terminology is located. The meaning assigned to a specific term is often dependant on the researchers' discipline. In the past, such undisclosed and discipline specific meanings have impeded the interpretation of research and the growth of a more cohesive research community.

The recent adoption of the term "Information and Communication Technology" (ICT) in the professional discourse is not immune from these problems. There is much confusion over the meaning of "ICT" in educational policy and practice and no one generally accepted definition in the research literature. Many people seem to automatically equate "ICT" with computers when the definition needs expanding beyond just new electronic gadgets or machines (Brown, 1995a). After all, technology is a process by which society identifies human problems and seeks solutions to solve them, such as artifacts, systems or environments (Pacey, 1983). This definition means that "ICT" is not always a visible product. Although the term "ICT" has only recently acquired special significance, it is naïve and potentially dangerous to use this as if it were a recent phenomenon. People have been using this technology since the dawn of human existence (Morgan, 1994).

The key point is that common usage of "ICT" is highly problematic especially in the context of the New Zealand Curriculum. On the one hand, "ICT" refers to a distinctive Technological Area within *Technology in the New Zealand Curriculum* (Ministry of Education, 1995). On the other hand, "ICT" is the term adopted by the Ministry of Education to promote the application of new technologies for learning, teaching and administration in New Zealand schools. Of course, it was not long ago that "information technology" (IT) was the preferred term used in the policy discourse. The problem is that "ICT" has different meanings in different contexts. The Technology Curriculum, for example, broadly defines "ICT" as artifacts, systems and environments that:

> *...enable the collection, structuring manipulation retrieval, and communication of information in various forms (Ministry of Education, 1995, p.12).*

The above definition is wide ranging and it encompasses activities and problems such as investigating the best way to distribute a newsletter to the local school community (Brown, 1997). In contrast, the definition of "ICT" presented in *Interactive Education* is considerably more restrictive. The ICT Strategy states:

> *Information technology (IT) is the term used to describe the items of equipment (hardware) and computer programs (software) that allow us to access, retrieve, store, organise, manipulate, and present information by electronic means (Ministry of Education, 1998a, p.2).*

The definition goes on to state that this includes computers, scanners, digital cameras, as well as database software and multimedia programmes. A highly technocentric definition of "IT" based on the main elements of hardware and software is also reflected in the description of "communication technology" (CT). The ICT Strategy claims that:

> *Communication technology (CT) is the term used to describe telecommunications equipment through which information can be sought and accessed, for example, phones, faxes, modens, and computers (Ministry of Education, 1998a, p.2).*

When combined, these two definitions show that "ICT" has a narrow technicist meaning in the context of the ICT Strategy. Although this term is promoted by the Organisation for Economic Cooperation and Development (OECD), the above definition is extremely limited and conceptually flawed. There is no acknowledgement of the competing definition in the Technology Curriculum or any appreciation that most information and communication problems are solved by low-tech solutions. Therefore, it would be unsurprising if a high proportion of teachers had poor or misconceptions of the nature of "ICT" since the term has several meanings in the official policy discourse.

In an attempt to overcome the confusion, Brown (1995a) has shown that there are at least three main dimensions to the use of "ICT" in education. A tripartite relationship exists between: (a) learning *with* ICT across the curriculum, (b) developing specific technological capability and knowledge *in* this domain, and (c) encouraging an awareness and critical understanding *about* the relationship between this technological area and society. The first dimension transcends all Essential Learning Areas whereas the other two are central to the Technology Curriculum itself. The point that must be noted is education in the area of ICT should involve all three dimensions. As Brown (1997) states, no one dimension can be seen in isolation from the other.

Irrespective of the utility of this framework, the lesson is the definition of "ICT" contained in *Interactive Education* is not a solid foundation upon which to build a national strategy for using new computer technology for learning, teaching and school administration. It conveys a technicist focus and gives the impression that people and social processes have little or no role in the successful implementation of a new educational technology. In other words, the definition fails to encapsulate the pedagogical dimension of the innovation. Ironically, a recent guide from the Ministry of Education (1998b) on *Implementing Technology in New Zealand Schools* makes this point. The publication states:

> *It is important to make a clear distinction between technology education—the development of students' technological knowledge, capability, and understanding of the relationship between technology and society—and the use in education of learning technologies such as internet, CD-ROM, and faxes (Ministry of Education, 1998b, p.7).*

The use of the term "learning technologies" is particularly interesting as it signals that the main emphasis is on learning processes rather than technology itself. Put another way, learning with ICT is not an end in itself, but rather a means of helping students to become more effective and motivated learners both within and across the curriculum. With this in mind, it is noteworthy that some publications from the Ministry of Education have begun to interchange "ICT" with the term "learning technologies". The most obvious example is the *Learning Technologies Planning Guide for Schools* (Ministry of Education, 1998c) distributed as part of the Principals First Initiative. Of course, the use of this new term merely adds to the confusion. The planning guide was purchased from the State of Victoria, Australia where "learning technologies" is well established in the education lexicon. In Australia, this term is defined as:

> *... the learning processes where students are engaged in educational activities while using technological tools (Australian Council for Computers in Education, 1999a, p.3).*

This last statement demonstrates that the metaphor of *computer as tool* is central to the definition of "learning technologies". In many ways, adoption of this term would help to overcome the potential confusion over different meanings of "ICT" in the New Zealand policy discourse. Arguably, this term better acknowledges that ICT is not inherently an educational solution as it encompasses a wide range of technologies beyond the realm of education. However, just like the common use of "instructional technologies" in North America, this term fails to acknowledge that technology is part of a wider social practice. In this regard, the concept of social practice refers to the complex interactions, multi-directional relationships and socio-political context in which technology is always located in a particular social and/or cultural system (Mehan, 1989). This perspective recognises the inherent values and assumptions embedded in technology and does not treat the computer as a neutral tool removed from other changes and developments in society (Bromley, 1998). It is fair to say that the non-neutrality of educational technology remains a major oversight of both the policy and professional discourse.

For this reason, the traditional phrase "educational technology" is considered the best term to fully describe the field of inquiry (Gentry, 1995). It encompasses the learning and teaching dimensions of computer use as well as technology as social practice from a broader socio-political perspective. The term signals a deeper interest in the educative process and its central purpose as distinct from the latest technology *per se.* After all, "education" is at the forefront of this term. It recognises that education is not synonymous with the latest ICT nor is education the same as learning and teaching—a point often overlooked. The use of educational technology reminds us that there has been a long history of technological fads in education with a legacy of failure (Cuban, 1986; Saettler, 1990).

The decision to adopt the term "educational technology" as a generic description for the field of inquiry is consistent with the critical orientation of this study. It is a deliberate attempt by the researcher to locate the Internet in an historical context in which enduring questions are asked about the pedagogical process, such as what it means to be a good teacher both with and without educational technology. So the aforementioned discussion is more than a pedantic concern over the misuse and confusion surrounding the different terms. It helps to focus the researcher's gaze and shows the study of wired schools is connected to a body of literature that goes well beyond recent ICT policy initiatives. In this sense, the study is not another rushed and/or ill-conceived effort by a researcher to chase the latest technological rainbow.

Of course, the issue of nomenclature is not the sole focus of this chapter. The discussion thus far is simply an attempt to establish the parameters of the study from a sound conceptual base. In the future, rather than being preoccupied with linguistic wars we would be better served by disentangling what people mean when they use one term or another. Put simply, the meanings and the context of their use are more important than the terms themselves. There will never be consensus over the terms as changes in the language reflect a progression in the discourse, with one group or stakeholder attempting to exert and/or maintain its dominance. As Ely (1963) once pointed out:

> *The task of defining a field is difficult. No one definition may be considered as the final definition. It is a reference point which may serve as a stimulus for further discussion. If it is used to promote rigorous discussion among the personnel within the field, it will have served its purpose (p.3).*

In sum, the purpose of this section was to raise the problem of terminology that is often taken-for-granted in the literature. It revealed the inherent contradictions and lack of consistency in the official policy discourse and showed that no single agreed meaning of "ICT" exists in the research community. In view of this problem, the study has adopted the term "educational technology" as a robust and all-inclusive description of the field of inquiry. The researcher's interpretation of this term and others—rightly or wrongly—has been articulated clearly so the meanings are open to scrutiny and rigorous debate. Accordingly, the present study avoids the trap of undisclosed definitions, which have potential to impede the interpretation of results. For the most part, "ICT" is referred to only in the context of its everyday use within the policy and professional discourse. In all other contexts, preference is given to the term "educational technology" or alternatively "new educational technologies", as the root discipline from which computer and Internet use is located as a pedagogical innovation. With consistent nomenclature established, the remainder of the chapter reviews the literature on the pedagogical use of the Internet, beginning with an historical account of computer use through a number of distinct educational technology waves.

2.2 THE LATEST EDUCATIONAL TECHNOLOGY WAVE

Throughout the world, the growth of computer networking coupled with new capabilities of the Internet has stimulated a wave of telecommunications activity in schools. This latest educational technology wave has strong parallels to the original computers in education phenomenon of the 1980s. Indeed, Collis (1996) argues that the "Information Highway Wave" is an iteration of the previous educational computing movement of almost two decades earlier. Both innovations began from a technological breakthrough after which there was an explosive synergy propelled by commercial interests and heightened social expectations. The invention of the personal computer (PC) was the "trigger event" of the first wave, whereas the development of the World Wide Web (WWW) was the catalyst that unleashed the second wave (Collis, 1996). Of course, neither wave has taken place in a vacuum. According to Collis (1996), the first wave was fuelled by vision, by bold predictions, and by fear that schools may be left behind. She claims that teachers did not initiate the use of computers in schools as the surge of enthusiasm was driven by a combination of push factors. She posits that these external factors explain why the diffusion of computers in schools has been so difficult over the years.

The key point is that the same push factors—that is, social vision, social response, social expectation and so forth—still influence the second wave. Thus, the cycle appears to be repeating itself. Collis (1996) warns that if the outcomes of the Information Highway Wave are to be any different from the "half-filled" or "half-empty" legacy of the first wave: 'We will do well to learn from experience' (p.21). The truth is that our experience with educational technology in schools has been somewhat mixed as the previous adage illustrates. In her analysis of the first wave, Collis (1996) refers to the "pendulum effect" where support for educational technology swings from subsidized exploration to eventual withdrawal as principals, practitioners, and policy-makers move on to other projects.

There is a strong sense of *deja vu* when it comes to teaching with technology. From a review of literature, it is easy to form a defeatist and overly pessimistic appreciation of the history of educational technology. After all, many previous critical analyses show that after the initial implementation period of a new educational technology the end-result is resolutely disappointing (Saettler, 1990). While there are multiple layers to any innovation that make sweeping generalizations problematic, technological breakthroughs often attract:

> *... wild projections of massive transformations by futurologists and with descriptions of high hopes for the realization of widespread social and economic reform, and end up in actual reality with failed predictions and quashed hopes (Bryson & De Castell, 1998b, p.66).*

In a seminal book, Cuban (1986) documents the succession of technologies touted as educational panaceas over the last 50 years and describes the gap between predictions and outcomes as the "technology expectation cycle". This cycle begins with a period of high expectations and bold predictions for the future. Seldom do teachers initiate the technology and self-serving promotional tactics by other people and groups often generates initial enthusiasm. This period is followed usually by increasing support for the innovation based on early observations and evidence from lighthouse projects. However, the novelty of the educational technology itself is rarely taken into account when comparisons are made with conventional instruction. Moreover, the proponents of the technology generally disregard complaints from teachers about the logistics of use, technical imperfections and incompatibility with the goals of the curriculum. The next stage is one of subsided enthusiasm and limited use. After a period of implementation, the research often reveals a disappointing level of curriculum integration. It appears that despite all of the effort and rhetoric most teachers only superficially embrace the new educational technology. The last stage of this cycle is normally characterised by the assignment of blame. There are attacks on schools for leaving costly machines to gather cobwebs and stinging rebukes of narrow-minded teachers for blocking progress through modern technology. According to Cuban (1986), few people ever question the wisdom of the innovation itself, and the fickle romance between teaching and educational technology continues within yet another automated or electronic invention.

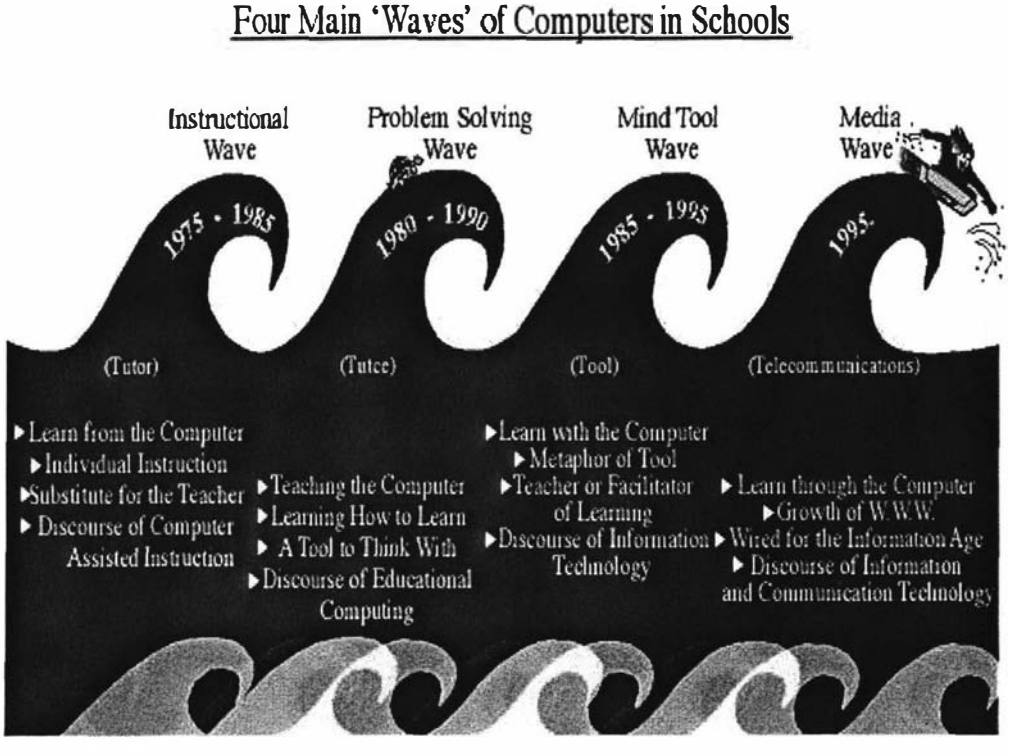

Figure 2.1 The four main waves of computers in schools

Although there is danger of reifying what is essentially a highly deterministic theory, the history of computers in schools can be understood loosely in terms of the above technology expectation cycle (Lai, 1993). Arguably, over the last 20 years four main waves of educational technology have swept through New Zealand schools. The adoption of a wave metaphor as depicted in Figure 2.1 traces the evolution of educational technology along Taylor's (1980) modes of computer use. It illustrates the main changes in the discourse over time and conveys the relatively soft boundaries between each phase as one wave washes into another with no definitive start or end-point. As such, the wave metaphor shows that each new wave is part of the previous one and represents an evolution of development rather than a standalone innovation. Thus, it avoids the determinism of the technology expectation cycle, which is a major flaw of Cuban's (1986) work.

The "Instructional Wave" coincides with the first wave described by Collis (1996) where students were encouraged to learn *from* the computer as a *tutor*. In the early 1980s, the enthusiasts claimed that computer assisted instruction (CAI) would help individualise learning and thereby act as a substitute for the teacher. Of course, the wave began with brave predictions of the technology's potential to revolutionize education. This is what Bork (1980; cited in Crook, 1994) had to say at the beginning of the Instructional Wave:

> *We are at the outset of a major revolution in education, a revolution unparalleled since the invention of the printing press. The computer will be the instrument of this revolution. By the year 2000, the major way of learning at all levels, and in almost all subject areas, will be through the interactive use of computers (p.4).*

In keeping with the expectation cycle, early predictions were followed by a number of test-beds and laboratory experiments (e.g., Project Plato). However, by the mid 1980s as the equivocal nature of the research became apparent it was clear that CAI was failing to transform learning and make it more effective, as predicted. In some quarters, teachers were blamed for their resistance to new computer technology due to inherent conservatism and hysterical fear of being replaced by a machine (Cuban, 1986). It was about then that another educational technology wave began to emerge.

The "Problem Solving Wave" shifted the focus to *tutee* applications where students taught the computer. It coincided with new adaptive theories of human intelligence that led to renewed interest in teaching students how to think—that is, metacognition. Again, there were many claims made about the potential of this latest iteration of educational technology. As Papert (1980) the inventor of the Logo™ programming language stated:

> *We are at a point in the history of education when radical change is possible, and the possibility for that change is directly tied to the impact of the computer (p.36).*

The use of Logo™ and other problem solving software (e.g., interactive fiction) reflected a different philosophy of educational computing in stark contrast from the behaviourist principles of the first wave. Papert (1981, p.87) adopted a romantic constructivist perspective and argued that 'In teaching the computer how to think, children embark on a exploration of how they themselves think'. By the late 1980s, it was apparent from the ambiguous research findings that Logo™ was not going to create a new kind of school without a formal curriculum. As far as some people were concerned, Logo™ did not live up to original expectations (Walsh, 1994). In short, it simply did not work.

The "Mind Tool Wave" marks a period where attention switched to students learning *with* the computer (Ryba & Anderson, 1990). By the 1990s, the metaphor of the computer as a *tool* was dominant. As a tool, the computer had the potential to amplify thinking and scaffold human cognition to new levels. Strong emphasis was placed on student collaboration and the development of language where the teacher's role became a facilitator of learning. This wave coincided with the introduction of the term "IT" in the policy discourse and was associated with the use of tool applications such as word processing, databases and spreadsheets in the classroom. A number of brave claims were associated this type of productivity software. As Nathan (1985; cited in Roblyer, Edwards & Havriluk, 1997) stated:

> *These tools, if used wisely and creatively, have the potential not only to support classroom activities, but also to transform the very nature of the way people learn and work (p.157).*

There is ample evidence to show that many teachers quickly incorporated the word processor into the classroom. It was ideally suited to the new process writing approach of the time. According to Brown (1995b), teachers report that word processing is one of the success stories of computers in schools. That said, the computer is claimed to be nothing more than a glorified typewriter in many classrooms and the research findings on word processing remain highly dependent on the instructional context (Cochran-Smith, 1991). There is little evidence, moreover, to show that databases and spreadsheets ever achieved a high level of curriculum penetration in New Zealand schools (Brown, 1995b).

By the mid 1990s, the level of enthusiasm for the computer as tool was swept away by yet another wave of technology. The "Media Wave" was triggered initially by the emergence of multimedia but it was promptly fuelled by new developments in *telecommunications*, which

gave rise to the introduction of the term "ICT" into the educational policy discourse. This wave is based on a convergence of media into a digital form that allows students to learn *through* connected computers as opposed to just *with* or *from* previously disconnected machines. Schools are being wired for the Information Age so that students can expand their horizons as real-world learning enters the realm of the classroom (Tapscott, 1999). Like previous waves, it is characterized by many pronouncements about the potential of the WWW to transform all facets of life. As Gates (1995) claims:

> *We are all beginning another great journey. We aren't sure where this one will lead us either, but again I am certain this revolution will touch even more lives and take us all farther. The major changes will be in the way people communicate with each other. The benefits and problems arising from this upcoming communications revolution will be much greater than those brought about by the PC revolution (p.XI).*

Obviously this revolution refers to the Internet phenomenon or Information Highway Wave described by Collis (1996). The question is: Will this wave be any different? So far, arguably, the Media Wave appears to have all the hallmarks of previous waves. The Internet fever sweeping the country is shaped by some seductive rhetoric that brings into question the obsolete nature of schools. Teachers are being enticed to embrace this revolution as illustrated in the *spin* and marketing of the new "dream machine" (Dawns & Selwyn, 1999). Already "ICT Lead Schools" have been appointed to act as a test-bed for realizing the potential of this latest educational technology wave. At this stage, there is a lack of research upon which to judge whether the WWW has lived up to early predictions, but history tells us that we should be wary of the overselling of the Internet. This lesson is highlighted in the following quote that could easily apply to the WWW but instead refers to the invention of the wax phonograph cylinder:

> *With the coming of the New Media, the need for print on paper will rapidly diminish. The day will soon arrive when the world's literature will be available from The Automatic Library at the mere pressing of a button (Uzanne, 1894; cited in McFarlane, 1997, p.173).*

While Collis (1996) is more optimistic about the impact of the Internet on education, the legacy of the last 20 years of computers in schools is relatively disappointing. There are of course many examples of good things happening in individual classrooms throughout the world, but as the Presidential Committee of Advisors on Science and Technology (1997) in its *Report to the President on the Use of Technology to Strengthen K-12 Education in the United States* concludes:

During a period in which technology has fundamentally transformed America's offices, factories, and retail establishments, however, its impact within our nation's classrooms has generally been quite modest.

The modest impact beyond isolated small-scale projects is one of the enduring lessons from the history of educational technology. If teachers are to avoid the assignment of blame then they must learn from past mistakes. It is a myth to believe that teaching will automatically change for the better because of a new educational technology. One of the main things learnt from experience is that the "added value" of any new computer technology is often related to how it is used (Brown & Ryba, 1996). But this observation should not obscure the fact that historically the failure of computers in schools has been attributed to poor teaching, when in truth the discourse of policy and supporting infrastructure has been at odds with the level of hype surrounding the innovation (Selwyn, 1999). Despite the promise of recent initiatives, it remains to be seen whether the ICT Strategy will truly address the systemic problems of incorporating new educational technologies throughout New Zealand schools.

In the meantime, a number of commentators believe that the progression from standalone PC to networked computers has followed a predictable pattern over the last two decades, which has given the impression, rightly or wrongly, that each new educational technology has been reinventing the wheel (Collis, 1996). While this observation paints an overly bleak picture of the past, The Milken Exchange eloquently summarizes the technology implementation cycle—albeit following a slightly different sequence:

In the early 1980s, when personal computers first were finding their way into schools... we thought students should learn to program... This was followed by a fascination with Logo to help students think. Then came our love affair with drill and practice applications... to bring up test scores, individualize instruction, and, not incidentally, make technology manageable without much training on the part of teachers. But then classroom-based word processing came on the scene, and educators deemed it important to teach students to use computers for composing and writing... Just as that emphasis was taking hold, along came multimedia, with the spotlight turned to hypertext programming so that students could create dynamic products for an audience. And now, in the late 1990s, we find the Internet is the holy grail whereby students will connect with rich educational resources throughout the world (Fulton, 1997, p.12).

The religious fervor associated with the Internet makes it very difficult for teachers to fully understand the technology's potential. Arguably, the level of hype combined with an over emphasis on infrastructure and preoccupation with the latest technical developments in networking has the potential to sidetrack teachers from the pursuit of new pedagogical understandings. Simply acquiring a greater level of Internet access will not automatically bestow on teachers insight into the wealth of opportunities for better learning through the Internet. As Lai (1996) points out, we need to recognize that providing teachers with 'more training does not necessarily mean better teaching' (p.10). Good teaching is likely to be dependent upon teachers with a sound conceptualization of the Internet to begin with, linked to contemporary understandings of the educative process. This remains a major challenge if the latest technological innovation of the Internet is not going to become just another passing wave in the history of educational technology.

2.3 THEORETICAL CONCEPTIONS OF THE INTERNET

This section shows that the use of the Internet in schools is still immature and further progress is required in better conceptualizing its role in education. Up until now, the Internet phenomenon has been described in a rather imprecise way. After all, the history of the Internet does not start at the beginning of the Media Wave. What we now call the Internet began in the 1960s where in the United States (US) a small number of Department of Defense computers were networked together to share military information (Anderson & Reed, 1998). This initiative was motivated by the fear of the Cold War period and the possibility of a Soviet nuclear strike (Galbreath, 1997). The intention was to establish a decentralised system for storing and exchanging information such that loss of crucial data would be minimised in any nuclear attack. In their spare-time, the people who developed the network also used it to communicate with one another on topics of interest (Merritt & Reynolds, 1995). While the hardware was crude and the method of data transfer slow, this unforeseen use of networked computers was a sign of things to come (Brown, 1995c).

By the 1980s, with the advent of microcomputers and the support of the National Science Foundation (NSF), more universities and government agencies joined the Internet network (Hahn & Stout, 1994). At about the same time, many universities and special interest groups created their own local area networks (LAN) which offered more users a gateway to the much larger original network. By this stage, the Internet had expanded beyond the boundaries of the US and soon just about all the universities throughout the world were connected via computer (Brown & Ryba, 1996). In New Zealand, this network of networks was first available at universities through an intermittent satellite link. This early system was, however, unreliable and with growing demand, in 1992, it was eventually replaced by fibre-optic cable (Merritt & Reynolds, 1995).

At first, the Internet was slow, clumsy to operate and dominated by text requiring hierarchical applications such as Gopher. This quickly changed in the early 1990s with the launch of the WWW, which was first conceptualised in Switzerland and later developed by the National Center for Supercomputing Applications (NCSA) at the University of Illinois. The Web, as it became affectionately known, provided a non-linear hypertext-based system for searching and retrieving electronic resources. Using navigation software such as Mosaic and Netscape, it was now possible to access images, text, audio, and later animations, and even video at the click of a button. These new web browsers combined with the number of new Internet Service Providers (ISPs) sparked a wave of growth that opened up the Web and other Internet services to schools and the public.

As the Internet has evolved it has become a technical innovation with many different meanings (Becker & Ravitz, 1998). It can involve the Web but it might equally entail the use of email, chat, mailing lists, telnet, Usenet, muds and moos, and so forth. The Internet has become a means to play, communicate, search for information, shop electronically, download and listen to music, and teach and learn. By way of the Internet, teachers now have the potential to access just about any kind of material that can be stored in an electronic form. A teacher can use the Internet to find teaching resources or their students can search the Web for information for a report. It is now possible for teachers to incorporate a wide range of Internet activities into their classroom including collaborating with other schools, participating in live events and virtual experiences, and students creating and publishing information on the Web (Cunningham & Andersson, 1999). The point is that when we talk of the Internet it can mean all of these activities and many others. Despite popular belief, it is not just the technical phenomenon of the Web or merely a static source of information.

In the context of education, the Internet needs to be reframed as a pedagogical innovation. Put simply, it needs to be conceptualised from an educational perspective. Over the last 20 years, a plethora of conceptual frameworks has been proposed for understanding the pedagogical value of computers. In the early days, Rushby (1979) proposed a systematic framework for categorising the different uses of computers under four main paradigms of computer use: (a) the instructional, (b) the revelatory, (c) the conjectural, and, (d) the emancipatory. In many ways, these paradigms have stood the test of time and could be adapted easily to better explain the different pedagogical uses of the Internet. However, the categories were never intended to address the potential of networked computers and the framework overlooks the non-neutrality of the technology itself. Although this criticism is accommodated by an extension of Taylor's (1980) 3Ts to include the computer as *toy* and as *topic* of study, the focus is on the applications themselves rather than the context or purpose of their use. Hence, despite the utility of this framework, it contains a significant flaw and is inherently technocentric.

In a more contemporary framework, Crook (1994) places the emphasis not on the technology but on the dimensions of collaboration and social interaction between computers, students and the teacher. There are four configurations of interaction described within this framework: (a) interactions with computers, (b) interactions in relation to computers, (c) interactions at the computer, and, (d) interactions around and through computers (Crook, 1994).

Collaborative interactions "with" computers simulate traditional guided instruction where the computer acts as the expert and engages the novice student in a type of instructional conversation. Whereas, collaborative interactions "in relation to" computers refer to the way students and the teacher interact in the presence of the technology. This is not just intermittent contact while students are engaged in computer activities, but interactions that occur within the broader social context of the classroom. Collaborative interactions "at" computers involve situations where groups of students work together using the technology. This type of interaction is usually where pairs or small groups of students work on the same computer at the same time. The interest here is the type of collaboration that is occurring between the learners as they discuss their ideas and negotiate shared understandings. In contrast, collaborative interactions "around and through" computers entail circumstances where contact may be dislocated in time and space—that is, students are not using the technology together at the same moment or in the same geographical location. The emphasis is on the level of collaboration that can arise when activities are extended beyond standalone classroom computers. While this latter category of interaction involves networked computers, it falls short of conceptualising the different types of learning experiences available beyond the classroom.

In another recent framework, Bruce and Levin (1997) propose a taxonomy for encapsulating the variety of educational technologies and their many uses by adapting a four part division borrowed from Dewey—namely: (a) inquiry, (b) communication, (c) construction, and (d) expression. They expand on each category to demonstrate how this enduring multi-faceted framework supports a raft of technology-based pedagogical activities that incorporate a range of media including the Internet. The term "media" is selected deliberately by Bruce and Levin (1997) to shift attention away from the technical features of the computer to the learner and the tasks on which educational technology is employed. Although this taxonomy includes many of the cutting-edge technologies missing from previous frameworks, just as with Laurillard's (1993) classification of educational technology, the focus is predominantly on higher education. It does not sufficiently explain the categories as they apply to the school sector.

A number of other models have been proposed for conceptualizing the pedagogical possibilities of the Internet (e.g., Dohertly, 1998; Trentin, 1999). Without doubt, however, to date Harris (1998a) has offered the most comprehensive framework relevant to Internet use in schools. The updated version of this framework is designed around 18 Activity Structures, which have quickly become one of the most frequently cited pedagogical models of the Internet in the professional literature (Harris, 1998b). The framework contains three major genres of student action in relation to the Internet (a) interpersonal exchanges, (b) information collection and analysis, and, (c) problem solving.

Harris (1998b) claims that *Interpersonal Exchanges* are probably the most popular type of internet-related activity. This genre involves learning experiences where students talk electronically to other students or groups. Email is often the main form of communication exchange although other applications may include chat, newsgroups, video conferencing, etc. The specific activity structures include:

- *Keypals*
- *Global Classrooms*
- *Electronic Appearances*
- *Telementoring*
- *Question-and-Answer Sessions*
- *Impersonations*

According to Harris (1998c), *Information Collection and Analysis* involves some of the most successful internet-based activities in the classroom. Typically, the activities under this genre require students to collect, compile and compare different types of information from a variety of sources. They involve more than just looking up information on the Web. The specific activity structures that fall within this category are described as:

- *Information Exchanges*
- *Database Creation*
- *Electronic Publishing*
- *Telefieldtrips*
- *Pooled Data Analysis*

Finally, the Internet is shown to have the potential to extend *Problem Solving* in classrooms throughout the world. Harris (1998a) acknowledges that, as yet, problem solving is the least common type of Internet activity within schools. Seven different activity structures are described under the problem solving genre:

- *Information Searches*
- *Peer Feedback*
- *Parallel Problem Solving*
- *Sequential Creations*
- *Telepresent Problem Solving*
- *Simulations*
- *Social Action Projects*

Harris (1998a) provides a detailed description of each activity structure with specific examples for all three genres. A more detailed description of each genre is beyond the scope of the Literature Review but the potential value of this framework has been summarised in a number of recent publications targeted at New Zealand teachers (e.g., Trewern, 1999). So far this framework is the best attempt to articulate the many faces of the Internet from a pedagogical perspective; it helps to add further flesh to the Internet as the latest technological innovation in the classroom.

The framework is informed by a clear philosophy of the teacher's role. Across each genre, Harris (1998a) adopts the metaphor of teachers as "instructional designers" based on the assumption:

> *Teachers will continue to use telecomputing tools in the classroom only if they can successfully design instructional activities that employ these tools in unique, personalized ways (p.2).*

She claims that internet-using teachers must take this new tool and "make it their own" if the innovation is to continue (Harris, 1998a). In other words, they must *reinvent* the learning experiences for themselves to fully appreciate and understand the Internet's potential. According to Harris (1998a), one way to achieve this goal is to provide teachers with a number of multi-level, multi-disciplinary activity structures for models of curriculum design. The belief is that teachers can function more as instructional designers when they have a broad conceptual model from which they can create their own customized pedagogical activities. In this regard, Harris (1998b) wants teachers to move away from merely adapting and replicating other peoples' lesson plans and preexisting internet-based learning experiences. A core assumption of this approach is that there is no one "best" model of Internet use in schools. Instead:

> *A carefully selected, consciously applied variety of models... will help to create optimal learning environments for students (Harris, 1998a, p.4).*

With this in mind, the aforementioned activity structures are intended to provide teachers with a 'cafeteria of alternatives' (Joyce & Weil, 1972; cited in Harris, 1998a, p.4) from which they can design and implement their own internet-related learning experiences as deemed suitable for their own students. In this sense, the framework simply maps the typography of the Internet as a pedagogical innovation. Thus, it requires teachers to think and does not fall into the trap of providing a tightly prescribed recipe for other people to follow. On the other hand, this approach treats the Internet as a neutral pedagogical innovation as it fails to acknowledge the inherently value-laden nature of educational technology. There is no attempt to critique the various internet-related learning experiences from a reconceptualist tradition or social relevance perspective of curriculum design in which the curriculum is seen as reinforcing some of the most urgent social problems of our time (Walker & Soltis, 1997). Those who subscribe to the latter view are deeply suspicious of how new educational technology is touted by people and groups in power and see 'the curriculum as an instrument to help students change the world into a better society' (White & Purdom, 1996, p.7). Few of the proposed internet activity structures are designed to fit this requirement and the framework makes little or no reference to the extensive curriculum design literature. It not only fails to explicitly acknowledge this literature but also has yet to demonstrate how each activity relates to contemporary developments in socio-cognitive learning theory. For this reason, it remains an incomplete conceptual framework for understanding the Internet as a technical and pedagogical innovation.

In sum, there is more to the Internet than accessing information. While an information metaphor is common in the literature, the Internet is a complex social, economic and educational phenomenon where people can network, share ideas, and develop new relationships. Hence, the Internet can also be conceptualised under the framework of a communication metaphor. As yet, partly because of its dynamic nature, there is no single all-inclusive framework that describes what the Internet is and how it can be used for educational purposes. Consequently, the alternative frameworks, with their different categories and dimensions of Internet use, should be viewed as complementary to each other rather than in competition. When used together and considered as a whole the frameworks offer a robust construct for trying to better define both the *information* and *communication* potential of the Internet in education. The search continues for a rich unifying framework with a strong contextual flavour, which offers a deeper analysis of the Internet from a contemporary understanding of the learning and teaching process.

2.4 LEARNING THEORIES AND EDUCATIONAL TECHNOLOGY

There are many current theories that explain how the use of educational technology can contribute to learning. Over the years, the alternative theoretical perspectives have been the subject of much analysis and debate. In a broad sense, two main traditions of learning

theory have emerged from this debate with contrasting theoretical perspectives. It is common throughout the literature to depict the behavioural tradition and the cognitive tradition at opposing ends of a learning continuum (Brown, 1995b). Despite the binary nature of this distinction, the respective theoretical perspectives are not considered separate and mutually exclusive categories; they reflect an evolution of thought rather than a discontinuous series of steps. The purpose of describing each perspective as a separate theory is to provide an indication of how the perspectives themselves and the claims about the potential of educational technology have evolved over time.

The behavioural tradition denotes those perspectives that are concerned with behaviour and its modifications rather than hidden mental processes (Ryba & Anderson, 1990). It is a tradition founded on the principle that learning can be observed and quantified through the control of stimuli and the appropriate sequencing of teaching material. The emphasis is on individualised instruction following small learning steps with reinforcing rewards when students get the right answer (Jones & Mercer, 1993). Inherent within behaviourist theory is that teaching steps have to be small in order to be successful, and that these have to be linked in chains to yield mastery of more complex material. The origin of the behavioural tradition can be traced back to the beginning of the 20th century when the instructional technology perspective promoted the benefits of controlling the sequence of instruction to maximise the probability of learning—long before the invention of the computer. The following primary source quote offers valuable insight into the thinking underlying this perspective:

> *If by a miracle of mechanical ingenuity, a book could be so arranged that only to him [her] who had done what was directed on page one would page two become visible... much that now requires personal instruction could be managed by print.... Books to be given out in loose sheets, a page at a time, and books so arranged that the student only suffers if he [she] misuses them, should be worked in many subjects (Thorndike, 1911, p.221).*

The extract from Edward Thorndike demonstrates that behaviourist theory has a long tradition and is an approach to using technology for learning that remains influential in schools. Of course, the concept of the mechanical book was advanced through the work of B.F. Skinner and the development of the mechanical teaching machine. Skinner (1954) was a vocal advocate of behaviourist theory and the use of machines to teach subject material based on the principles of Operant Conditioning. The programmed instruction perspective proposed that teaching machines provided the means to control stimuli and reinforce the probability of students gaining correct responses. The advent of CAI was an extension of this perspective just as arguably the Internet now opens new possibilities for managing instruction and the careful sequencing of subject material along these principles.

Table 2.1
Learning Traditions and Perspectives in the Educational Technologies Literature

Learning Tradition	Learning Perspective	Main Tenets
Behavioural	*Instructional Technology*	• instruction is individualised • teacher is manager of instruction • emphasis is on connection between tasks • attempts to control the sequence of instruction • aim is to make teaching as efficient as possible
	Programmed Instruction	• learning is in a chain of small steps • attempts to reinforce appropriate behaviour • computer is used to individualise instruction • technology acts as a substitute for the teacher • teacher is at the centre of the learning process
Cognitive	*Information Processing*	• brain is like a computer • people have short and long term memories • key to learning is the quality of the processing • learning problems are problems in information loss • technology helps to teach specific information processing strategies
	Metacognitive	• thinking about thinking • focus on helping students learn how to learn • regulation of one's own thinking processes • students take responsibility for their own learning • direct teaching of learning strategies and higher order thinking skills with technology
	Constructivist	• emphasis on learner's prior experience • learners build their own cognitive structures • attention on student's concepts and understandings • knowledge is individually and socially constructed • technology creates rich learning environment for discovery where teacher acts as a facilitator
	Cognitive Apprenticeship	• teacher is an expert or coach • cognition is situated in real contexts • expert learners have more domain knowledge • focus on the dialogue between experts and novices • technology is used to imitate authentic contexts not possible in conventional classrooms
	Socio-Cultural	• learning is a social phenomenon • culture is embedded in all learning experience • language is central to the richness of human culture • speech and action together help process information • technology scaffolds learning and knowledge is inducted through communities of practice
Overarching	*Inclusive*	• synthesis of learning theory • trans disciplinary incorporation of concepts • perspectives are simply explanatory constructs • seeks to understand the nuances of each perspective • offers the big picture of the evolution of theory • emphasis on the multi-faceted nature of technology • teacher adopts a dual role as facilitator and manager

(adapted from Brown, 1995b)

In contrast, the cognitive learning tradition is concerned with the underlying mental processes of thinking and learning (Ryba & Anderson, 1990). The so-called cognitive revolution grew out of concern that behavioural perspectives took no account of the internal processes that occur in students during the learning process. Proponents of this tradition maintain that teaching must consider the existing cognitive structure and knowledge of the learner. How knowledge is internally organised by the student has considerable impact on what is learned (Simonson & Thompson, 1994). This tradition assumes that students bring to each task an individual and unique set of prior experiences, knowledge, self and task perceptions and motivations that mediate whether new learning will occur. All these factors combine to affect the way the learner responds and completes a learning task. Consequently, there is more to learning than knowledge transmission and it is insufficient for students to be passive recipients of large volumes of information.

From the cognitive tradition, it is the analysis, interpretation and evaluation of information in ways that are personally meaningful that adds real value to the learning process. We know that it is insufficient for technology to expose students to large volumes of disorganized information, as they may become overwhelmed in information but left thirsty for real knowledge (Brown & Ryba, 1996). Put another way, using the Internet as a large diameter pipeline through which to download increasing amounts of information may lead to passive 1950s style learning on 21st century networks (Brown, 1999).

The Cognitive Perspectives

There are many perspectives that make up the cognitive tradition and they tend to differ in their emphasis and interpretation on four key dimensions of human cognition—that is, the (a) individual nature of cognition, (b) social nature of cognition, (c) situated nature of cognition, and (d) distributed nature of cognition (see Table 2.1). With these dimensions in mind, the following discussion attempts to briefly illustrate some of the main differences between the perspectives.

The information processing perspective recognises that the key to deep learning lies in the quality of the processing. It uses the computer as a metaphor to explain individual cognitive processes, such as information acquisition, retention and retrieval (Atkinson & Shiffrin, 1968). The perspective concentrates almost exclusively on the mechanisms involved in the flow and storage of information within the brain (Crook, 1994). Thus, it is very much an individual theory of human cognition.

The metacognitive perspective is concerned with identifying and explaining the cognitive processes engaged in knowledge acquisition. Metacognition is divided into two parts: knowledge of cognition and regulation of cognition (Young, 1997). This perspective seeks

to make people more aware of their own thinking processes and encourages learners to make conscious attempts to control and self-regulate their cognitive strategies (Brown, 1978). It follows that metacognition is central to the ability to learn how to learn (Lieberman & Linn, 1991). The main aim is to encourage students to become reflective thinkers and self-directed learners, which has proved to be more difficult than first envisaged (Boekaerts, 1997). Despite this, it is important to note that 'metacognitive awareness and self-regulatory activity has its root in social interactions with others' (Reeve & Brown, 1985, p.347). Thus, this perspective entails an interest in both the individual and social nature of cognition.

The basic tenet of the constructivist perspective is that people learn by processing information they encounter on the basis of what they already know, and thus construct their own knowledge (Jones & Mercer, 1993). Implicit in constructivist theory is the assumption that new understandings are built upon existing knowledge structures and these are derived from one's previous experience (Duffy & Jonassen, 1991). In its purest form, therefore, this learning theory implies that knowledge construction is a very individual process. Consequently, the teacher's role is often portrayed as a facilitator or guide on the side (Sprague & Dede, 1999). There are many blends of constructivism (Phillips, 1995), however, and recent iterations of the theory acknowledge that human cognition does not take place in a social vacuum (e.g., Perkins, 1991). So, there is an individual and social dimension to human learning. Despite the move towards a social constructivist perspective, some deep and unresolved issues still pertain to rival constructivist theories, which make this perspective far more problematic than evident in the professional discourse.

The cognitive apprenticeship perspective emanates from an interest in the area of artificial intelligence and anthropological work on the learning process outside of school (e.g., Resnick, 1987; Salomon, 1988). It emphasizes the "communities of practice" (Lave & Wenger, 1991) in which learning takes places in the real world and the need to better connect these with the learning communities of schools (Jonassen, 1995). A basic assumption is that the acquisition of knowledge and skills should be anchored in the social and functional contexts of their use (Brown, Collins & Duguid, 1989). To overcome the problem of inert knowledge that has little durability in actual life situations, learning must be embedded in contexts that are representative of the kinds of problems to which students will have to apply their knowledge and skills in the future (The Cognition and Technology Group at Vanderbilt, 1996). The aim is to situate cognition in authentic problems that are relevant to the real world of students (De Corte, 1990). From this perspective, the teacher's role is to help students acquire domain specific knowledge through scaffolded instruction where control is gradually faded from the expert to the novice. So, the social and situated nature of human cognition is a hallmark of this perspective, which like many of the other theories attracts a fair degree of criticism and controversy in the literature (Greeno, 1997).

The socio-cultural perspective presents human learning as socially grounded within culture. Learning is profoundly defined as a social phenomenon—that is, an activity embedded within culture rather than just a set of cognitive processes thought to exist in the head (Crook, 1994). This perspective arises from a school of thought inspired by the Soviet socio-historical movement of the 1930s and, in particular, the work of Vygotsky. A basic tenet is that cognitive attributes of the individual are the outcome of engagement with culture. As we interact with people, and participate in communities of practice, our beliefs and values are influenced by those with whom we converse (Jonassen, Peck & Wilson, 1999). Thus, language is central to thinking and the richness of human culture. In contrast to other perspectives, language is seen as a cognitive tool that helps people to think in new ways (Jones & Mercer, 1993). Implicit within this perspective is the idea that human cognition is distributed throughout our tools and culture (Jonassen, 1995). In this sense, culture is a kind of distributed memory where each individual both stores and contributes to the total memory of the community. As people spend more time in communities to which they are connected, both physically and virtually, they acquire more knowledge and have more influence in shaping its beliefs and culture (Scadamalia & Bereiter, 1994).

The key point of this perspective is that individual accounts of cognition must incorporate a socio-cultural dimension with a strong distributed flavour (Crook, 1994). Learning is not just an individual process. Human cognition is claimed to initially occur on an inter-psychological plane and encountered only at the intra-psychological plane once it has been socially mediated through culture (Wertsch, 1985). Of course, the problem is that culture and membership of a community can be very controlling, and it is easy for people be misled and fooled by groupthink. Thus, the point to note is that *what* students learn is equally important to *how* they learn, which has sometimes been overlooked when studying the learning process.

Active and Meaningful Learning

Although the perspectives differ in some crucial areas and are known by different names depending on the school of thought, they share a number of similar assumptions. There is general agreement that learning is a consequence of thinking and good thinking is learnable by all students when it involves the *active* and *meaningful* use of knowledge. Grabe and Grabe (1998) use the term active as an acronym to synthesize the basic tenets of cognitive theory. When learning is "active" it is claimed to involve:

- *Active tasks requiring students to transform information into generative as opposed to inert knowledge that is personally meaningful;*
- *Cooperative tasks requiring meaningful interaction among students that challenges their thinking and opens their ideas to wider scrutiny;*

- *Theme-based tasks requiring flexible and project-based learning activities that are relevant to the interests of learners;*

- *Integrated tasks emphasising all essential learning areas where technology is used as a tool to encourage meaningful problem-based learning;*

- *Versatile tasks requiring use of technology only when most appropriate and the emphasis is on developing skills and knowledge that can be readily transferred to authentic problems;*

- *Evaluative tasks encouraging authentic assessment of technological capability within different skill and knowledge domains (adapted from Grabe & Grabe, 1998).*

In a similar vein, Jonassen (1995) offers a seven-fold model of meaningful learning from a social constructivist perspective. Educational technology must be situated within (a) active, (b) constructive, (c) collaborative, (d) intentional, (e) conversational, (f) contextualized, and (g) reflective learning environments. Each attribute adds flesh to the concept of meaningful learning and at a basic level the framework offers a powerful synthesis of recent developments in cognitive theory. In their revised five-fold framework, Jonassen, Peck and Wilson (1999) make explicit the following assumptions about meaningful learning from their blend of constructivism:

- *Meaning is in the mind of the knower;*

- *Knowledge is constructed not transmitted;*

- *There are multiple perspectives on the world;*

- *Knowledge construction results from activity, so knowledge is embedded in activity;*

- *Knowledge is anchored in and indexed by the context in which the learning activity occurs;*

- *Knowledge-building requires articulation, expression, or representation of what is learned;*

- *Meaning may also be shared with others, so meaning making can also result from conversation;*

- *Meaning making is prompted by a problem, question, confusion, disagreement, or dissonance and so involves personal ownership of that problem;*

- *Meaning making and thinking are distributed throughout our tools, culture and community;*

- *Not all meaning is created equally.*

Although active and meaningful learning can take many different forms, over the past 30 years a more complete picture has emerged from a number of scientific fields of how learning occurs (Bransford, Brown & Cocking, 1999). The convergence of cognitive psychology, developmental psychology, and neuroscience, to name just three, shows that active engagement, meaningful problem-solving, and so forth, are vital. When these principles are translated into practice through project-based and problem-based learning experiences, there is a rich context for knowledge-building and greater potential for positive transfer (Brown, & Ryba, 1996). A great deal of research has shown that learning tasks that are situated, over time, in some active and meaningful context are not only better understood, but also more consistently transferred to new situations (Perkins, 1992). We have also learnt that time allocated to learning experiences and much of what constitutes the typical approach to student assessment is antithetical to what promotes active and meaningful learning (Bransford, Brown & Cocking, 1999).

Learning is Messy

Dwyer (1996) describes the new science of learning as a shift from knowledge instruction to knowledge construction. This type of bipolar distinction is popular in the literature as it helps to amplify the key differences between the two main learning traditions. However, there is a danger of this theoretical dichotomy being reified too zealously in the context of educational technology. Although research has given rise to some consensus of what we know about learning and the learning process, the synthesis of evidence from cognitive theory provides no recipe for the design of knowledge-building learning environments (Bransford, Brown & Cocking, 1999). At a deeper level, this dichotomy conceals the conceptual rifts, the inherent contradictions, and the contestable nature of contemporary accounts of the learning process. Put simply, learning is a far messier process than conveyed through the catechisms of active and meaningful learning. The relationship between the different learning theories and perspectives cannot be encapsulated on a single linear dichotomy. At the very least, the different theoretical perspectives need to be located and understood on both vertical and horizontal axes (Good & Brophy, 1995).

On one axis, for example, the theories differ in the way they view knowledge. At one extreme, the traditional behaviorists understand the world as fixed and knowable. From this end of the axis, learning is about understanding the world as it really is. The aim is to use educational technology as a means of helping to teach the learner the correct view of the world. Thus, the teacher is a manager of instruction. At the other extreme of the axis, the world is essentially unknowable. For example, from a radical constructivist or post-modem perspective there is no real world. Even if one exists, as some constructivists concede, we can never be sure that we know what it is. It follows that when students construct their own view of the world based on their own experiences no one view is necessarily better than another. From this perspective, the teacher is simply a facilitator of learning. The major difference at points along this axis is whether knowledge is seen as absolute or relative and the nature of the teacher's role.

The second major axis is the individual—social—cultural continuum (Good & Brophy, 1995). At one end of this axis, the focus is on the individual and their attempts to understand the world through fairly passive forms of instruction. Little or no attention is given to learning from others in a social context. At the middle of this axis, learning is inherently a social process where students learn from interaction with others. Further along the continuum, at the opposite end, learning is distributed across and tightly bound within culture. It is a deeply reciprocal and mutually shared activity, which is embedded in communities of practice across time, space and geographical location. In this sense, the continuum extends beyond knowledge construction to knowledge induction. Overall, the point of difference along this axis is whether knowledge building is mindless or mindful—the latter requires us to consider whether human cognition is an individual, social or cultural mediated activity.

When the aforementioned theories and perspectives is plotted at the respective intersections of these two axes, a better insight is gained into the uneven state of the theoretical landscape. In some cases, what appear similar theoretical positions under the cognitive umbrella are now poles apart. Some cognitive theorists, for example, might hold to a socially mediated view of learning but retain a realist conception of knowledge. Whereas other theorists ascribe to a similar view of the learning process but maintain that knowledge is relative to the context in which it is used. It needs to be borne in mind that other axes can be added to this matrix, such as creativity, motivation, learner control, and so forth, which further complicate the terrain. The lesson from the dualism of these two main axes is that despite the emergence of some common ground, learning is messy and the study of human cognition remains open to conjecture.

The Value of Learning Theory

If no single all-inclusive learning theory exists then what is the value of all this theory? The answer is that everyone, academics and teachers alike, are "theorizing creatures" guided by theory, whether it be formal, informal, simple or complex (Rajagopalan, 1998). Our observations are shaped by theories and these are what we use to make sense of the potential of new educational technologies—for better and worse. Amongst other things, the role of theory is that it: (a) helps us envision new worlds, (b) allows us to see the world differently, (c) gives us a language to articulate our worldviews, and (d) keeps us critical and intellectually honest. Indeed, the ability to critically reflect on teaching practice is highly problematic without a set of explicit theories.

With this in mind, an overarching approach is proposed for understanding the potential of the Internet where the different genres and theoretical models of the learning process are not seen to be mutually exclusive. In the past, there has been a tendency to view the two main learning traditions as competing theories. A more pluralistic approach focuses on both the differences and commonalities between the learning perspectives. It does not see them in direct competition on a linear axis but rather seeks to identify and understand the nuances of each perspective and locate these within an overarching framework. The position is taken that we need to retain the big picture to understand the complexity and complementary elements of each perspective, and the range of learning opportunities afforded by new educational technologies. In this sense, an inclusive perspective offers a synthesis of learning theory through a trans-disciplinary incorporation of the alternative theoretical perspectives. Such an approach is based on the view that theory is not a fully elaborated position that is impermeable to historical shifts or reformulations. Instead, theory is a partially developed explanatory construct that can always evolve and shift along a theoretical axis in response to new experiences and understandings. In sum, this overarching approach with its pluralistic tolerance of each perspective acknowledges the reciprocity between theory and practice and does not view formal and informal theories of human cognition as mutually exclusive.

2.5 LEARNING AND THE INTERNET

This section attempts to operationalise an inclusive perspective through an overarching conceptual framework that maps the four key dimensions of human cognition in relation to the potential uses of the Internet in schools. The framework is an embryonic effort at synthesizing the immature literature pertaining to learning theory and the Internet. It is proposed here as a useful model, albeit underdeveloped, from which to anchor further research and understandings on the potential of the Internet as a pedagogical innovation. The framework recognises four potential contexts of Internet use: (a) content, (b) connectivity, (c) community, and (d) construction. A real strength of the "4Cs" is that each metaphor is

informed by the main elements of learning theory outlined earlier in this chapter. In many ways, the model is equally applicable to the different uses that students and teachers can make of the Internet.

The Internet as Content

The Internet is one of the best resources that teachers have at their disposal for up-to-date information. Having said that, there is no guarantee that the wealth of information available through electronic sources will lead to more active and meaningful learning in the way advocated by contemporary learning theory. When the Internet is used for "content", it may simply promote an "information banking" (Freire, 1972) conception of schooling in which students are rarely asked to challenge their existing ways of knowing. Put another way, the content metaphor of the Internet may drown students in information but starve them of new knowledge (Brown & Ryba, 1996). If we have learnt anything over the years, it is that education is not about the acquisition of subject content. Rather, it entails a critical analysis of what we know, where students need to question the dominant sources of information as they build knowledge for understanding, which has the potential to transform their whole perspective of the world.

The key point is that there is more to using the Internet in education than as a 'giant CD-ROM in the sky' (Williams, 1997, p. 44). While this metaphor fits well with a traditional model of the curriculum, the amount of data now available through electronic and other means requires that students become effective processors of information. They need to become critical navigators of knowledge (Brown, 1999). This requires a deeper understanding of the learning process and involves using the Internet as an information resource for more than just tele-access activities (Schrum & Berefeld, 1997). After all, Harris (1998b) has shown that the Internet provides an ideal context for authentic and collaborative learning activities where students are actively involved in the problem solving process. We know that students can work in groups using the Internet to ask essential questions, research genuine problems and in the process reflect on which strategies are best for getting specific information (McKenzie, 1998). There are many such tele-research activities and information literacy models that provide opportunities for students to "wander, wiggle and weave" through a systematic investigative process (Lamb, Smith & Johnson, 1997).

When the Internet is used in this way the emphasis shifts from the transmission of inert knowledge—that which is factual but does not make much difference to one's life—to generative knowledge, which is durable, flexible and more likely to have personal significance (Dede; cited in O'Neil, 1995). This approach enables students to reflectively follow an authentic line of inquiry using meaningful time sensitive data. The major advantage is that knowledge is shown to be dynamic and changing, rather than fixed at a point in time

(Brown & Ryba, 1996). Conflicting information from a variety of sources requires students to determine which ones are not only factual, but also trustworthy and honest. It follows that an essential aim of using the Internet to gather content should be to foster the development of generative knowledge by opening information to wider scrutiny (Brown, 1999). However, if teachers simply graft the Internet on to a traditional model of teaching then the new electronic information will do little or nothing to challenge the dominant "information banking" metaphor of schooling. The lesson is that mere exposure to information in novel ways will not promote teacher independent thinkers ready to face the world as critical, responsible, thinking members of society.

The Internet as Connectivity

The Internet opens up a new world of "connectivity" for the exchange of ideas and information between people (Brown, 1999). When teachers use the Internet as a means of communication, it affords opportunities for intellectual partnerships where people can learn from one another without the limitation of geographical constraints. Its allows students to acquire knowledge through distributed relationships, where they learn to see how other people think and potentially begin to reflect on their own thought processes. In this sense, they engage in metacognition. The privacy and relative safety of electronic communications—chat, email, newsgroups, etc.—provides an excellent way for students to articulate their own thinking processes and gradually test and share their personal beliefs with a wider audience. In an online environment, social interaction takes on a new meaning and virtual relationships can be rich sources of cognitive conflict (Brown & Ryba, 1996). The connectivity of the Internet can result in partnerships that are similar to one with a more capable peer. In this way, the Internet allows the learner to expand their Zone of Proximal Develop (ZPD) and scaffolds skill and knowledge not possible in other contexts. So, connectivity has the potential to amplify human cognition across time and space by building new knowledge networks.

There are many opportunities where "keypal", "ask an expert" and "tele-mentorship" activities provide the chance for students to engage in thinking processes not possible through conventional teaching methods (e.g., Serim & Koch, 1996). Some of these activities allow instruction to be scaffolded by an expert where students learn as apprentices by working alongside a more experienced old-timer. After all, there is nothing better than asking an expert for assistance when you need help (Brown, 1999). This recognises that human intelligence is distributed across culture, and expertise is rarely the preserve of a single individual. Whatever the form of communication, best practice will encourage a greater sense of intimacy between people and connectivity of understandings. The Internet makes it possible to talk with people from different backgrounds and to hear first hand about their difficulties, which is a near impossible learning experience under normal circumstances. It

enables students to compare and contrast other cultures with their own and to reflect on similarities and differences (Sewell & Brown, 1999). When designed in accordance with the principles of active and meaningful learning such "tele-presences" provide a clear transformational advantage over conventional classroom activities. As Robinson (1993) points out, the Internet should be used for educational activities that nurture rich forms of collaboration between people not possible by alternative and more conventional means.

The Internet as Community

One of the most promising Internet uses is when the partnership between people and technology creates powerful new online learning communities. In this context, a "community" is defined as a basic form of social organization consisting of individuals and groups who share common interests, values and goals (Schrum & Berefeld, 1997). The view advanced here is that online communities of practice are far more powerful than connectivity alone. Put simply, there is more to learning under the metaphor of community than just electronic communication between individuals (Brown, 1999). This metaphor is based on the premise that learning is a socially and culturally mediated process. Added to this, learning frequently takes place unintentionally within informal and nonformal communities of practice. The Internet can nurture the establishment of online communities and give rise to new "cognitive clusters" that help to induct students and novice members with new knowledge.

When learners become members of an online community, they acquire new insights and understandings that potentially reshape their values and beliefs. This assumption is based on the belief that humans naturally work in knowledge building communities, exploiting each others skills, appropriating each others knowledge and seeking out help from other people when problem solving (Jonassen, Peck & Wilson, 1999). Given the opportunity to participate, individuals readily adopt the cultural practices and tacit knowledge of such communities with great success (Brown, Collins & Duguid, 1989). At the outset, new members start on the outside of the community and slowly progress toward deeper understandings as they identify with the culture and become more active within its social milieu (Brown, 1999). By analogy, the progression is similar to the difference between learning about another country, from someone who lives in that country, to actually visiting the country itself. Then, after a period, moving from being a visitor with a tourist's gaze, to a resident with all the tacit knowledge that comes from membership of a local community (Williams, 1998). Hence, learning in an online community is a process of gaining increasing wisdom over time. It is best thought of as a work in progress.

The major advantage of the connected classroom is that learning is not only reliant on a more capable peer. Under this metaphor, learning is supported and sustained by a community

which extends beyond the traditional classroom. People can be members of more than one community and each online community acts as a separate ZPD from which learning can be scaffolded (Brown, 1999). In this regard, teachers should not underestimate the potential of traditional Internet applications, such as chat and email lists as community building tools. These applications easily lend themselves to participation in online learning communities through tele-sharing and tele-collaborative projects (Schrum & Berefeld, 1997), where ideas are debated, risks are taken, and mistakes are seen as natural steps in learning—necessary features of "guided apprenticeship" from novice to expert (Brown & Ryba, 1996). It is these apprenticeships in genuine communities of practice that help students and teachers to construct new knowledge with the potential to result in educational transformations.

This is in contrast to classrooms as we know them. The fact is that schools are not an authentic community of practice (Resnick, 1987). Most learning activities do not resemble the practices undertaken by people within their respective subject cultures outside of schools. Put bluntly, the ability to pass exams is a reflection of a student's success in school culture rather than a reflection of their ability to apply a particular knowledge domain when solving authentic problems (Perkins, 1992). Consequently, the type of knowledge gained within the culture of the classroom is often fragile and disconnected from the real world. It may be useful for what happens in schools but not much else. The metaphor of community, therefore, requires us to adopt a new way of thinking about the nature of schools.

The Internet as Construction

The least well known context of Internet use is "construction". This is where students and teachers work through a hypercomposition design model to build their own electronic products (Grabe & Grabe, 1998). The point is that the "added value" of the Internet is not simply viewing someone else's creation, but rather the type of learning processes students engage in as they investigate meaningful problems, debate and reflect upon the results, and eventually publish and share their findings with a wider audience (Brown & Ryba, 1996). When the Internet is used for construction, it provides an excellent audience and publication medium for student creations. As Brown and Riley (1997) claim, the construction of multimedia and web pages is a logical extension of the cyber-cycle. This cycle is consistent with recent developments in learning theory that attempt to situate cognition in authentic projects and team investigations that promote greater transfer of learning to actual life situations. In keeping with the principles of cognitive apprenticeship, students can learn from doing as they work both individually and alongside others on authentic problem-based learning tasks (Cunningham & Andersson, 1999). Importantly, this approach does not automatically privilege web-based resources over traditional materials. The point is that construction activities can be grafted readily on to already sound teaching practices that promote active and meaningful learning.

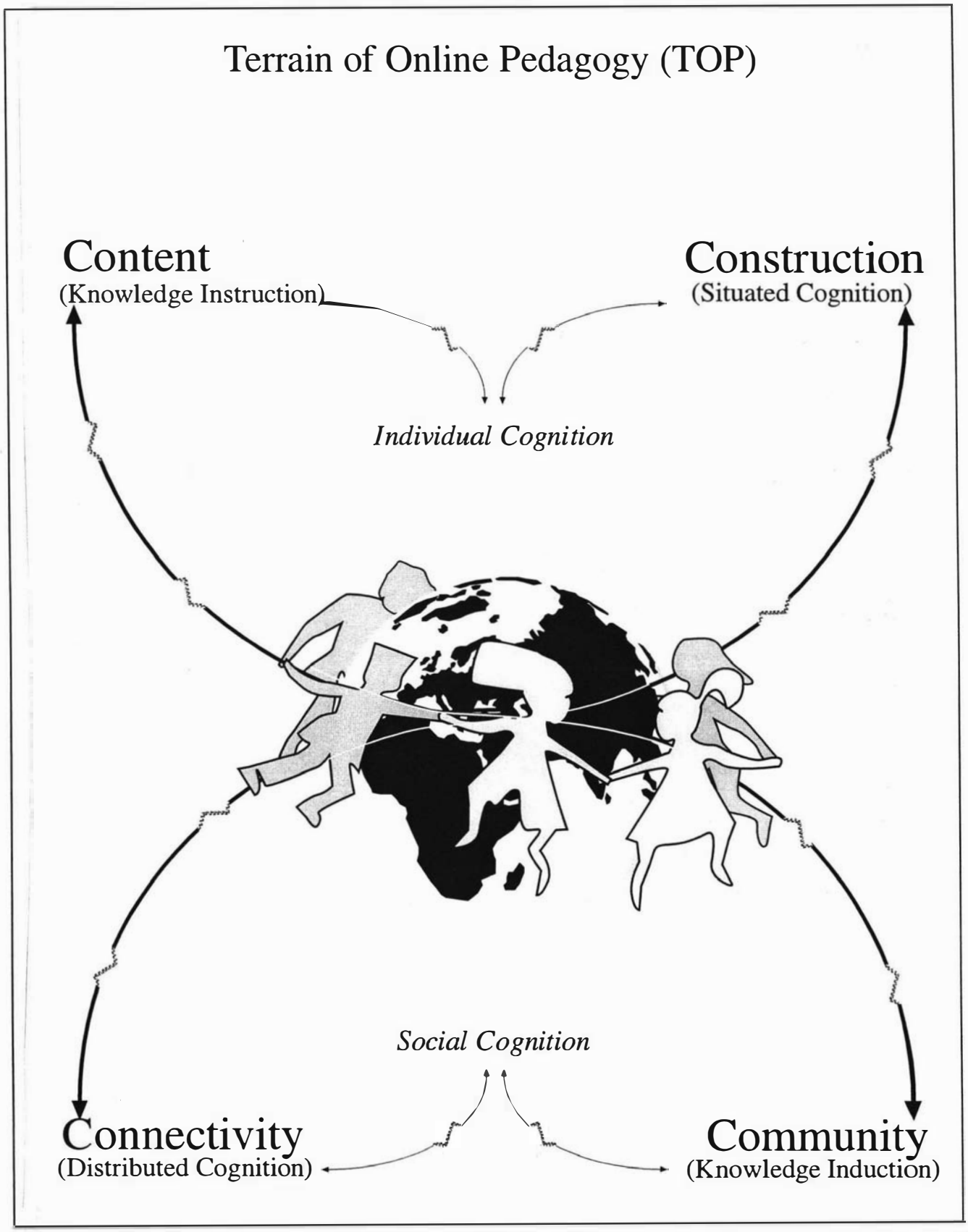

Figure 2.2 The terrain of online pedagogy

The Terrain of Online Pedagogy

In a similar way to learning theory, the different contexts of Internet use can be plotted on two intersecting lines or wires as depicted in Figure 2.2. At one end of the wire, the Internet is used for the acquisition of traditional content knowledge. This reflects an "information banking" view of schooling at the extreme end of the continuum. While some internet-based tasks are better than other activities, the general emphasis is on the individual learner and knowledge instruction. In contrast, at the other end of the continuum, knowledge is inducted through the Internet, as learners become members of an online community of practice. Here the Internet is part of a larger cultural system of learning where the construction of knowledge is a process of induction within a wider community. The major point of difference is that much of what is learned occurs without formal teaching and the learner acquires increasing knowledge through experience. This conceptual dichotomy is intended to show that when students merely learn from the Internet there is no guarantee that new electronic content offers a transformational advantage over more conventional teaching materials. Although we lack good quality research, it appears that many teachers are using the Internet in this rather limited way (Barron & Ivers, 1998). Certainly improved access to up-to-date information is advantageous, but active knowledge construction depends on mindful and strategic navigation of electronic content.

On the other wire, when the Internet is used for the purpose of communication where people become electronically connected through networks there is greater potential for the sharing of knowledge across distributed contexts. New intellectual partnerships can arise from online relationships leading to increased curiosity, inquisitiveness and social interaction. At this end of the continuum, the Internet allows ideas to be shared which lead to potentially deeper levels of thinking and a stronger sense of efficacy as a thinker (Sewell & Brown, 1999). The point is that rich online relationships are likely to develop when learners actively participate in distributed contexts beyond the traditional classroom. Of course, the development of higher order thinking skills is intertwined tightly with the acquisition of domain specific knowledge and this is recognised at the other end of the line. It is only in situated contexts designed for authentic problem solving where a lot of tacit and durable knowledge is acquired, especially when there is guidance from an expert or master teacher. The point of this dichotomy is to show that little will be gained from better Internet access that merely encourages people to make connections with those in other spaces and geographical locations. At this end of the continuum, it is easy to become lost in cyberspace. Whereas at the other end of the wire a situated approach is advocated to knowledge construction as the best means of translating the principles of active and meaningful learning into classroom practice.

On the whole, this framework provides a structure for thinking about the Internet steeped in deep thinking and rich understandings of the leaming process. It provides a theoretical lens to better identify the raft of opportunities the Internet makes available for active and meaningful learning. Although the two wires continue a rather binary analysis, when combined the 4C framework provides a more complete map of the terrain of online pedagogy (TOP). In a loose sense, it provides a framework to overlay the different internet activity structures with what is known about the nature of human cognition. Of course, like any terrain, there are contours and mountains not always evident on the map. The key point is that the terrain is more complicated and less symmetrical than conveyed by the two-dimensional representation of the TOP framework, as there is not a straight line of sight from one end of the axis to the other.

Despite this, the framework shows that the Internet can help transform the curriculum but only if the technology is used to support models of learning underpinned by sound teaching practice. Suffice to say the Internet can only amplify an already sound curriculum based on contemporary principles of learning theory; it cannot supplant a deficient one (Brown, 1999). Too often in the past teachers have attempted to tame a new educational technology by grafting it on to an out-of-date approach to learning—for example, early experiences with CAI. Prior experience has taught us that mere exposure to computer technology in novel ways will not promote generative knowledge. This means that access to the Internet should be seen as a starting point—not as an end in itself (Dede; cited in O'Neil, 1995). Instead of learning to use the Internet, the real goal should be using the Internet to learn (Brown, 1999). The point of this dichotomy, albeit simplistic, is to show that we need a fundamental shift from training memories to educating minds (Perkins, 1992). When hi-tech schools employ hi-tech teaching methods that promulgate mindful engagement, there are many possibilities for better learning within the terrain of online pedagogy.

In sum, it is a myth to believe that educational technology changes teaching for the better—good teachers do. One of the main things learnt from prior experience is that the pedagogical value of any new computer technology is determined often by how it is used. This means that wired schools are not synonymous with good teaching practice. There is no guarantee that teachers will use the Internet as a means of doing new things in new ways. Indeed, the Internet may reinforce many features of traditional classroom practice. That said, learning is a messy construct and there is nothing uniform in how the Internet can be used for pedagogical purposes. Hence, an inclusive perspective is required to understand the wealth of opportunities that the Internet provides for active and meaningful learning. At this point, the central message to emerge from the Literature Review is the need for teachers with a sound conceptualization of the Internet, linked to a critical and contemporary understanding of the educative process.

2.6 THE COMPUTER-USING TEACHER'S ROLE

There have been numerous attempts to substantiate the claims about the potential of computers to enhance the learning process. Despite efforts to demonstrate empirically the positive effects of new computer technology on student achievement, the research findings remain equivocal (e.g., Hattie, Biggs & Purdie, 1996). By and large, the benefits of standalone computers—let alone networked machines—have yet to be shown on a large scale in the regular classroom. As Bracey (1992) aptly wrote a number of years ago, the jury is still out on the research. Put more straightforwardly, there are still many more questions than answers (Beynon & Mackay, 1993).

On the other hand, the computer is not a monolithic system where research findings can be transferred from one setting and one learning environment to another. Generalizations of the research literature are problematic as the contribution of new computer technology is highly dependent on the context in which it is used in the classroom (Salomon, 1990a). This is a point often overlooked by the technophiles and technophobes alike in the technology debate. Throughout the literature, there is a tendency to give too much weight to the technology and not enough attention to the surrounding educational context. Consequently, meta-analyses of the research literature (e.g., Jones & Paolucci, 1998; Schacter, 1999; Thompson, Simonson & Hargrave, 1996) have limited value, as these conceal many methodological weaknesses and are insensitive to the context of computer use. The research is rarely persuasive as the effects of educational technology can be attributed to many factors. In short, the judicious answer to the question of whether computers enhance learning is: "it depends".

While many mutually dependent variables combine to affect learning, the teacher matters most (Lai, 1999). It is abundantly clear that teachers have an important bearing on how a new educational technology shapes and influences learning outcomes. Teachers make a difference! As LaFrenz and Friedman (1989) once wrote, 'Computers don't change education, teachers do!' (p.222). Hativa (1994) confirms this truism after an exhaustive analysis of six years of qualitative and quantitative research in which the weight of evidence led to the conclusion that 'the teacher has a crucial role' to play (p.108). Surprisingly, even the CEO Forum (1999) and the Software Publishers Association with their vested interests concur with this assessment. The latter group found after an analysis and review of 133 research articles that:

> *These studies underscore the importance of the teacher's role in creating an effective, technology-based learning environment (Sivin-Kachala & Bialo, 1995, p.25).*

This conclusion shifts the attention away from the technology itself to the people effects and the social practices. As Fulton (1997) argues:

> *Effective use of technology is the result of many factors, chief of which is the teacher's competence and ability to shape technology-based learning activities to meet students' needs (p.11).*

Above all, therefore, one kind of result consistently appears in the literature. That is, the teacher is a key figure in the success or failure of an educational technology initiative. At the same time, giving mediocre teachers the latest technology is not a recipe for promoting active and meaningful learning (Abi-Raad, 1997). As Collis (1996) points out this does not happen by chance:

> *Good teachers are associated with good examples of computer use. There is no evidence that the computer use made these teachers into good teachers. A good teacher see possibilities in a powerful technology, see ways to realize them in his or her own situation, and has the energy and persistence to implement them, usually at personal cost (p.23).*

The lesson is that if the goal is to promote creative, innovative and talented students, then creative, innovative and talented teachers are needed. Having said that, to cultivate good teachers the right tools for the job have to be provided. There is an implicit assumption throughout the policy discourse that these tools include access to new computer technology. Putting aside the relative importance for the moment of educational technology to the art, craft and science of good teaching, it is generally believed that teachers should be confident and competent at using the Internet in their professional work. However, technical know-how on its own will not alter classroom practice. In order to harness the educational potential of the Internet new technical skill and knowledge must be linked to new pedagogical beliefs. Fullan (1993a) shows that the success of any educational innovation is highly dependent on the beliefs and values of the teacher. The message is that for lasting educational transformations to occur, beliefs about teaching and technology must change together.

Importance of Teacher's Beliefs

The benefits of studying the teacher are self-evident but there is still a need for more in-depth research. Despite the rise of ICT in the policy discourse, the teacher remains a neglected voice in the study of this latest educational technology wave (Collis, 1996). Without doubt, teachers have a lot to contribute in helping to understand how the Internet can be used to create conditions for better learning. We must take greater account of their views. In the past, there has been a shortage of good quality research on what teachers think about the impact of educational technology on their lives and work culture—for better and worse. As Cochran-Smith (1991) states:

> *Most important, perhaps, is research that investigates how teachers in various settings and with various goals in mind interpret computer technology over relatively long periods of time and what influences their interpretations have on students' opportunities to learn (p.123.).*

This gap in the research still exists. It is widely accepted that more attention should be directed towards studying teachers' beliefs (Kagan, 1992). According to Shulman (1986; cited in Fang, 1996), the study of teacher beliefs is the missing paradigm in the research. Lai (1993) makes the point that the success of any computer technology is influenced by the teacher's belief system. A clear link is seen between teacher's pedagogical beliefs and their classroom practice (Miller & Olsen, 1994). How teachers teach, and what they teach usually reflects their conception of the world and how they view the purposes of education. Arguably, teacher beliefs are the best indicators of the actions and decisions they make in the classroom (Pajares, 1992). A key distinction is made here between beliefs, perceptions and opinions. Beliefs are deep-seated understandings that underpin the practice of teachers, whereas perceptions and opinions are somewhat fluid interpretations of everyday experiences, which are notoriously unreliable. Yet, few studies of teachers' beliefs appear in the literature. There is still a need for research that will yield insight into how teachers filter and mediate educational technology as they modify learning experiences to fit their beliefs.

Why Study Good Computer-Using Teachers?

The importance of studying the beliefs of early adopters and experienced computer-using teachers is that they are likely to influence how other teachers use the Internet for pedagogical purposes. They are important opinion leaders in convincing other people of the advantages (and disadvantages) of adopting a new educational technology. By studying good teachers, we may unlock some of the determinant factors that lead to the successful adoption and implementation of the Internet in schools. This line of inquiry may also provide valuable information relevant to preservice and inservice teacher education as up-to-date skill and knowledge of ICT is now an expectation of the teaching profession. In 1997, the Green Paper on teacher education concluded:

> *In the New Zealand context, quality teachers can be seen as having... the ability to use information and communications technologies effectively as an aid to teaching (Ministry of Education, 1997, p.21).*

While this Report failed to shed any light on how teachers should be using ICT in the context of their work, The Education Review Office (ERO) (1998) agreed that a "capable teacher" needs to demonstrate informed professional knowledge of 'appropriate technology and resources' (p.11). Amongst other things, teachers are expected to:

- *use a range of resources and technology that demonstrates informed knowledge of what is available in the school and the wider community;*

- *use resources and technology in a planned and relevant way to contribute to the achievement of learning objectives;*

- *demonstrate willingness to extend skills in using information technology (ERO, 1998).*

Davy (1998, p.102) rightly questions whether 'being a techno whiz is one of the most important qualities of a good teacher' but regardless of this there is a lot to learn from the wisdom embodied in teachers' beliefs and practices. We may be able to ascertain the relative weight or importance of extending skills in ICT in relation to some of the other dimensions of the capable teacher. After all, a good computer-using teacher will not only know how to use the technology but also is likely to have the pedagogical knowledge of how to promote active and meaningful learning in the classroom. Such learning is not synonymous with the Internet, as it requires good teachers. Accordingly, this type of research may help to unpack the interplay between technical and pedagogical knowledge in the mix of what constitutes good teaching in the context of the Internet. It may also help to defend the pedagogical rationale for computers in schools against a future neo-conservative backlash.

As Weinstein (1991) posits, when a teacher first uses a new computer technology there are innumerable questions they ask themselves: What are computers good for? How do computers fit into the social organisation of the classroom? How does the computer relate to existing curriculum goals? Is the computer congruous with my current approach to teaching? Teachers' answers to these questions determine the level of adoption and the role computers will play in the classroom. The benefits of studying teachers who have considerable wisdom at using computer technology for pedagogical purposes is to understand their responses to these questions and how they are derived and operationalised in their teaching practice. Such an approach may allow an illuminative analysis of the true value of good teachers and encourage greater debate on the attributes of the so-called capable teacher.

In the last decade, the study of good computer-using teachers has become an increasingly fruitful area of research. A growing number of studies have sought to identity the distinctive practices of such teachers. There has been an emphasis on how good computer-using teachers differ from their colleagues in an attempt to better realize the potential of new educational technologies. In pursuing this objective, there have been various studies of successful, accomplished, effective, competent, and exemplary computer-using teachers. The remainder of this section offers a critical review of the research on good computer-using teachers with particular emphasis on the methodologies adopted and the variety of sample selection techniques applied.

Successful Computer-Using Teachers

The first attempt to study the beliefs and practices of teachers deemed successful at using computers was undertaken by Shavelson, et al. (1984). In the mid 1980s, 60 primary and secondary teachers were identified as exponents of good practice and observed in the context of their work. In addition, some of these teachers were interviewed to elicit data on their teaching methods and their perceptions of the computer as a pedagogical tool. It was found that successful teachers:

> *... stressed both cognitive and basic-skill goals, as well as microcomputer use as a goal in and of itself, used a variety of instructional modes to meet these goals; (...) they integrated the content of microcomputer-based instruction with the on-going curriculum, and coordinated microcomputer activities with other instructional activities (Shavelson et al., 1984, p.vii).*

The teachers were considered adaptive experts in that they changed their use of computers in the classroom according to the objective and feedback from the students. Although the research provided a seed for further work, the study itself was limited to mathematics and science instruction and its wider value was restricted by the conception of what success entailed at that time.

Accomplished Computer-Using Teachers

In the late 1980s, a nationwide survey of grade 4-12 teachers in the US investigated the experiences and patterns of practice among accomplished computer-using teachers (Sheingold & Hadley, 1990). The research was notable for its use of a nomination technique in the sample selection process. A range of strategies was employed to obtain the sample, including letters and telephone contacts to local and state directors of educational technology, hardware and software industry personnel, professional organisations, and leading educators and researchers in the field. In addition, an advertisement was placed in a magazine which invited teacher self-nominations. This search process resulted in a database of over 1,200 names including teachers from every state and major city.

The nomination process did not define in advance specific criteria for the selection of teachers but rather accepted recommendations on face value. With the benefit of hindsight, this was a major strength of the research as it sidestepped the problematic definition of good teaching and allowed people to define what constituted an accomplished teacher for themselves. From the researchers' perspective, accomplishment was regarded as teachers who integrate the computer as a tool into their everyday classroom and use educational

software to encourage more self-directed learning on the part of students (Hadley & Sheingold, 1993). However, the failure to justify the implicit definition of accomplishment along with the lack of explicit selection criteria left a number of issues unresolved. At best, the sample involved a selection of nominated or perceived accomplished computer-using teachers. This is a subtle but important distinction that few people acknowledge when interpreting the results.

Added to this, only about half (n=608) of the original nominated sample agreed to complete the questionnaire, which brings into question what is missing from the responses. The questionnaire itself was comprehensive seeking data on: (a) the demographics of the teachers, (b) the teachers' training and experience with computers, (c) the teachers' current practice, (d) ratings on barriers to computer integration, and, (e) ratings of incentives to integration (Sheingold & Hadley, 1990). It was found using factor analysis and multi-variant segmentation techniques that few differences existed between teachers in conventional demographic variables. The sample consisted of 42% men and 58% women who taught in educational settings with an unusually high level of access to computers compared to most typical US schools. In most instances, teachers had been using computers for instruction for four years or more. Hadley and Sheingold (1993) offered the following profile:

> *The teachers in the sample were on average, a mature and experienced group, more than half between 40 and 49 years old, and three-quarters having been teachers for 13 years or more (p.268).*

As many as 80% of the teachers had access to a home computer and most indicated that they were to some degree self-taught. The teachers were considered eager consumers of information about computers. Up to 90% of the participants reported they used software catalogues, computer magazines, conference proceedings and educational workshops for gathering information. Teachers pursued a range of professional learning opportunities about computers with many of them completing courses in their own time. Together, these characteristics contributed to the very high level of comfort that teachers reported about using the computer as a tool for their own work.

According to Hadley and Sheingold (1993), one of the most striking features was that the computer was not a single-use machine, but rather a multi-purpose tool used in many different ways. While the teachers utilized a range of content specific and tool software, word processing was by far the most popular and versatile computer application. It was used by 90% of teachers, at all grade levels, and reported to be the 'most productive and interesting use of the computer in the curriculum' (Hadley & Sheingold, 1993, p.271). Instructional software, including drill and practice, tutorial and problem solving programs,

were a close second with respect to the number of teachers who used them. This software was most common in mathematics and remedial work, but was not used to the same extent or as frequently as the word processor. When teachers were asked to report the three most frequently used computer applications the responses were clear cut, with 75% of the participants ranking the word processor first, followed by 37% with drill and practice and 24% tutorial programs.

A high percentage (88%) of the teachers indicated that the computer made a positive difference to their teaching practice. Three main types of changes were reported. First, there were changes to the teacher's expectations about the amount and complexity of student work. The students were thought to grasp more difficult concepts and cope with higher levels of thinking as a consequence of computer use. Second, there were perceived changes in the ability to individualise student work. The computer was reported to permit greater individualization of the curriculum. The third and most significant change was the perceived tendency to transform a teacher-centred classroom into a student-centred classroom. As one teacher is quoted:

> *It has enabled me to change from a teacher centred classroom to a student centred classroom. It has also led to a more open approach to problem solving, rather than the pursuit of one correct answer (Hadley & Sheingold, 1993, p.277).*

Such comments gave the researchers the confidence to conclude that teachers were using computers in ways that deeply affected their teaching and their students' learning. They deduced that teachers were now teaching differently and more effectively than they did in the past. Of course, whether a survey technique can elicit teacher beliefs is a matter of some debate. This conclusion would have more validity if Sheingold and Hadley (1990) had conversed with the teachers. Equally, the statement that teachers were creating '... conditions for deep, engaged and meaningful learning' is rather difficult to defend without direct observations of classroom practice (Hadley & Sheingold, 1993, p.278). Hence, the authors are guilty of reading too much into their data given the tenuous nature of the supporting evidence.

Above all else, the amount of experience that teachers have with computers is identified as the key determinant of accomplished practice. According to Sheingold and Hadley (1990), as teachers gain more experience they become more comfortable and expert at integrating the computer into the classroom. They propose that with experience teachers gradually manage more expansive uses of the computer, and this, in turn, engenders new approaches to the curriculum itself.

Once again, this is a highly speculative claim based on the results of a single written questionnaire. Nonetheless, Hadley and Sheingold (1993) present three interesting conclusions about the features of accomplished computer-using teachers. The distinguishing characteristics are summarised as: (a) teachers with a high level of motivation and commitment to their students and their own development; (b) teachers with strong support and collegiality for the integration of computers into the classroom; and, (c) teachers with access to the computer itself in sufficient quantity (Hadley & Sheingold, 1993). What the authors fail to do is compare these features with what we already know about the attributes of accomplished teachers *per se*.

Table 2.2
Different Genres of Accomplished Computer-using Teachers

Genre	Profile	The Computers Impact
Enthusiastic Beginners	• Less experience • More likely female • Teach primary age and/or special needs students • Optimistic outlook • Use few computer applications	The revolution is here and supported in its initiation, but we have yet to know fully what it will mean.
Supported Integrators	• Often men • Extensive computer experience • Usually computer coordinator • Have an interest in computers • Use a range of software applications in the classroom	The revolution is a schoolwide evolution that is well under way and becoming part of the larger school culture.
High School Naturals	• Most often men • Less experience teaching • Specialist teachers • Computers are an extension of existing expertise • Usually high school teachers	There is no revolution or deep change; rather, it is a matter of fact, technology is simply what is taught and used in certain subjects.
Unsupported Achievers	• Younger teachers • Experienced with computers • Regard computers as important for education • Have less access to support and hardware and software • Teach in less affluent schools	Neither the revolution nor widespread change has happened yet. The work to make it happen is being done in the face of great odds, but it is worth it.
Struggling Aspirants	• Less experience with computers • Older age group • More likely women • Less secure about computer use • Acknowledge their frustration • Less likely to own a computer	The revolution is far off. No change has happened, and it is not clear whether change is really worthwhile or possible.

To their credit, the researchers avoid the temptation of generalizing the research findings into one overall profile of the accomplished computer-using teacher. Instead, Hadley and Sheingold (1993) propose a number of different "genres" that characterize the sample. As described in Table 2.2 they identify five distinctive sub-groups: (a) enthusiastic beginners, (b) supported integrators, (c) high school naturals, (d) unsupported achievers, and (e) struggling aspirants. Although the groups provide a useful framework from which to better understand the nature and diversity of accomplishment, they conceal a potentially flawed assumption. That is, the participants are classified on the basis that they actually represent a sample of accomplished computer-using teachers. This assumption is highly contestable, as there was no attempt to select a refined sample of teachers based on a synthesis of what constitutes accomplished teaching in the first place.

Effective Computer-Using Teachers

In the early 1990s, Sherwood (1993) replicated the above methodology in an Australian study on the practices and perceptions of effective computer-using teachers. A national survey was undertaken using a sample of teachers who were either self-nominated or selected by their school or education authority as effective computer users. There were 731 teachers nominated for the research of which 362 responded to the same questionnaire instrument as used in Sheingold and Hadley's study. Despite the low response rate and inherited weaknesses of the research methodology, the study revealed some interesting findings that probably have greater relevance to the New Zealand context.

The nominated or perceived effective computer-using teachers were a mature group with almost half (49%) between 35-44 years of age. Those who participated in the research had considerable teaching experience with 61% of teachers having spent 13 or more years in the classroom. A majority of the teachers were men (55%) with just under half (49.5%) of the participants having used a computer in their teaching for seven years or more. Sherwood (1993) found that 65% of the teachers owned a home computer. Teachers reported that to some degree they were self-taught, but many had taken advantage of a range of training opportunities with the most common being courses offered during teaching hours, and instruction from other teachers. That said, most teachers devoted a considerable amount of their own time outside of other aspects of their work to integrating educational software into the classroom (Sherwood, 1993).

A variety of software was used for pedagogical purposes with the most common application being word processing (96%). The use of drill and practice software (89%) and interactive fiction-type programs (79%) were also popular, which brings into question whether the latter application was known by a different name or simply not identified by Sheingold and Hadley

(1990). While most teachers perceived adequate support at the school level for using educational software, there were insufficient resources and trained personnel available at the school district and central level of the education authority. At the individual level, the motivation to innovate with new computer technology arose from intrinsic factors. The incentives for teachers persevering with using computers in the classroom were reported to be the betterment of teaching and learning and the personal challenge of integrating the computer into the curriculum. A high percentage (76%) of the participating teachers claimed that the computer made a significant difference to the way they taught. The main difference was in the shift from a teacher-centred towards a student-centred classroom. As one teacher is quoted:

> *I'm no longer a sage on the stage, but a guide on the side (Sherwood, 1993, p.172).*

Despite this personal testimonial, it was unwise of Sherwood to use these data to claim that the computer was a major force in reshaping the curriculum and teacher's beliefs about teaching and learning. Although this may be the case, a survey instrument is not an appropriate technique to elicit the messy and deep-seated nature of teacher beliefs (Pajares, 1992). Added to this, self-report data on changes to one's teaching over time are highly problematic. In this regard, the research did not address the conceptual and methodological weaknesses of the original study. Hence, the claim that effective computer-using teachers are '... motivated learners with an enthusiasm for their profession and a dedication to their students' is less convincing than it sounds (Sherwood, 1993, p.173). What is required is research that goes beyond a superficial level of analysis of effective teaching where in-depth information is gathered from conversations with teachers over an extended period.

Competent Computer-Using Teachers

At about the same time, Vockell and Sweeney (1993) compared the responses of teachers who self-reported themselves to be competent at using computers with those who perceived themselves less competent users. Despite potential ethical concerns over the selection process, the research examined two school systems in Indiana, US, one with substantially greater commitment than the other to using computers within the classroom. In fairness, the less committed school was not considered "bad", but rather typical in its use of computers for educational purposes (Vockell & Sweeney, 1993). It was presumed that differences in commitment between the schools would provide a measure of varying competence among the teachers at each school. The teachers were asked at the respective schools to rate their competence at using the computer in the classroom, through a written questionnaire. On the basis of their responses teachers were classified as either less competent or more competent computer users. Teachers at the more committed school reported a higher rate of competence

than those at the other school, but the differences were not significant, especially when the poor response rate is taken into account. Despite claims otherwise, the findings were inconclusive about whether more competent teachers are employed in schools with greater commitment to using computers in the classroom. After all, the results came from self-report data only. There was no attempt in the research design to define competence, with or without computers, and then to verify this in the classroom.

Above all, the main difference to emerge was the strength of the responses and the frequency with which more competent teachers employed specific applications and instructional strategies. More competent teachers used the computer more often for both individual and small group work. Furthermore, a higher percentage of these teachers used the computer for word processing than their so-called less competent colleagues. The most frequently used applications for both groups of teachers were word processing, drill and practice and tutorial programs in that order. At the time, the Internet was not available for classroom use. Overall, a relatively high percentage of teachers fell within the more competent category at each school, which explains in part why they shared similar perceptions of what was required to become competent. Notably, the factors that were perceived to have contributed least to competence were information in professional journals, and university undergraduate and postgraduate courses. The most effective factors were 'workshops at their schools specifically geared to personal goals and interests' (Vockell & Sweeney, 1993, p.28).

Given the rather narrow conception of expertise at the beginning of the study, it was right of Vockell and Sweeney (1993) to conclude there are no clear models of how to develop teacher competence. At the completion of the research, they reflect on the notion of the competent computer-using teacher and lend their support to the criteria originally proposed by Bitter and Yohe (1989). First, competent teachers will be critical users of computers and will be able to recognise their limitations and future possibilities. Second, teachers must have a broad education to conceptualise the use of computers from more than one perspective. Finally, teachers must be able to integrate computers into the curriculum in ways that stimulate thinking. While these criteria shift the definition of teacher competence away from technical skills, the concept of integration often means a curriculum offering more of the same. That is, there is no conception of the need to reconceptualize the curriculum itself. Notwithstanding this problem, a number of people and groups have proposed stage models of teacher development in which competence is reported at different ends of a professional continuum—for example, The Milken Exchange propose seven dimensions for gauging progress in ICT implementation in schools (Lemke & Coughlin, 1998). However, few of these models are derived from what is known about the idiosyncratic nature of teacher's learning and like Vockell and Sweeney (1993) they place educational technology at the centre of discussion when other factors may be equally important in the mix of what makes a competent teacher.

Exemplary Computer-Using Teachers

To disaggregate "exemplary" computer-using teachers from more typical ones, Becker (1994) undertook a secondary analysis of data from a national survey of computer use in US schools. In the original national probability survey (Becker, 1991), 516 upper elementary and secondary teachers completed a subject-specific questionnaire or telephone interview on various dimensions of their teaching practice. Because the questions differed for each level and subject group a series of common and group specific standards were developed to identify teachers who were perceived to be exemplary. The common standards were based on questions relating to: (a) the teacher's goals for computer use, (b) the frequency with which students use computers, (c) the saliency of the computer approaches used in the classroom, (d) the amount of experience using different types of software, and (e) the general functions of the computer in the classroom (Becker, 1994). A series of 12-15 group specific standards sought to identify characteristics that exemplary computer-using teachers might be expected to possess. These standards were guided by the general principle that computers should be used by the teacher to help students 'think better, writer better and solve problems better' (Becker, 1994, p.317).

Teachers were allocated an index score based on these standards and placed on a continuum of exemplary practice. In the absence of any prior research of this type, an arbitrary cut-off score was used to judge between typical and exemplary computer-using teachers. The problem of determining where to draw the line was demonstrated by an admission that a less rigorous cut-off point was required to get enough teachers in the sample. As Becker (1994) states 'a more rigorous definition would have produced only two math teachers' whereas a '... less rigorous cut-off score produced a total of 11 mathematics teachers' (p.321). The results may have provided quite a different profile of exemplary practice had this decision not been made for the ease of statistical analysis. In total, 45 teachers were identified as exemplary with 12 of these working in the elementary school. It was estimated that because the elementary teachers were over represented compared to an equal probability sample, between only 3-5% of all US teachers would meet the defined standards. Of course, an explanation for the larger sample of elementary teachers that Becker (1994) did not consider is that these practitioners may be more expert than their colleagues at other levels. Such an explanation may have generated a deeper level of discussion on the nature of exemplary practice.

The distinctive characteristics of exemplary computer-using teachers were described under the following categories: (a) differences in teachers' school and classroom environments, (b) differences in teachers' own backgrounds and experiences, and (c) differences in teachers' practices and perceptions concerning computer use.

The school and classroom environments of exemplary teachers were found to be representative of the larger sample. There was little difference between exemplary and typical teachers with regard to the socioeconomic status of the school and the number of years that computers had been used in the classroom. The largest predictors of exemplary practice were the collegiality among the teachers using computers in the school and the amount of available software within each institution. Furthermore, the levels of support from the school and the available professional development opportunities were important factors. According to Becker (1994), smaller class sizes and better ratio of computers to students were also key indicators of exemplary practice.

There were a number of differences in exemplary computer-using teachers' backgrounds and experiences. The largest difference was that exemplary teachers spent twice as many hours personally working on computers at school than did other teachers. Surprisingly, there was little difference between the two types of teachers in their use of computers at home. The exemplary computer-using teachers were, however, disproportionately men and the male teachers used computers twice as often in the home as their female colleagues. A strong connection was seen between exemplary practice and time and experience in the classroom. In other words, an exemplary computer-using teacher had spent time using computers in the classroom as well as time learning to teach well. It was deduced that exemplary teachers had taught on average three years longer than other computer-using teachers and had used computers in the classroom for about one year longer. Experience by itself was not the most significant difference, but it was considered a contributing variable in exemplary teaching practice.

A key difference was the amount of formal training in teaching with computers. Almost all exemplary computer-using teachers received some training and had extra credits beyond a bachelor degree. Becker (1994) makes the point that these additional qualifications may be a proxy for experience. Another explanation is that exemplary teachers may have a stronger commitment to teaching which contributes to their desire for further education. Whatever the explanation, this additional education may lead to a better understanding of the learning and teaching process that helps, in turn, to promote more effective use of computers in the classroom. Clearly, the inter-play between experience, qualifications and practice requires further investigation.

Some interesting differences appear in the practices and perceptions of exemplary computer-using teachers. The sample of exemplary teachers reported that they introduced new topics as a result of computer use and appeared to emphasize small-group work more than other teachers. A key point to note is that such differences in the social organisation of computer use may reflect the teachers' long-standing classroom practices rather than changes brought about by the pedagogical innovation. In other words, the differences may already exist as

opposed to being the consequence of teachers learning to maximise the benefits of using computers (Becker, 1994). There were just as many barriers to computer use perceived by exemplary and typical teachers, but the problems tended to be different ones. Unlike typical teachers, the exemplary teachers did not regard insufficient hardware as a major problem. Instead, lack of inservice training opportunities and of access to a home computer were perceived as the main impediments to exemplary practice. Finally, Becker points out that whether students are benefiting from exemplary practice can only be assumed and there is still a need to study the competencies of students in these learning environments.

This last point highlights a major stakeholder who has often been ignored in research on the study of good computer-using teachers—that is, the students. It reminds us that the definition of exemplary practice depends on one's perspective, which Becker will need to better acknowledge when he eventually publishes the results of the latest national survey of Teaching, Learning and Computing (TLC) across the US. At the time of the Literature Review, the findings of this major study had yet to be widely published, although preliminary information about the research including the survey booklets was available from the Web (Becker & Anderson, 1998). As the research unfolds, this latest survey may become an important source of new information relevant to the study of internet-using teachers in the New Zealand context.

In the meantime, Berg et al. (1998) report a study of exemplary technology use in elementary classrooms that encompasses aspects of the Internet. In this study, data gathered over a six-month period during 1996-1997 from technology coordinators were used to create a questionnaire that was sent to teachers identified as exemplary. The aim of the study was to find out how educational technology is used in the classrooms of the most successful computer-using teachers. In the first phase, 57 technology coordinators from southwestern Ohio, US, school districts were sent a questionnaire with two open-ended items. The first question asked them to identify up to five exemplary uses of educational technology in elementary classrooms. In the second question, the teachers were invited to name up to five exemplary computer-using teachers. From a 74% response rate to the questionnaire, 161 exemplary uses of educational technology were identified. After data analysis, this list was collapsed to create 39 distinct exemplary uses of educational technology.

In the second phase, information gathered from the original questionnaire was used to develop a second questionnaire for use with the expanded sample of nominated exemplary computer-using teachers. A real strength of this study was the way in which the second questionnaire was grounded in the technology coordinators' responses. The researchers claimed to adopt a cultural constructivist approach (Scott, Cole & Engel, 1992) in the questionnaire design by retaining as much as possible the exact words and descriptions of the

original participants. The second questionnaire was sent to 76 teachers who were deemed exemplary by their colleagues. Of course, the sample represented a group of nominated exemplary computer-using teachers rather than exemplary teachers *per se.* Teachers were asked about the frequency of student use of various computer applications along with how important they believed each type of educational technology to be. Across the board, teachers rated the importance of each item at a higher level than its frequency of use. Berg et al. (1998) found, for example, that the Web was highly valued despite its infrequent use by students. Once again, the use of computers for writing and desktop publishing was the most frequently used application in the classroom.

While the second questionnaire was completed by 82% of the sample, and the results were consistent with a low variability of responses, it needs to be noted that 45% of technology coordinators did not nominate any exemplary teachers. Indeed, some of the respondents wrote that they did not have any exemplary computer users in their school district. Added to this, Berg et al. (1998) failed to report key demographic information that may have provided the basis for a deeper level of interpretation, such as, age, gender and teaching experience. This oversight is surprising given the disproportionate number of male exemplary computer-using teachers identified by Becker (1994). Although the study contains some valuable data on the frequency and important uses of educational technology, it over estimates the trustworthiness of the research methodology. A written questionnaire—albeit grounded in practice—over a short time period is not a qualitative approach as claimed nor is it a secure basis from which to proclaim the "good news" of the extent to which teachers have embraced a constructivist approach to classroom technology use. Accordingly, the following conclusion must be treated with caution:

> *A significant finding of this study is that exemplary technology-using teachers are using technology in their classrooms in ways that are overwhelmingly constructivist. That is, the technology uses that students used most frequently in the teachers' classrooms were research, writing, and desktop publishing. Students are using technology as a tool to explore new information and produce new products. They are actively engaged in learning (Berg et al., 1998, p.120).*

The mere fact that students may be using the computer as a tool is no guarantee that it will lead to active and meaningful learning as envisioned by contemporary learning theory. In this case, Berg et al. (1998) provided insufficient information on the context in which student research, writing and desktop publishing occurs in the classroom. Like many of the previous studies, the authors also fail to acknowledge the problematic definition of exemplary teaching both with and without educational technology in the classroom.

Lessons from the Study of Good Computer-Using Teachers

There has been a basic failure in the research to recognise that what researchers define and select as a successful, accomplished, effective, competent, and exemplary computer-using teacher is exactly what they get. Put another way, the criteria adopted—whether it be explicit or implicit—and the sample selection techniques employed have an obvious bearing on which teachers are identified and then profiled as exponents of good practice. The key point is that different people have different perceptions of what is meant by the good teacher. Parents no doubt have different views from principals. Likewise, students will have different perceptions from Boards of Trustees. Even the teaching staff will disagree depending upon their age, gender, experience and area of curriculum specialization. And, of course, the business sector is unlikely to fully concur with the definition of good teaching offered by ERO and the Minister of Education. The lesson is that one must always ask whose definition is being used and for what purpose.

With this in mind, after more than twenty years of computer use in schools what is known about so-called good computer-using teachers? The following points offer a brief synthesis of the consensus that has emerged from the research findings. At a descriptive level it is known that good computer-using teachers:

- *Are well-qualified professionals;*
- *Have been using computers for several years;*
- *Possess access to computers in sufficient quantity;*
- *Make regular use of computers in their own classroom;*
- *Utilize a number of computer applications with students;*
- *Are capable and confident in their ability to use computers;*
- *Are enthusiastic about the potential of computers in education;*
- *Have participated in ICT-related professional development activities;*
- *Adopt a learner-centred approach to their classroom use of computers;*
- *Feel supported in their work by their colleagues and senior management;*
- *Are a mature group of dedicated professionals with a wealth of experience.*

The problem is that if the nature of the sample is predetermined by the criteria, then the above attributes merely amplify and reflect the original definition of good teachers. It follows that the criteria and sample selection technique requires just as much scrutiny as the research findings. It is fair to say that the circular definition of good computer-using teachers brings into question the trustworthiness of this kind of research, which has yet to be widely acknowledged in the literature.

Brown (1995b) first identified this basic methodological flaw in a small New Zealand study of proficient computer-using teachers over three distinct phases. The first phase invited various people and groups to nominate teachers they considered proficient at using computers for learning and teaching. In the second and third phase, a refined sample of teachers was identified for further investigation after a systematic selection process, which culminated in two micro ethnographic case studies. This research was unique in that it attempted to recognise in the sample selection technique the perspectives that different stakeholders bring to the definition of good computer-using teachers. Brown (1995b) invited four well-known professionals with different background experiences to assist with the sample selection process. This group offered a range of stakeholder perspectives of what constitutes proficiency in the use of new computer technology and was consistent with the concept of "cross-perceptual analysis" in which people with different perspectives work together to reach consensus. Notably, the selection process was guided by a set of explicit criteria that drew on the literature on good teachers *per se*. The core assumption was that proficient computer-using teachers would be a subset of good teachers.

While many of the findings were consistent with the above synthesis, the main lesson to emerge is that the search for the good teacher has been hampered by an overly technocentric focus. There is an implicit and potentially flawed assumption that good teachers should be using computers in the first place. It is taken-for-granted in this type of research that after thoughtful reasoning good teachers will want to learn how to use the computer as a valuable educational resource. They will embrace its potential without question or reservation. The key point is that no research has sought to ask good teachers whether they believe the use of computers is essential to their ability to design and implement good pedagogy in the classroom. Consequently, we do not know to what extent good teachers view the computer as central to their work.

In sum, new professional standards suggest that all good teachers should be using educational technology for pedagogical purposes. Many of the standards proposed by groups such as the Milken Exchange (Coughlin & Lemke, 1999) and the International Society for Technology in Education (Friske et al., 1996; Wiebe & Taylor, 1998) are highly problematic as they define good teaching as a set of computer skills in isolation from the wider debate over what constitutes good pedagogy *per se*. A preoccupation with teachers' technical know-how and how often they use the latest educational technology in the classroom is the antithesis of good teaching. It adds to a narrow instrumentalist conception of teaching which already dominates the literature. A set of basic standards will never tell the full story, as teachers' work involves intricate, intuitive and idiosyncratic processes that are exceedingly difficult to describe. To answer the question what it means to be a good computer-using teacher one has to understand what it means to be a good teacher both with and without educational technology—a much harder question to answer.

2.7 WHAT WE KNOW ABOUT GOOD TEACHERS

The question of what constitutes a good teacher and thereby good teaching practice has obvious importance. It has taken on increasing significance at a time when there is a movement to introduce professional standards, which have potential to exercise greater control over what happens in schools by rewarding individual teachers for the quality of their instruction (Apple, 1996). For this reason, there is heated debate over the professional standards movement and the mix of attributes and characteristics that define good teachers. Over the years, numerous lists of the qualities of the good teacher have appeared in the literature (e.g., Boylan et al., 1991; Porter & Brophy, 1988; Wesley, 1998). Before reviewing some of the different models and perspectives that contribute to the standards debate, it is useful to describe one of the better known studies on the distinguishing features of quality teachers undertaken by the OECD (1994) in 11 different countries including New Zealand. This study was based on the view that quality teaching should be regarded as a holistic concept across five key dimensions of competence:

1. *Knowledge of substantive curriculum areas and content;*
2. *Pedagogical skill, including the acquisition of and the ability to use a repertoire of teaching strategies;*
3. *Reflection and the ability to be self-critical, the hallmark of teacher professionalism;*
4. *Empathy and the commitment to the acknowledgement of the dignity of others;*
5. *Managerial competence, as teachers assume a range of managerial responsibilities within and beyond the classroom.*

In their attempt to elaborate on each dimension, the OECD (1994) provides a long checklist of the features of quality teachers, which partly contradicts its intention to maintain a holistic orientation. In the New Zealand study, for example, Ramsay and Oliver (1993) identify the following 15 capacities and behaviours of quality teachers:

1. *Are highly intelligent people with outstanding powers of observation and the ability to carry out many ideas in their heads at the same time;*
2. *Have developed strong philosophies of education, containing theories which are well grounded and tested regularly against their personal practice;*

3. *Have capacities of patience and are also prepared to persevere for long periods of time;*

4. *Are extremely rational people who reflect carefully on their practice and who give reasons for making particular decisions relating to children's learning outcomes;*

5. *Have a very strong sense of humour and demonstrate a caring capacity for the children in their classrooms;*

6. *Work long and arduous hours;*

7. *Besides their excellent relationship with children, also have the ability to interact meaningfully with other adults;*

8. *Complete tasks themselves and also demand that children be completers of their work;*

9. *Reveal themselves to their children as persons rather than just teachers;*

10. *Adopt bicultural approaches wherever possible;*

11. *Modify the environment in their classrooms;*

12. *Place an emphasis on the security, comfort, well-being and happiness of their students;*

13. *Have a very high passionate commitment to their career as teachers;*

14. *Are confident in their own ability as teachers;*

15. *Have a wide knowledge of socio-political issues and a strong social conscience (p.70).*

While the above list provides a useful basis for the identification and selection of good teachers in the New Zealand context, it conceals the multiplicity of perspectives that have influenced thinking about the good teacher. In particular, it fails to acknowledge that conceptions of quality teachers are deeply contestable because they reflect closely what is valued about education. Thus, a deeper level of analysis is required in order to peel back the competing discourses that lie beneath the surface of the debate over the nature of the good teacher.

Following on from this, the remainder of this section reviews the different perspectives and paradigms that have evolved in the study of good teachers, effective teaching practice and how teachers become exponents of good pedagogy. The term paradigm is used here to distinguish between the different worldviews that operate like a set of lenses through which conceptions of good teachers are framed. Overall, a pluralistic approach is proposed as no one model or paradigm is shown to be able to lay claim to providing an all-inclusive definition of good teachers.

Theoretical Models of Good Teaching

A number of theoretical models of teaching appear in the literature, each of which have their own definitions and interpretations of the good teacher (Brown & McIntyre, 1993). Squires (1999) describes the variations of these models as:

> *Teaching as a common sense activity; teaching as an art; teaching as a craft; teaching as an applied science; teaching as a system; teaching as reflective practice; and teaching as competence' (p.3).*

Early accounts of teaching were based on what has been described as a technical rationality model (Schon, 1983). This model views good teaching as the consequence of external and exogenous factors. What happens in the classroom is the product of the educational system itself rather than the nature or quality of teacher intervention. It is a mechanical model of teaching where good teachers are efficient technicians who make effective use of materials and resources that the education system deems appropriate. At the time, the technical rationality model was influenced by the principles of behaviourism and the belief that student achievement was caused by, and the result of, a prescribed set of teaching skills (Olson, 1992). Over the years, the term technical rationality has been associated with a pragmatic and instrumentalist approach to teacher education. Such an approach views teaching as a common sense practical craft where good teachers possess a set of prescribed skill and knowledge to implement all aspects of the curriculum. This is a technicist model where teachers engage in little or no critique of the dominant ways of knowing.

In contrast, a number of cognitive models of the good teacher have emerged which reject the narrow technicist view of teaching and teacher education. The core assumption is that teachers' behaviour is influenced in no small measure by what they think, as thought and action go on at the same time. As Preskill (1998, p.350) writes, 'The best teachers spend much time thinking about their teaching—what they are doing, why they are doing it, and how they can do it better'. This point is illustrated through the story of a young Inuit who learned to hunt seal from his father. The young man was informed that:

If you want to hunt seal you have to learn to think like a seal (Erickson; cited in Hilty & Gitlin, 1996, p.101).

The implication is that if you want to identify, understand, or even promote good teaching, then you have to learn to think like a good teacher (Hilty & Gitlin, 1996). This analogy conveys two points. First, good teaching is a cognitive process. The process must be taken into account as much as the outcomes as expert performance cannot be measured by action alone. It follows that you cannot prescribe a list of skills and attributes of good teachers in the absence of a consideration of their thinking. Second, teaching is a deeply personal experience. In view of this, teacher's voices must be included in pedagogical discussions (Hilty & Gitlin, 1996). The lesson is that good teaching is an intellectual activity, which requires an educational philosophy that encompasses the artistic, creative and innovative components of the process. In short, good teaching is a creative art.

In the 1980s, a new direction of inquiry began to explore differences in the level of performance between novices and experts. This iteration of the literature was grounded in the belief that good teachers have different cognitive structures than those with less professional expertise. If one analyzes the thought processes of the expert, this will tell you what expertise is, and thereby reveal how we can prepare good teachers (Olson, 1992). Berliner (1986) was influential in the development of this model by proposing that experts follow a set of rules built up in their cognitive structures from experience. A central tenet of this perspective is that expertise is the outcome of hours of honed practice (Bereiter & Scardamalia, 1993). Bruer (1993) claims that many years of experience in the area of expertise are a prerequisite for becoming an expert. According to Berliner (1994), there is no way for expert teaching to occur without practice and considerable experience. Through experience, experts have superior subject-specific and pedagogical knowledge to that of novices. Thus, knowledge typically begets knowledge. Having said that, expertise is more than experience as otherwise all veteran teachers would be experts. The key difference is that expert teachers have not only more knowledge from which to draw but they analyse problems at a higher order and access, organize and utilize their knowledge more efficiently to arrive at the better solutions (Sternberg & Horvath, 1995). Hence, good teachers are critical decision makers. An emphasis on a teacher's ability to make decisions and problem solve leads to a conception of good teaching as a form of applied science.

Although this perspective offered a fruitful line of reasoning, it fell short of explaining how novice teachers become experts (Desforges, 1995). The cognitive processes involved in the trajectory from novice to expert were still unclear. In addressing this gap, the Dreyfus brothers proposed that expert practice arises without conscious reflection but through semi-automatic processes (Dreyfus & Dreyfus, 1986). With greater experience, experts are able to automatize their procedural knowledge and thus free up working memory to be utilized for

higher order functions of their work (Anderson, 1990). This theory makes the case for tacit knowledge and intuition rather than conscious reasoning as being critical features of expert performance (Eraut, 1994). In contrast to conventional wisdom, expertise is viewed as an arational activity that does not follow a set of fixed rules (Olson, 1992). According to this model, there are five stages of skill acquisition with novice behaviour characterised by dependence on rules. At the final stage, expert practice just happens much like skillfully driving a car. This perspective argues that it is impossible to deconstruct expertise into specific rules that guide practice. Teaching is too complex for this as it involves a type of "know how" that has to be understood from a holistic system wide perspective.

Another influential model of the good teacher has been that of the reflective practitioner (Schon, 1987). Contrary to the previous theory, this model emphasizes the continuous process of reflection on practice in which some conscious reasoning is going on as expert teaching is occurring. In other words, the reflection process is deliberate rather than automatic. Good teachers think critically about their teaching and try out new actions to change things for the better (Eraut, 1994). As Hilty and Gitlin (1996) maintain, good teachers have a capacity for reflection and self-criticism. While teaching is not isolated, solitary work, it is the propensity of these teachers to constantly review their performance, and critically evaluate themselves, which sets them apart from their colleagues. Schon (1987) reminds us, however, that the reflection process is often messy and problematic where much of the teacher's knowledge is tacit in nature. Hence, neither an applied science nor systems conception of teaching offers an adequate explanation of the good teacher. As an alternative, the metaphor of the reflective practitioner makes the case for the teacher as thinking professional. Thus, *reflection-in-action* and *reflection-on-action* coupled with an emphasis on flair and imagination—the artistry of teaching—is the hallmark of this perspective.

While Eisner (1994) introduces the concept of connoisseurship and Hoyle and John (1995) talk of the extended professional, there is general agreement in the literature that the good teacher is not a narrowly trained technician. There is also consensus over the importance of knowledge (Shulman, 1986). To quote a truism, good teachers know their subject well. Having said that, there are different types of knowledge that teachers require. According to Shulman (1987), the effective teacher possesses seven categories of knowledge:

- *content knowledge;*
- *general pedagogical knowledge;*
- *curriculum knowledge;*
- *pedagogical content knowledge;*
- *knowledge of learners and their characteristics;*
- *knowledge of educational contexts;*
- *knowledge of educational ends.*

The above categories are not mutually exclusive. However, it needs to be noted this list does not include the kind of specialised technical and pedagogical knowledge that teachers require to make effective use of new computer technology. Therefore the categories are not all-inclusive. The key point is that *knowledge* unlocks the conceptual tools required in the reflection process. It is knowledge that offers the lens for critical self-reflection and provides the language for teachers to articulate their observations of new actions within the crucible of the classroom. Without a sound knowledge base, and a philosophical framework for applying this in one's teaching, the goal of critical reflection is problematic.

It is also problematic to assume that teachers' knowledge is equal to the sum total of the individual parts of each category. The knowledge that teachers possess is complex, deep-seated and grounded in personal experience. It is also automatized and shaped profoundly by contextual factors such as the characteristics of the learners, the learning environment and the subject being taught (Good & Brophy, 1995). Although good teachers have a lot of it, the knowledge of experts is often unarticulated, tacit in nature and situated in experience. The situated nature of expertise means that good teaching is tightly context bound, which makes it problematic to study. It is exceedingly difficult to quantify and much knowledge remains fragile, incomplete and inherently unstable. Indeed, not all of the knowledge has equal value or standing. Carr and Kemmis (1986) recognise this point in the different categories of teacher knowledge they identify under the following headings:

- *folk wisdom;*
- *common sense knowledge;*
- *skill knowledge—about certain effective teaching strategies;*
- *contextual knowledge—of this student, class, community or culture;*
- *professional knowledge—teaching strategies and curriculum;*
- *educational theory—learning, teaching and the role of education in society;*
- *social and moral theories and general philosophical outlooks.*

This latter type of knowledge recognises that teaching at its core is an ethical and moral profession. As Fullan (1993a, p.12) writes, 'Scratch a good teacher and you will find a moral purpose'. Thus, beyond cognitive definitions of expertise, good teachers help students to understand the ethical, moral and democratic principles that shape our society while questioning practices that lead to the inequitable distribution of knowledge, power and resources (Hilty & Gitlin, 1996). In essence, this requires a critique of ideology and a deep understanding of the place of education in a liberal democratic society. The good teacher, therefore, uses information from one or more fields, strives for in-depth understanding rather than superficial awareness, and challenges the learner in active and meaningful contexts to go beyond their own constructions of knowledge. Suffice to say 'good teachers are also good learners' (Hilty & Gitlin, 1996, p.103).

This observation reiterates the point that a commitment to thinking and reflection is at the heart of good teaching. The crucial difference is that critical reflection as opposed to technical reflection looks at what drives the thinking—that is, the beliefs, experiences and sociopolitical values (Sparks-Langer & Colton, 1991). There is usually consideration of aspects of social justice linked to some form of action. In this sense, teaching is a political activity. Most schools are political workplaces where people:

> *...are required to carry out a wide range of tasks often with the bare minimum of resources, whilst successfully contending with the demands and expectations of several types of interest groups including parents, colleagues, administrative superiors, and students (Bryson & De Castell, 1998a, p.551).*

Thus, good teaching is inherently political work involving individual and collective judgements about what is worth teaching, why and how. The curriculum itself—that is, content, pedagogy and assessment—lies at the heart of a political struggle over what teachers should do and how the curriculum should be taught. This reminds us that the curriculum is not neutral and good teachers sometimes have to teach against the gain. As Preskill (1998) asserts:

> *No teacher can be a fully accomplished practitioner or an effective school leader without the ability to critique the practices of the school and the larger society (p. 346).*

According to Haberman (cited in Smyth & Shacklock, 1998), good teaching comes from a different genre that is clear about what is being managed—namely, learning, life chances, and the opportunity to challenge entrenched and oppressive views. This last point is in stark contrast to the type of selection criteria and identification methods applied to the study of so-called good computer-using teachers. In Haberman's terms, we know that good teaching is likely to be occurring whenever:

- *students are actively involved;*
- *students are directly involved in real-life experience;*
- *students are involved with issues they regard as vital concerns;*
- *students are involved with explanations of human difference;*
- *teachers involve students with the technology of information access;*
- *students are involved with applying ideals such as fairness, equity or justice to their world;*

- *students are asked to think about an idea in a way that questions common sense or a widely accepted assumption which relates new ideas to ones learned previously, or which applies an idea to the problems of living;*

- *students are involved in reflecting on their own lives and how they have come to believe and feel as they do (cited in Smyth & Shacklock, 1998, p.116).*

Sadly, many of these ideals are lost in the latest movement to define teaching as a competence. Put bluntly, you cannot standardize the type of talent that good teachers possess from within this genre. While the competency and professional standards movement has led to wider recognition of the multi-faceted nature of the teacher's role, it is based on a type of managed professionalism that ignores the fact that good teaching is charged with emotion. It is not just a matter of being efficient, knowing your subject, having the correct competencies, or possessing the right kind of techniques (Hargreaves, 1997). As Hargreaves (1998) writes elsewhere:

> *Good teachers aren't just well-oiled machines. Computers can never replace them. They are emotional, passionate beings who fill their work and their classes with pleasure, creativity, challenge and joy (p. 559).*

The teaching-as-competence movement is also counter-productive to the awareness and emergence of the second self (Preskill, 1998). This concept recognises that most highly accomplished leaders (e.g., Martin Luther-King) have uncovered new leadership capacities and ethical and moral dimensions of their selves not previously discernible, which takes the meaning of their work to new heights. The second self is another way of expressing the idea that the best teachers are open to new ideas, willing to question the dominant ways of knowing and keep growing as educators and as human beings.

Good Pedagogy Requires a Complex Rubric

A brief review of the literature shows that the illusive search for the good teacher requires a complex rubric. There is no one profile of good teachers but there is agreement that they do exist (Collinson, 1999). Carr and Kemmis (1986) identify three views of teaching that help to summarise and distinguish the main differences between the competing perspectives. First, the "technical view" conceptualizes teaching as a craft in which a focus on efficacy and outcomes rather than process is centrally important. In the "practical view", teaching is seen as an art or dynamic process that is too complex to define with concrete objectives. Finally, the "strategic view" sees teaching as essentially a political activity within a much larger social and historical context.

In a similar vein, Snook (1996) believes there are two basic models of teaching and teacher education. The first model defines teaching as a "practical craft" where the aim is to meet the immediate needs of students and schools. Under this model, the good teacher is equipped with sound teaching methods, general familiarity with all aspects of the curriculum and the ability to manage students in the classroom. According to Snook (1996), this model encourages a mechanistic understanding of teaching where teachers are expected to acquire a prescribed set of teaching skills. Although this approach recognises some important aspects of teaching, it is limited and inappropriate to the challenges of teaching in an increasingly complex and unjust world.

The second model believes that good teachers possess a broad understanding of education in its social, historical, and political context. Snook (1996) describes this model of teaching and teacher education as a "learned profession". From this perspective, one's approach to teaching is informed critically by the reciprocity between theory, research and teaching practice. This model requires well-educated teachers with knowledge and deep understanding of the various disciplines including their limitations (Snook, 1996). As Codd (1998) writes, they are trusted professionals rather than educational workers. Accordingly, the model rejects mechanistic views of teaching and is based on the assumption you cannot reduce pedagogy into specific rules or skills that underpin teachers' work. Teaching is far too complex.

Although Snook (1996) does not make this point, the term pedagogy takes on new significance when teaching is conceptualised as a learned profession. In the tradition of critical pedagogy, this perspective supports the view that good teaching involves an analysis of the processes that define what knowledge is important to know, how we should learn it, and how the production of knowledge itself serves to maintain social, economic and political inequalities (Sholle & Denski, 1994). The duality between teaching as a practical craft and teaching as a learned profession recognises that the good teacher is not necessarily a good educator. This subtle but decisive point is underscored by the analogy of Fagan in the story of Oliver Twist who was clearly a good teacher of young thieves but a good educator he was not (source unknown). The point of this analogy is that good teachers go beyond preparing students to cope with the type of society we have today—they seek to create a better more socially just world. For this reason, the enduring and fundamental question is do good teachers create a passive, risk-free citizenry or rather empower a political citizenry committed to addressing the unjust and oppressive features of society (McLaren, 1988).

The depth of this question illustrates the superficial nature of prior research on the good computer-using teacher. In Carr and Kemmis' (1986) terms, it shows the research has lacked a strategic view of teaching and good pedagogy. Of course, the above binary distinction is overly simplistic as it ignores some of the nuances and subtle differences in the various

models of the good teacher. A more complete and illuminative understanding of the complex nature of good teaching is gained by placing the different perspectives on opposite sides of a multi-dimensional rubric. On one side of this rubric, for example, teaching can be viewed as a practical craft whereas at the other end good pedagogy is conceptualised as a learned profession. On a second dimension, teaching can be seen as a pragmatic activity as opposed to an ethical and moral endeavour at the extreme end of which good teachers have a strong sense of the second self. Teaching is either a passive or emotionally charged practice on yet another dimension of this rubric. In addition, good teaching can be viewed as entirely neutral or highly political depending on one's perspective. An inverse relationship does not always exist along each dimension, as good teaching can be an art, craft and applied science. The crux of the good teacher is the portrait that emerges from the dynamic interplay between the various dimensions of this rubric when taken as a whole.

In sum, good teaching is idiosyncratic and takes different forms. For this reason, the concept of the expert or exemplary teacher is highly problematic. The good teacher—in the broadest sense of the word—can never be described fully in a checklist of certain personal attributes and professional qualities. There is more to the good teacher than their ability to master the features of the latest educational technology. The lesson is that 'a good teacher does not stop being a good teacher simply because they have not demonstrated competency in the use of learning technology' (Australian Council for Computers in Education, 1999b, p.3). Multiple models of teaching and a pluralistic perspective are needed as the definition of good teachers is inherently subjective and value laden. After all, definitions of good teaching are essentially a reflection of what is valued about education itself. Values determine the emphasis we place on the various dimensions of the good teacher. With this in mind, the following core principles stand out from a review of the literature. The good teacher:

1. *Has a critical philosophy of education anchored by a strong sense of social justice;*

2. *Has a lot of knowledge acquired through a blend of theory, research and practical experience;*

3. *Has a disposition toward innovation, risk taking and the promotion of active and meaningful learning across the curriculum;*

4. *Has a strong commitment toward critical self-reflection supported by their school culture and professional relationships.*

Above all, good teachers are trusted and learned professionals with a critical understanding of pedagogy in its wider social, historical, and political context.

2.8 SYNTHESIS OF EMERGENT THEMES

This section provides a synthesis of the emergent themes from a review of the literature. It presents the key findings from an analysis and interpretation of the literature relevant to the rapid growth of the Internet as a pedagogical innovation. Although many points and issues arise from the Literature Review, the major gaps and findings are synthesized in the following emergent themes.

1. The field of inquiry is cluttered with different terminology that is interchangeably used to describe the same phenomenon. There is no single agreed meaning of ICT in the professional discourse or research community. The lack of consistent nomenclature continues to plague research on the use of technology for educational purposes.

2. The Internet represents a new wave of educational technology. There are strong parallels between the Information Highway Wave and the original educational computing movement of almost two decades earlier. While the rhetoric about computers in schools has not always matched the reality, each iteration of educational technology is part of a continuous process of development, which makes sweeping generalizations on their success or failure problematic.

3. The Internet is a multi-faceted social, economic and educational phenomenon. When talking of the Internet there is need to think beyond the Web as the Information Highway can include the use of email, chat, mailing lists, telnet, Usenet, muds and moos, and so forth. While an information metaphor is common throughout the literature, the powerful features of the Internet need to also be conceptualised within the framework of a communication or relationship metaphor.

4. The Internet needs to be reframed as a pedagogical innovation. However, there is nothing uniform in how the Internet can be used for educational purposes. To date, our understanding of the Internet is immature and further progress is required in better conceptualizing its role within schools—for better and worse. Various frameworks help to explain the pedagogical possibilities of the Internet, but individually none of these models fully encapsulates what it is and how it can be used for learning and teaching.

5. Many theories and perspectives explain how the use of educational technology can contribute to better learning. Although the perspectives differ in some crucial areas and are known by different names, they share a number of common assumptions. There is agreement that learning is a consequence of thinking and good thinking is learnable when it involves the *active* and *meaningful* use of knowledge. However, there is no recipe for the design of knowledge-building learning environments as human cognition is a messy construct with no single all-inclusive theory.

6. It is necessary to retain the big picture to understand the complexity and complementary elements of each learning perspective. A pluralistic approach will help to better identify the range of learning opportunities afforded by new educational technologies. An inclusive perspective recognises that theory is not a fully elaborated position that is impermeable to change. Such an approach provides a wider lens through which we can articulate, envision and make sense of the raft of possibilities for better learning within the terrain of online pedagogy.

7. The teacher is a key figure in the success or failure of an educational technology initiative. Although numerous other factors influence the level of technology adoption in schools, the teacher matters most. Despite this, the teacher remains a neglected voice in the study and implementation of new educational technology. It is widely accepted that more attention should be directed towards studying teachers' beliefs as these determine how teaching occurs. In particular, there is a need for research that will yield insight into how teachers modify their use of educational technology to fit their beliefs.

8. To promote creative, innovative and talented students, teachers who are creative, innovative and talented are needed. Such teachers are expected now routinely to make use of ICT in their work as evident in the composition of new professional standards. Irrespective of the standards movement, a lot can be learnt from the wisdom embodied in the beliefs and practices of good teachers. They are important opinion leaders. By studying good teachers, some of the factors that lead to the successful implementation of the Internet in schools may be uncovered. This may help to ascertain the relative importance of ICT to the art, craft and applied science of good teaching and thereby encourage greater debate on the attributes of the so-called capable teacher.

9. The study of good computer-using teachers is an established line of inquiry. However, prior research has serious methodological flaws. There is a basic failure to recognise that what a researcher defines as a good teacher is exactly what they get. The criteria and sample selection techniques require just as much scrutiny as the research itself. In the past, the search for the good teacher has been characterized by a narrow instrumentalist conception of teaching in which there is an implicit assumption that new computer technology is good for education. It may be assumed incorrectly that good teachers view the computer as central to their work.

10. To answer the question what it means to be a good computer-using teacher it needs to be understood what it means to be a good teacher *per se*. There are numerous lists of the attributes and characteristics of quality teaching but these typically fail to acknowledge that the dominant values and ideology of the time influence conceptions of the good teacher. The concept of the good teacher is deeply contestable and inherently subjective because the definition adopted is a reflection of what is valued about education.

11. Good teachers are not simply narrowly trained technicians who make efficient use of resources. Such a practical craft model of teaching ignores the cognitive dimensions of good pedagogy where the best teachers spend a great deal of time thinking about their work. Thus, good teaching is an intellectual activity that has been described as a creative art, learned craft, applied science, and ongoing process of reflective practice. Good teachers are thinking professionals who operate within an ethical and moral framework. Their work is emotionally charged and inherently political, which rarely is acknowledged in the study of teachers' use of educational technology.

12. There is no one profile of the good teacher. A checklist of attributes can never do justice to the intricate, intuitive and idiosyncratic processes involved in the art, craft and science of good teaching. Rather than attempt to standardize teaching, the identification of good pedagogy requires a complex rubric that recognises the dynamic and multiple dimensions of teachers' work. While it is necessary to maintain a pluralistic perspective, above all good teachers are trusted and learned professionals with a critical understanding of pedagogy.

2.9 SUMMARY

This chapter presented a review of the literature relevant to the advent of the Internet in schools. It established the parameters of the study by first raising the problem of terminology and then tracing the evolution of computers in schools through a number of distinct educational technology waves. Various theoretical conceptions of the Internet as both a technical and pedagogical innovation were outlined and related to the new science of learning. It was shown that teachers need a sound conceptualization of the Internet linked to a contemporary understanding of the educative process. The key role of the teacher was discussed and the expanding body of research on good computer-using teachers was critically reviewed. Attention was given to the concept of good teaching drawing on what is known from the study of good teachers, effective teaching practice and how teachers become exponents of good pedagogy. The chapter shows that the study of internet-using teachers is a rich area of inquiry, especially when research is informed by a critical and multi-dimensional definition of good pedagogy. Finally, a synthesis of emergent themes highlights the key findings and current gaps in the literature, which underlie the definition of the research problem.

In the following chapter, the specific research problem and research questions are stated and a number of additional methodological issues are considered with regard to conducting research in the area of new educational technologies.

CHAPTER THREE

Methodology in Theory

'The computer is no substitute for the individual, experienced teacher' (Rowe, 1993, p.22).

3.0 INTRODUCTION

This chapter states the research problem which the study was designed to investigate drawing on the emergent themes identified in the literature review. It begins with a brief background to the problem and then defines the research objective and specific research questions. A number of methodological issues are raised with regard to conducting research on the study of new educational technologies. The different traditions of educational research are described and consideration is given to the most appropriate research method for meeting the objective. A brief analysis of different methodological approaches is undertaken and it is argued that research in the area of educational technologies must be conducted within a multi-paradigmatic framework where methods are not predetermined by specific philosophical traditions. The chapter concludes with a number of guiding principles for conducting research on the use of new educational technologies in schools.

3.1 BACKGROUND TO THE PROBLEM

The use of computers has become a common feature of most New Zealand schools. However, with the emergence of the "dot.com" phenomenon there is a new expectation on schools to bring the benefits of the connected world into the classroom. There is mounting pressure from a number of sources to wire schools to the Internet to better prepare students and teachers for their technologically induced futures. Thus, the advent of the Internet heralds a whole new era in the history of educational technology, which was foreshadowed by the launch of the ICT Strategy (Ministry of Education, 1998a). It is no accident that the first serious attempt to address the potential of ICT in education coincides with the rapid growth of the Internet in business and global commerce. Indeed, one of the four objectives of the ICT Strategy is to:

> *Increase opportunities for schools, businesses, and government to work together in developing an information technology-literate workforce that will help New Zealand to maintain its competitive advantage (Ministry of Education, 1998a, p.10).*

It follows that a number of potentially dangerous assumptions are embodied in the ICT Strategy. The race to connect New Zealand schools is set against the backdrop of a wider economic imperative that is problematic. It is highly debatable, for example, whether the role of schools is to prepare future citizens for work. The State has a much greater responsibility in a democratic society than '... to ensure that students are prepared to meet the technological challenges of the future' (Ministry of Education, 1998a, p.5). This goal assumes that people have to respond to the demands of technology, rather than technology becoming more responsive to the changing needs of society. It perpetuates the myth that ICT is an external force driving the future direction of society and maintains the type of technological determinism that has historically characterized educational technology. The assumption in the ICT Strategy is that technology is inherently good, evidenced by the failure to question whether teachers should be using the Internet in the first place. Broadly speaking, the value of ICT is taken-for-granted and treated by policy-makers as unproblematic.

There is still a tendency of educational policy-makers to assume that with better access and infrastructure the mere adoption of ICT will somehow equate with conditions for better learning, teaching and administration. Many of the claims embodied in the ICT Strategy of what technology can do for students and teachers fail to acknowledge the importance of the instructional context. Again, they attribute too much potential to the technology itself. As the literature review showed, it is the wider social and ecological context in which educational technology is embedded that is equally important in creating the conditions for active and meaningful learning in the manner envisaged by contemporary theory. A related point is that there is little or no acknowledgment in the ICT policy discourse of the equivocal nature of the research. Instead, the potential of ICT to enhance the learning and teaching process is presented as if it were proven when this is far from the case. Despite the concerns raised in Chapter One, absolutely no mention is made of the growing debate surrounding the use of technology for educational purposes. In the absence of such debate, it is timely to undertake research on teachers' Internet adoption from a critical perspective.

While the Government is about to invest significant resources in ICT by building infrastructure and improving school capability through a number of new initiatives (e.g., computer recycling, the online resource centre, and the ICTPD Cluster Programme[1]), rather less attention is being given to the risks of technology-driven pedagogical reform. There is even a possibility that the emphasis on ICT may distract teachers from other aspects of their work. The danger is that with the advent of the Internet teachers may be spending a large portion of their time dealing with a new layer of networking and computer management problems instead of adding value to the quality of the curriculum through better planning and creative use of existing resources.

[1] The ICTPD Cluster Programme provides a cluster of schools over $300,000 spread over three years to support professional development under the direction of a single ICT Lead School.

Between 1995 and 1996, Internet access is reported to have increased from a mere 12% to 34% in New Zealand primary schools (Telecom Education Foundation, 1996). However, it may be that after outfitting schools with new cabling, recycled hardware and a plethora of online resources, the benefits of Internet use are considerably less than anticipated. On the surface, students may appear to be highly engaged and enthusiastic as they interrogate the Web, but many of them could be downloading information in relatively passive ways following traditional teaching methods (Brown & Ryba, 1996). Despite the multi-faceted nature of the Internet, there is no guarantee that use of various activity structures will promote the opportunity for deep processing of information leading to the construction of durable knowledge. Ultimately, if the Internet is to encourage better learning, hi tech schools require hi tech teachers (Cuban, 1998).

In the last decade, thousands of New Zealand teachers have participated in ICT-related professional development. However, there remains a considerable gap between theory and practice. Although the literature review showed that there are some well-developed theories about the potential of the connected classroom, there is still need to understand how good teachers are using the Internet to enhance their teaching practice. In the past, there have been ample studies that describe how teachers in "lighthouse schools" are using computers for pedagogical purposes. What is missing from the literature is a description of how teachers are using technology in naturalistic conditions. That is, those teachers who experience all the trials and frustrations of integrating computers in the classroom with limited resources and without the additional support of short-term government initiatives. In particular, there is a need to capture teachers' own stories (Carter, 1993) and study the way that their perceptions and beliefs mediate the use of educational technology in schools. This includes both personal theories as well as *ways of knowing* that teachers employ to guide their classroom practice. It needs to be understood why some teachers see specific learning opportunities and use new educational technologies like the Internet for pedagogical purposes, and others do not.

In sum, the rapid growth of the Internet is at the foreground of the Government's recent attempt to promote the use of ICT in schools. Because the ICT movement is based on a number of largely unexamined assumptions, there is a need to pay closer attention to how New Zealand teachers are experiencing this latest educational technology wave—for better and worse. Despite claims about the Internet's potential to improve and transform many aspects of the education system, there are few studies that document what is really going on in schools (Windschitl, 1998). The danger is that with the pace of technological change what has happened may never be understood unless there is a study of these changes as they occur. Put bluntly, the investment in ICT remains an act of faith until more is known about the way in which New Zealand teachers have adopted and implemented the Internet in their professional lives and work culture.

3.2 STATEMENT OF THE PROBLEM

There is a lack of critical debate over the rapid adoption of the Internet in New Zealand schools. The hype of the Internet as a social, economic and educational phenomenon is diverting much attention away from its "real" pedagogical value in the classroom. At this stage, there is a tendency for people to overemphasize what the technology can do at the expense of the art, craft and applied science of good pedagogy. Put another way, the Internet's seductive appeal may be counter-productive to good teaching which promotes critical thinkers, critical consumers and critical citizens. To date, a review of the literature shows that most of the research on good computer-using teachers has adopted an instrumentalist perspective. There is a significant gap in the literature from a strategic view, which conceptualizes teaching as a trusted and learned profession. The present research seeks to close this gap. It is abundantly clear that teachers have a major influence on the way in which different internet activity structures are used in the classroom. Arguably, teachers' perceptions and beliefs lie at the heart of the Internet's potential in education. There is a need to study these beliefs to better understand how they inform and shape teaching practice. In particular, the experiences, perceptions and practices of good teachers already using the Internet need to be investigated so the advantages and disadvantages of this global phenomenon do not become enshrined uncritically in policy, theory and practice. Overall, there is a dearth of information available on teachers' Internet use in New Zealand schools and the research intends to address this problem by following a suitable direction of methodological inquiry.

3.3 RESEARCH OBJECTIVE

The main research objective is:

> *To investigate how teachers believe the Internet has affected learning and teaching—for better and worse.*

3.4 RESEARCH QUESTIONS

To meet this objective, the study was designed to answer the following specific research questions:

i) What are the background characteristics of internet-using teachers?

ii) How do teachers use the Internet for learning and teaching?

iii) *What perceptions and beliefs do internet-using teachers have about the learning and teaching process?*

iv) *What changes to their practice and work culture do teachers report from using the Internet for learning and teaching?*

v) *What perceptions and beliefs do teachers have of how the Internet supports the learning and teaching process?*

vi) *What factors do teachers believe inhibit and/or enable the use of the Internet for learning and teaching?*

3.5 METHODOLOGICAL ISSUES

This section considers a number of methodological issues relevant to the selection of the most appropriate research design. In recent decades the methods of educational research have been open to heated debate. This debate has its origins in historical arguments dating back to the early 17th century about the nature and philosophy of human inquiry. These arguments have deep ontological, epistemological and axiological roots and broadly reflect the evolution of three main philosophical traditions: (a) positivism, (b) interpretivism; and (c) a broad combination (and convergence) of critical, feminist and post-modern theory (Reid, Robinson & Bunsen, 1995). It has become common to describe these different traditions in terms of three distinct research paradigms as shown in Table 3.1. Although the term paradigm is often loosely used, it refers to a basic belief system based on specific ontological, epistemological and axiological assumptions (Guba & Lincoln, 1994). The significance of the paradigms is that they reflect quite different assumptions about the world that arguably give rise to their own distinct methods of social science.

The Competing Paradigms

In order to establish the research philosophy underlying the selection of the specific methodological approach of the present study, it is useful to describe in a general sense the nature of each paradigm and contrast their respective worldviews. In this context, the term "worldview" refers to the specific ontological, epistemological and axiological assumptions that inform and shape the researcher's orientation toward the human world. It is common to define and distinguish between different worldviews based on how people respond to the following philosophical questions:

- *What is the nature of reality and what can be known about it?*
- *What is the basis of our knowledge about the things in the world?*
- *How should we use our knowledge of the world?*
- *How can we go about finding out what we believe to be known?*

The first question asks: Is there a real world of objects or simply a world of ideas (Clark, 1997). The answer to this question influences whether knowledge should be based on objective observations of real phenomena or on the subjective interpretations of how people experience multiple and often conflicting realities of the social world. In many ways, the answers to the questions that follow depend on the response to the nature of reality.

Table 3.1
The Three Main Research Paradigms

Assumptions	Positivism	Interpretivism	Critical et al
Ontological	Real Reality or Real but there are Imperfect Conditions	Relativism Multiple Realities of the Social World	Historical Realism Reality Shaped By Social, Cultural, Political Values
Epistemological	Dualist / Objective In Search of Truth	Subjective / Transactional Value Laden Findings	Subjective / Transactional Value Mediated Findings
Methodological	Experimental Control/Manipulation	Contextual/ Holistic Analysis of Variables	Active/Dialectical Designed for Action

Guba and Lincoln (1994) stress that no researcher should go about their work without being clear what school of thought informs their response to these questions. From the outset, the researcher must indicate the specific paradigm or worldview that has been used to guide the research design, as this has an important bearing on how they arrive at their interpretations and understandings of the phenomena under investigation. The view adopted in this study, therefore, is that the researcher's philosophical perspective needs to be clearly established so that others can understand the factors that have influenced the decisions made throughout the research process. However, this is not a straightforward task as there are many nuances and contradictions contained within one's personal worldview. At the individual level, the research tapestry is far richer and more varied than presented by the three-fold classification of positivism, interpretivism and critical theory (Clark, 1997).

In recent years, for example, post-modernism has become a standalone alternative to the conventional paradigms (Denzin & Lincoln, 1994). A new participatory paradigm has been proposed also as a legitimate form of research inquiry (Heron & Reason, 1997). Thus, as new paradigms emerge and existing ones evolve it is important to keep in mind that these theoretical perspectives are only explanatory constructs, which help to understand the nature of human inquiry. The paradigms, like any theory, should be seen not as fixed positions but rather fluid texts always open to debate and subject to change. There is no way to establish beyond question their ultimate truthfulness as if there was the paradigm debate would have been resolved centuries ago (Guba & Lincoln, 1994). With this in mind, the following section describes each paradigm and its main philosophical assumptions before making the case for the adoption of a multi-paradigmatic framework where no one research perspective has any claim to methodological supremacy.

Positivist Paradigm

The Positivist Paradigm, also known as logical empiricism or post-positivism, emanates from the natural sciences. It is based on the premise that the methodological procedures of natural science can be directly applied to the social sciences (Soltis, 1984). This assumption has dominated the discourse of science for some 400 years (Guba & Lincoln, 1994). It reflects a realist view in which some rational order or system is thought to underlie the nature of the world around us. In its crudest form, realism presumes that the world exists externally and is independent of the social scientist (Hughes, 1990). The researcher is a rational spectator—that is, someone who makes neutral, value free and objective observations (Toulmin, 1981). It follows that positivism is known for the type of reductionist thinking associated with traditional scientific inquiry. Overall, the cornerstone of positivism is the belief that natural scientific methods are applicable to social research.

Interpretivist Paradigm

The Interpretivist Paradigm emerged from recognition that other ways of knowing existed beyond traditional science. In some circles, this paradigm is also referred to as constructivism (Guba & Lincoln, 1994). Irrespective of the name, the paradigm attracts a collection of different theoretical perspectives that lean toward a relativist view of the world. In its extreme form, relativism denies the existence of a real world. It follows that interpretivism represents a school of thought where people are believed to construct their own versions of reality, there are multiple realities of the world, and observations are mediated continually through the individual's particular view of reality (Mishler, 1979). From this perspective, what distinguishes humans from the rest of their environment is their

ability to use language and give meanings to their experiences. To understand the multiple realities of the social world, researchers have to focus on interpreting the meanings participants give to their experiences, which is sometimes known as hermeneutics or phenomenography. The basic tenet of interpretivism is that the researcher wears their own "theoretical lens" that shapes inherently biased, value laden and subjective observations of an indeterminate world.

Critical Paradigm

The Critical Paradigm adopts a form of historical realism that shares the subjectivity of interpretivism but attempts to retain the explanatory power of traditional science. In a loose sense, this paradigm is unified by a combination of critical, feminist and post-modern theory in which there is a strong emancipatory dimension (Anderson, 1989; Longino, 1989; Reid, Robinson & Bunsen, 1995). Although each theory stands on its own and should not be confused with one another, together they form a school of thought where the role of social science is to engage in a critique of ideology. In the tradition of the Frankfurt School, the assumption of critical theory is that perceptions of social reality are distorted and the researcher needs to raise false consciousness. Anderson (1989) refers to false consciousness as unknown and imprecise reconstructions of reality that perpetuate, as much as explain, social phenomena. From this perspective, the critical examination of social phenomena is claimed to liberate people from sources of domination, repression and subjugation (Carr & Kemmis, 1986). Broadly speaking, enlightened observations of an unjust and inherently political world lie at the heart of critical social science.

Summary of Paradigms

There are many interpretations of the research paradigms and the aforementioned descriptions are highly simplistic. A deeper analysis of the subtle, evolving and blurring nature of the differences between each paradigm is beyond the scope of this discussion. However, in its purest form positivism construes a view of humans as passive and determined by exogenous causes. Humans are not seen as significantly different from other life forms explained by the methods of the natural sciences. In contrast, interpretivism, with its constructivist view of knowledge, encourages a view of humans as active and self-creating. People are radically different from other things in the natural world and totally inexplicable in terms of such methods. The critical paradigm supports a similar position but presents a view of humans as oppressed and in need of liberation. Human liberation resides in the context of critical self-reflection and often highly practical research methodologies that address deep-seated social and educational problems. With a brief description of each paradigm—albeit somewhat unsophisticated—attention shifts to how the different research traditions have promoted methodological debate.

3.6 THE METHODOLOGICAL DEBATE

The paradigms often manifest themselves as quite different research methodologies, which explain why the methods of social science have been open to intense debate. It is a mistake, however, to see this debate as a crude distinction between quantitative and qualitative methods (Salomon, 1991). Such a dichotomy is overly simplistic. The methods of social science are far more sophisticated than this and such a dichotomy fails to do the methodological debate justice. The battle for methodological supremacy is complicated because it is fought not only between the paradigms, but also within each paradigm. There are different interpretations and intra-paradigm altercations on what constitute appropriate research methods. The key point is that the question of appropriate methods is crucial as it strikes at the core of what counts as "good" research.

The research literature on educational technologies has not been isolated from this debate as there is much controversy over the best research designs. According to Selwyn (1997) the methods of research suffer from three continuing weaknesses: (a) an excessive optimism, (b) the avoidance of qualitative methodologies, and (c) the distrust and avoidance of theory. The following section elaborates on these weaknesses by tracing the contribution and development of different research methods to the study of educational technologies. It reveals how the tension between research paradigms has fuelled debate over appropriate methods of research. The strengths and weaknesses of different research designs are discussed and the limitations of prior research used to show that the paradigms of social science are not incommensurable. It is argued that the philosophical traditions complement each other and that research in the area of educational technologies needs to adopt a multi-faceted methodological approach, one that utilizes both quantitative and qualitative methods within a multi-paradigmatic framework.

Legacy of Positivism

In the first decade of educational computing, most of the research was exploratory and undertaken in relatively contrived conditions. When computers were first studied in education the literature was dominated by experimental studies that attempted to measure the machine effects (Roblyer, 1996). This type of research usually involved two groups of students in a treatment and non-treatment experiment. An hypothesis was proposed and quasi-experiment designed to test for cause and effect relationships. Generally, the aim was to isolate the beneficial effects of the technology on learning by attempting to control, manipulate and observe all the intervening variables (Ryba, 1991). The research was characterised by its attempt to establish whether technology is more effective than traditional methods of instruction.

The research during the 1970s and early 1980s on the benefits of computer assisted instruction (CAI) emanated from such positivist assumptions (Brown, 1995b). During this period, the research usually involved one group of students receiving traditional instruction and another group receiving instruction in the same material, but from the computer. Some type of pre and post-test research instrument normally measured the so-called effects. The group that recorded the greatest learning gains was deemed to have had the most effective type of instruction. At the time, this method provided a rigorous and acceptable way to establish the value of using educational technology for instructional purposes. It demanded a high level of precision and offered the ability to replicate studies using multi-variant techniques with large groups for comparative purposes. Data were analysed using various statistical procedures and the research was synonymous with quantitative techniques. The predominant emphasis was on measuring learning outcomes rather than studying the learning process (Ryba, 1992).

One of the difficulties, however, of interpreting the results was that the treatment group was often studied in isolation from the regular curriculum. The experiment did not replicate the conditions in the regular classroom. Furthermore, the groups were observed only for a limited period and rarely were there any attempt to control for Hawthorn Effects. In educational research, Hawthorne Effects are those that show up not because of the particular benefits of the innovation being studied, but because often any innovation at all will produce some measurable benefits (Anderson, 1990). In other words, the results may have been due to the novelty of the computer experience rather than the treatment itself. Another common mistake was the failure to include a computer control group or second treatment group based on another form of teaching innovation. The computer was usually pitched against traditional teaching methods instead of good pedagogy *per se.* Broadly speaking, this type of research tended to emphasise what computers could do to, or for students, rather than what students could do with computers (Harel & Papert, 1990).

Clark (1983) was the first to expose the failure of this type of research to consider the instructional context. Going against conventional wisdom, he argued that media do not affect learning, as it is the different methods of instruction that impact upon what is learned. Clark (1983) used an analogy to claim that media were mere vehicles that delivered instruction, but that did not influence learning any more than a truck delivering our groceries cause changes to our nutrition. He also made the point that it was problematic to assume that the effects of media were always related to causes and that differences after an experimental treatment were directly related to the treatment. Clark (1991) argued that effects on learning from media could not be captured in isolated, contrived situations, which relied almost exclusively upon quantitative techniques. Since the appearance of the initial argument, Clark's claims have been hotly debated in the literature (e.g., Kozma, 1991).

With the benefit of this debate, the present study adopts the position that ICT are not neutral vehicles as Salomon (1997) has helped to explain the cultural and psychological relationship between mind and media. At the time of this debate, however, the common ground was the need for a new paradigm that takes greater account of the instructional context. Salomon and Gardner (1986) drew on the lessons from television research to maintain that when computers were introduced into classrooms a number of other factors altered as well: the teacher reacted in different ways, the nature of student interaction was different, and the physical environment changed. They showed that it was problematic to design an experiment to control all intervening variables, as you can never identify the full range of factors that might potentially be associated with a particular effect. It follows that Salomon and Gardner (1986) believed experimental methods were inappropriate on their own as they were insensitive to the multiple ways that computers can be used for instructional purposes. Instead, they advocated a holistic paradigm that studies the computer as a cultural phenomenon.

Despite this argument, the issue of appropriate methodologies was not thoroughly debated until exhaustive research on the effects of Logo™. In the 1980s, research on the Logo™ programming language dominated the computers in education field. Interest in Logo™ was centred particularly in North America where there was a lot optimism regarding its potential to enhance general problem solving skills. The potential of Logo™ to develop higher order thinking skills based on the work of Seymour Papert (1980) resulted in a flurry of experimental research. The key question was: Did Logo™ work? Overall the results were somewhat equivocal. While some research reported positive effects on the development of cognitive and metacognitive skills (e.g., Clements & Gullo, 1984), other studies were notably more cautious especially concerning the durability and potential transfer of skills (e.g., Pea & Kurland, 1984). At the time, controversy over Logo™ was such that there was even a movement to place a moratorium on its use in schools.

In a seminal article, Papert (1987) took exception to some of the criticisms about Logo™. His reaction was not over the equivocal results of research on Logo™, but more on the methods that had been adopted to establish its beneficial and deleterious effects. Papert (1987) maintained that Logo™ had been judged unfairly; the criticisms were rooted in a misunderstanding of what Logo™ was about and how it should be studied. In particular, he argued that experimental methods largely missed the point. It was not Logo™ *per se* that directly influenced learning, but the overall social and cultural context within which the software was embedded. Papert (1987) pointed out that:

> *The context for human development is always a culture, never an isolated technology (...) you have to center your attention on the culture – not on the computer (p.23).*

The key point of Papert (1987) was that research had to focus on the educational culture surrounding the computer, as opposed to the technical and cognitive requirements of simply doing Logo™. What he rejected here was a school of thought known as technological determinism. As previously described, technological determinism assumes that technology's effect on society depends on the structural properties of the technology itself, regardless of social and cultural factors (Mehan, 1989). Papert (1987) described prior educational computing research as trapped at a "technocentric stage" where centrality was given to the computer. To move beyond this stage, he proposed that research needed to adopt a paradigm that concentrated on the learning environment as a whole and the researcher as an educational activist.

Transition to Post Positivism

In light of these criticisms, the traditional quasi-experimental design was modified to take greater account of the instructional context. At the same time, a number of system wide evaluation studies also were undertaken to determine the level of computer use in schools (e.g., Pelgrum & Plomp, 1993). This shift paralleled the general transition to post positivism in the methodological literature where there was a move way from decontextualised research. In an elaborate quasi-experimental study, for example, Clements and Nastasi (1988) attempted to address the weaknesses of prior research on Logo™ by undertaking systematic observations within a naturalistic learning environment. This study was unique in that unlike prior research it clearly stated the theoretical assumptions on which observations were dependent. The research was designed around an observation scheme that operationally defined, for the first time, the type of metacognitive activities that students engaged in as they learnt with Logo™. Although the operational definition of metacognition was problematic, the study provided some important evidence that Logo-learning environments offered a context for socially strategic problem solving behaviours.

While these results were encouraging, the research design did not fully address Papert's methodological concerns. For example, Clements and Nastasi (1988) did not promote activism and they disregarded many contextual variables, such as: (a) the prior experience of students; (b) their different levels of motivation; (c) the diversity of learning styles; (d) the varying perceptions of the Logo™ learning experience; and, (e) the role of the teacher. Indeed, the teacher's views of the learning process, their pedagogical approach and learning expectations were never considered or controlled (Brown, 1992). In many ways the teacher was construed as a type of nuisance variable. Although the research was conducted in a naturalistic environment, the quasi-experimental method left out much of what was human. There was still a need to study the range of contextual variables within the naturalistic computer learning environment.

Another important contribution to the on-going methodological debate came in the work of Emihovich and Miller (1988). In an original paper on the social context of Logo™, a multi-method and multi-disciplinary approach to research was proposed utilizing a modified reference model. This model drew upon concepts from anthropology, psychology and sociolinguistics to form a frame of reference (Emihovich & Miller, 1988). It made no strong claims to external reality, but was designed to allow an inter-disciplinary qualitative and quantitative contextual analysis using a specific theoretical framework. The basic tenet was that research needed to be guided by, and analysed in relation to, an explicit educational theory. Although Emihovich and Miller (1988) acknowledged that this model was at its embryonic stage, they argued that research stripped of context was no longer a fruitful avenue of inquiry. What was required was a research model that combined both experimental and naturalistic forms of inquiry within an ecological context.

Rise of Interpretivism

An interest in the wider ecology of the learning environment coincided with the rise of interpretivism. This period heralded the rejection of quasi-experimental designs in favour of qualitative methods, which sought to understand the nature of the dynamic interactions within the computer learning environment. From this ecological perspective, no one component or system was seen in isolation from the wider context of instruction. The intention was to study the inter-related systems and connections between elements that combine to create the computer learning culture (Brown, 1992).

Mehan (1989) was one of the first to apply ethnographic research methods to the study of educational computing. His year-long case study showed that in the natural context of the classroom, teachers could use the innovative features of computer technology either to meet previously established educational goals or to strive toward previously unattainable educational goals. Mehan (1989) argued that it was social practice not the features of the technology, nor the structure of a social organisation, that determined the ultimate use of an educational innovation. As social practice the computer was always part of a larger social system, which included:

> *The students, the teacher, their history of past relationships, the history of ways of teaching, the history of ways of organising classrooms, the relationships that the classroom curriculum has to the surroundings, and the relationship between the classroom and the school, community, and agencies beyond (Mehan, 1989, p.19).*

The insight gained from this case study had significant implications for future research. It was important to study the modifications and changes to social practice that accompanied computer use in schools. Mehan's (1989) central thesis was that the effects of the computer were unlikely to be unidirectional, but rather multifarious. Consequently, it was argued that all research of social phenomena takes place within a social system, which has an important bearing on both the process and outcome of the research. According to Mehan (1989), the crucial ingredient was people and their experiences with the computer, not just the inherent features of the technology itself.

The focus on "people effects" led to a much better appreciation that it was the dynamic interactions between computers, students, teachers, curricula and wider social systems that were central to what was learnt (Ryba, 1989). It was not the computer that determined learning *per se*, but a range of nested mutually influential relationships within an inter-related web of social practice. Salomon (1991) claimed that a conglomerate of interdependent variables, events, perceptions, attitudes, expectations and behaviours affected the computer learning environment. He first illustrated this point through an analogy of a symphony orchestra:

> *The music we enjoy is produced by symphonic orchestras, not just single flutes (Salomon, 1990a, p.530).*

This quote is probably the best example of a fully articulated interpretivist perspective in the context of the study of educational computing. Salomon (1990a) was reacting to the growing disenchantment with the analytic, experimental, reductionist, one-variable-at-a-time paradigm, in which the forest often cannot be seen for the trees—the orchestra for the flute. He criticized the positivist tradition by stating that:

> *The analytic-experimental approach we are so familiar with cannot fully satisfy the need to study individual changes in a changing context. One of the reasons is that such an approach requires the manipulation of a single variable (...) Rather than having a single or a few independent variables to which differences in a well specified dependent variable can be attributed, with everything else held constant, we now have a complex package of interdependent and mutually defining variables each of which is "independent", "mediating", and "dependent" at the same time (Salomon, 1992, p.65).*

The key point to emerge from this interpretivist view was that educational computing research needed to shift towards a systemic paradigm, where people and culture coexist and jointly define one another (Salomon, 1992). To define more precisely the systemic paradigm Salomon (1991) distinguished between the need to study the effects "with" the computer and the effects "of" the computer. Effects *with* the computer involved changes as students used technology to support their learning. These were effects pertaining to a particular context, which Salomon (1991) described as situated cognitions. Effects *of* the computer related to the consequence of computer use. These effects were generalisable and transferable outcomes related to decontextualised cognitions. Although Salomon (1991) contended that both types of effects needed to be understood within a systemic paradigm, the effects *of* the computer were ultimately more significant as these effects related to changes to culture rather than just to isolated experiences.

Overall, the main difference between this systemic paradigm and the more traditional experimental method was that one focused on the whole ecology of inter-related variables within the learning environment and the other treated social, cultural and emotional factors as either nonexistent or, at best, as background variables. While staunch support remained for the traditional experimental design (e.g., Becker, 1987), the growth of case study and ethnography as legitimate methodological approaches epitomized the shift from the dominant positivist to the flourishing interpretivist paradigm. The status of qualitative research was well and truly established when Levine (1990) described a range of alternative methodologies that had gained recognition as valid forms of inquiry in the assessment of classroom-based microcomputer initiatives. Hence, from the early 1990s a variety of case study and ethnographic approaches began to address the claim that most of the previous experimental research had been looking for love in all the wrong places (Polin, 1992).

The so-called new methods during this period attracted many closet positivists but the case study approach distinguished itself when the fieldwork was predominantly qualitative. This type of research tried to maintain a close link between theory and practice such that observations gained from case studies were "illuminative" and thus mutually comprehensible—that is, directly relevant to classroom practice. The aim was not to test theory but to collect a database of information that might yield insights, give meanings and provide converging evidence for the construction of tentative theories. In this sense, the case study was not so much a discrete methodology, but more a style of research with an aim to observe, probe and understand the subjective meanings of complex social phenomena (Yin, 1989). The intention was to gather a rich archive of descriptive information that could become a cumulative resource with the potential for generalisation. The major strength of the case study was its flexibility and adaptability to the rapidly changing nature of the computer learning environment.

Case study was not without its critics. There were ongoing criticisms within and beyond the educational computing literature concerning the effects of the researcher, the time required for observation, the amount of data that had to be processed and the difficulty of accurately reporting complex interactions within a case. Many traditional researchers attacked the foundations of case study and a number of modified experimental designs were proposed for determining the effectiveness of technology in education (e.g., Poirot & Knezek, 1992). From the positivist perspective, the new qualitative methodologies, often involving purposive samples in naturalistic settings, provided large volumes of information but very little knowledge or explanation. Moreover, they had little reliability as researchers could reach different conclusions from the "soft" qualitative data. There was no basis for replication and rigorous testing and falsification of educational theory (Becker, 1987). In sum, the positivist opponents of case studies of computer environments maintained they had little external validity and generalisability to other contexts.

Emergence of Critical Research

The major criticisms of the case study and related contextual approaches originated from a quite different philosophical tradition. A small but growing number of researchers were not convinced that interpretivism presented a consistent and unified alternative to the shortcomings of positivist research. The preoccupation with context was likened to a form of social or cultural determinism. In this context, cultural determinism is the belief that culture as a whole shapes the social system and specific educational technology has little or no influence on the nature of the system at large (Mehan, 1989). Put another way, this perspective assumes that technology is assimilated by culture. The problem with this view is that culture can be very conforming and it is often resistant to innovation and change. At a deeper level, school culture usually reflects the dominant ideology, which means that the use of technology in education is inextricably linked to issues of power and social control.

From this critical perspective, the growth of case study and other interpretivist methodologies was pragmatic as much as epistemological (Carr & Kemmis, 1986). They were pragmatic in that these methodologies supported conflicting epistemological positions and there was very little recognition that humans have misconceptions of the social world that are not themselves a secure basis for validation. More importantly, case study was not committed to critique. Although the methodology could accommodate a critical perspective, it did not always prescribe for action. The approach could shed light on the nature of the interactions within the computer learning environment, but it usually left it for others to decide how to act. The key point is that these criticisms arose from the philosophical assumptions of the Critical Paradigm, which was gaining an increasing foothold in educational research.

An alternative methodology emerged known as action research in which the classroom teacher adopted a dual role as teacher-researcher (Carr & Kemmis, 1986). This method attempted to operationalise the ontological, epistemological and axiological foundations of the critical paradigm. It did not cast the researcher into a separate and distinctive role, but rather one of collaborating with the participants with the common purpose of improving classroom practice. This type of research required the researcher to work with the participants to directly help them with their practical problems of trying to integrate the computer into the classroom. In its purest form, action research tried to engage the participants in democratic and non-exploitative forms of self-reflective inquiry (Beynon, 1993). Thus, it was concerned with the experimentation of teaching practice and the collaborative monitoring of multifarious effects through a process of critical reflection (Somekh, 1991). In brief, the aim was to demystify the rhetoric about educational technology by challenging teachers' distorted perceptions of the potential of computers in schools.

The origins of action research in the computer environment are difficult to establish but the method has strong connections to the Centre for Applied Research in Education (CARE) at the University of East Anglia, Norwich. It can also be traced to the Educational Computing Research Group (ECRG) at Deakin University, Australia. The common denominator is probably Stephen Kemmis—a leading proponent of action research who worked at both institutions. Although Olson (1988) first contemplated the benefits of an action research agenda for educational computing in the late 1980s, most of the early initiatives were poorly conceptualized and few designed in keeping with the philosophical assumptions of the critical paradigm. However, since then action research has flourished as a valid model of teacher professional development (e.g., Ryba & Brown, 1994).

In the New Zealand context, this initially involved some of the 24 "exploratory studies" on the use of various computer applications in 66 kindergarten, primary, intermediate and secondary schools (McMahon, 1986). In 1989, the disestablishment of the Computer Education Development Unit (CEDU) meant that few of the results from these studies were ever widely circulated, but undoubtedly the research gave many teachers the chance to reflect on their early experience with computers in their own classrooms. Despite this, it is debatable whether the exploratory studies followed the four basic steps of action research in the tradition of critical theory: (a) planning, (b) acting, (c) observing, and, (d) reflecting (Kemmis & McTaggart, 1988). These steps are not discrete but rather dynamic; each step is but one element within a continual research spiral leading to empowerment and lasting educational change of a reconceptualist nature.

In most instances, a naive practical form of action research was adopted in ICT professional development (Brown, 1995). This type of professional development is now common and is notable for its attempt to develop skill, knowledge and resources in the context of classroom practice. The model relies upon trained facilitators (and researchers) to work with clusters of teachers to plan, implement and reflect on a range of practical ICT-related activities in the classroom. In this sense, it aims to promote continuous learning through experience. Although the research component appears to have been lost with the practical focus, this approach to professional development is now a linchpin of the ICT Strategy (Ministry of Education, 1998a). It is fair to say that this model of professional development has been more successful than earlier initiatives at getting teachers to use computers for learning and teaching (Gilmore, 1994). At the same time, it has arguably fallen short of providing teachers with sufficient theoretical knowledge and analytical powers of analysis to liberate them from sources of domination, repression and subjugation.

The lesson is that action research can be very controlling and it has no claim to methodological supremacy. The weaknesses of action research in ICTPD have yet to be fully exposed but they relate to unequal power relationships, the high level of skills required, and the difficulties of accurately reporting the research findings. Traditionalists argue that the methodology is impractical and that research outcomes are intangible; they have no status. The methodology cannot be replicated and it lacks external validity. Moreover, the successful adoption of an educational technology is determined by factors often beyond the control of individual teachers. At a deeper level, the commitment to action leaves the potential for teaching to be hijacked by ideology. Thus, action research has the potential to impose an ideology that is both liberating and oppressive (Gauthier, 1992). The liberation of some groups may be at the expense of others. Action research presupposes the researcher's perceptions are not distorted and that common ground of what constitutes good pedagogy exists. The goal of empowerment is problematic because some teachers may be quite content with their existing practice. There is no guarantee that enlightenment will lead to freedom of action, as certain types of change may be impossible within the existing education system.

In sum, this section has revealed some of the underlying methodological strengths and weaknesses that must be acknowledged in the selection of an appropriate research design. It has described the debate over the search for good quality research and traced the evolution of different methodological approaches in the study of new educational technologies. While no one approach was shown to have methodological supremacy, it can be seen that all of the above perspectives have influenced to some extent the decisions about the research design adopted in the present study. In light of the shortcomings of each methodological approach, the question is: How do we study the adoption and implementation of a new educational technology by teachers in New Zealand schools?

3.7 THE CHALLENGE OF A NEW RESEARCH PARADIGM

The development of an appropriate research paradigm remains a major challenge within the literature. The limitations of prior research suggest that no one methodology is sufficiently inclusive toward the study of this latest educational technology wave. No doubt, the methods of research will continue to be refined but the debate over their legitimacy tends to deflect attention from their compatibility. Despite tensions between the different research designs and respective competing paradigms, each methodology contributes to our overall understanding of the role of educational technology in the learning and teaching process. This composite worldview refutes the incommensurability argument that there can be no accommodation between the paradigms (Lincoln & Guba, 1985). In the future, the paradigms of social research need to shift toward not just a pluralistic tolerance of different methodologies, but mutual support for each other. This view is based on the premise that no one approach to the study of educational technology is an end in itself. Each approach enriches the other.

This position does not mean that the paradigms of social science should combine; rather that research needs to be conducted within a multi-paradigmatic framework. Such a framework suggests a type of methodological pluralism (McLennan, 1995) where each perspective is valuable in contributing to our understanding and knowledge base of the effects that arise from new computer technology in schools. From this perspective, the paradigm debate is less problematic than usually portrayed because what becomes important is what researchers want to find out, rather than the method or approach that they adopt to find it out (Howe, 1992). The questions we ask are crucial, as these determine the methodology—not the other way around. Hence, the problems researchers define and the questions they ask ought to be the major focus of debate. The research community will engage in debate that is far more fruitful if the paradigms are used to critique the research questions rather than debase the available methodological approaches.

In sum, the research community is better served to think of the paradigms and their underpinning ontological, epistemological and axiological assumptions as open texts. That is, explanatory frameworks that are partially developed and that can, and should, be re-written in light of new experiences. We need to understand that the research paradigms, and indeed all theory and scholarly work, are not a fixed set of beliefs to which one must adhere, but rather evidence of the intellectual struggle with questions which can never be fully resolved. It is not surprising that different research agenda and theoretical perspectives contain impurities and internal contradictions, as this will always be case for those we encounter. For this reason, a multi-paradigmatic framework is guided by a set of general principles as opposed to any fixed type of orthodoxy.

3.8 GUIDING PRINCIPLES FOR RESEARCH

There will never be one all-inclusive research methodology but there are a number of general principles that should guide the study of new educational technologies. The main principle is to make research visibly relevant to the improvement of teaching practice. This basic tenet will in turn lead to a kind of practice that is informed by and critically responsive to theory (Mercer & Scrimshaw, 1993). The aim is to explore the reciprocity between policy, theory and practice to improve all three at the same time through a critically reflective and self-consciously applied research programme. With this in mind, the design of the research was guided by the following general principles, which are derived from the research methods and paradigm debate.

1. Focus on the problems confronting teachers rather than selecting a specific educational technology and looking for a problem.

2. Ensure that prior theoretical assumptions are made explicit and that every opportunity is given to build new theory as well as critiquing existing theories.

3. Explain and clearly justify the decisions made throughout the research process such that these are always open to scrutiny and/or potential replication.

4. Include contextual factors in research designs such as demographic variables, teacher interventions, curriculum experiences and the type of collegial relationships.

5. Recognise the limitations of traditional methods and ensure that research conditions are ethical, feasible, applicable and transferable to teachers' work in regular classroom settings.

6. Utilize both quantitative and qualitative research techniques over a reasonable period such that a range of data can be obtained from as many different sources as possible.

7. Allow sufficient time for the study of significant effects so that observations do not pertain simply to novel experiences as opposed to more durable and lasting changes over time.

8. Involve the participants as much as possible in the research process as their concerns and perspectives will ultimately determine the value of the research and its potential to improve teaching practice.

9. Question existing ways of knowing, consider alternative explanations and always encourage teachers to critically reflect on their teaching practice, as the true source of betterment requires the confronting of false consciousness.

10. Make the implications explicit but exercise caution in generalising findings from one study to the next. There are so many approaches and differences in educational settings that situational factors may limit the transfer of results from one setting to another.

In addition to the above principles, the study was influenced by Lincoln and Guba's (1985) concept of trustworthiness, as described in Chapter Four. The design of the present study was guided also by the emerging phenomenographic literature in which the researcher endeavours to understand how an individual experiences some phenomenon (Bruce & Gerber, 1994). This approach is underpinned by a non-dualistic worldview, in that a specific phenomenon can be known only as it is perceived. Thus, it avoids some of the unresolved philosophical arguments over the nature of reality as outlined earlier in the chapter.

3.9 SUMMARY

This chapter stated the research problem. It began with a brief background to the problem and then described the research objective and specific research questions. A number of methodological issues were raised in relation to conducting research on the study of new educational technologies. The different traditions of educational research were described and consideration was given to various philosophical issues that influence the selection of the most appropriate research methods. A brief analysis of different methodological approaches was undertaken to clearly establish the research philosophy underlying the present study. The conclusion was that research on the adoption and implementation of educational technology by teachers must draw on a multi-faceted approach, one that utilizes both quantitative and qualitative methods within a multi-paradigmatic framework. The chapter concludes with a number of guiding principles for conducting research from this perspective.

The following chapter presents the selected methods, procedures and techniques compatible with a multi-paradigmatic framework.

CHAPTER FOUR

Methodology in Practice

'For the beginner there are many solutions. For the expert there are few' (Knight & Smith, 1989, p.438).

4.0 INTRODUCTION

This chapter describes the methodology and three main research phases. It presents a description of the participants and sample selection process for each phase of the study. The research, which was developed in several phases, involved a progressive analysis of a purposive sample of proficient, accomplished and experienced internet-using teachers. This required the application of specific criteria to the research sample and systematic selection processes at each phase. An account of the procedures and techniques used for piloting, gathering and analysing data is provided, along with justifications for decisions made throughout the research process. Attention is also given to ethical considerations, issues of trustworthiness and the perceived methodological limitations of the research.

4.1 RESEARCH DESIGN

The study was designed to meet the research objective using a multi-paradigmatic framework based on the core principles of conducting research in the area of new educational technologies, as presented in Chapter Three. In keeping with the objective, the research design was informed by the phenomenographic literature (Bruce & Gerber, 1994) in which the researcher endeavours to understand how an individual experiences some phenomena. This approach is underpinned by a non-dualistic worldview, in that a phenomenon can be known only as it is perceived. From this perspective, a multi-faceted approach was adopted to better understand the wider social practice of Internet use in the naturalistic context of schools. The research design involved both qualitative and quantitative methods and techniques of data collection over an extended period of time (see Table 4.1).

The first phase utilised a survey method, involving a postal questionnaire to gather background information on teachers' experiences, perceptions and practices of using the Internet for learning and teaching. Phase Two extended the initial survey through a follow up postal questionnaire and then an informant interview in which selected teachers were invited to converse and respond to questions about their own teaching and Internet experience. The second phase was designed to provide qualitative data that would capture the voice of individual teachers.

Table 4.1
Research Questions and Data Techniques by Phase

	Research Objective	**Phase One Research Method**	**Phase Two Research Method**	**Phase Three Research Method**
	To investigate how teachers believe the Internet has affected learning and teaching — for better and worse.	Survey	Survey	*Narrative-Biographical* *Micro Ethnographic* *Case Study*
	Research Questions	**Phase One Techniques**	**Phase Two Techniques**	**Phase Three Techniques**
1.	*What are the background characteristics of internet-using teachers?*	*Postal Questionnaire*	*Postal Questionnaire* *Informant Interview*	*Capability Schedule* *Informant Interview* *Biographic Interview* *Participant Observation* *Written Autobiographical Story*
2.	*How do teachers use the Internet for learning and teaching?*	*Postal Questionnaire*	*Postal Questionnaire* *Informant Interview*	*Capability Schedule* *Informant Interview* *Biographic Interview* *Participant Observation* *Written Autobiographical Story*
3.	*What perceptions and beliefs do internet-using teachers have about the learning and teaching process?*	*Postal Questionnaire*	*Postal Questionnaire* *Informant Interview*	*Research Diary* *Informant Interview* *Biographic Interview* *Participant Observation* *Documentation Schedule* *Written Autobiographical Story*
4.	*What changes to their practice and work culture do teachers report from using the Internet for learning and teaching?*	*Postal Questionnaire*	*Postal Questionnaire* *Informant Interview*	*Research Diary* *Informant Interview* *Biographic Interview* *Participant Observation* *Documentation Schedule* *Written Autobiographical Story*
5.	*What perceptions and beliefs do teachers have of how the Internet supports the learning and teaching process?*	*Postal Questionnaire*	*Postal Questionnaire* *Informant Interview*	*Research Diary* *Informant Interview* *Biographic Interview* *Participant Observation* *Documentation Schedule* *Written Autobiographical Story*
6.	*What factors do teachers believe inhibit and/or enable the use of the Internet for learning and teaching?*	*Postal Questionnaire*	*Postal Questionnaire* *Informant Interview*	*Research Diary* *Informant Interview* *Biographic Interview* *Participant Observation* *Documentation Schedule* *Written Autobiographical Story*

The final phase involved biographical narratives of three experienced internet-using teachers supported by micro ethnographic case study material. A narrative approach, amplified by a microscopic level of ethnography, sought to understand how teachers were experiencing the Internet as a social, economic and educational phenomenon. The three phases were designed to provide a multi-layered investigation of a purposive sample of proficient, accomplished and lastly experienced internet-using teachers from the wider research population.

Research Population

The target population comprised of all internet-using teachers in primary and intermediate schools within three clearly defined geographical locations: (a) Central Region East, (b) Central Region South and (c) Central Region West. These regions are established boundaries for schools located within the North Island of New Zealand. The research population was further refined to all internet-using teachers employed in schools within a specified distance (25 km) of the Central Business District (CBD) of a selected city and town within each region. In total, this represented 104 schools. The regional profile of these schools is presented in Table 4.2.

Table 4.2
Regional Profile of Schools

School Regions	Urban	Semi Rural	Total
Central Region East	32	14	46
Central Region South	17	8	25
Central Region West	25	8	33
Total	74	30	104

Each location was selected on the basis that it provided a typical sample of internet-using teachers from a range of urban and semi rural schools of different size. At the beginning of the research, the locations did not include an ICT Lead School as defined by the Ministry of Education. This was a real strength of the sample in that the research would investigate Internet use under naturalistic conditions. Selection was also based on the feasibility of each location and anecdotal evidence of strong regional support for educational computing.

Over the years, the locations have had ready access to a number of teacher education and professional development courses offered by local polytechnics, colleges of education, and a variety of private trainers. There are also a number of well-known educationalists in each location with established reputations in the telecommunications field. Thus, there was every indication that: (a) the Internet had a high profile; (b) computers were being used extensively in local schools; (c) there was sufficient educational and technical support for teachers who wished to use the Internet; and, (d) a reasonable number of proficient internet-using teachers would be found within the target population.

Population Definitions

The following definitions applied to the target population:

i) *An internet-using teacher was defined as any teacher who used the Internet for learning and teaching purposes within their school or home.*

ii) *A primary school was defined as a school delivering the National Curriculum Framework for students between years One and Eight.*

iii) *An intermediate school was defined as a school delivering the National Curriculum Framework for students between years Seven and Eight.*

The inclusion of intermediate schools within the target population was important, as some teachers would be employed at non-contributing schools—that is, where students continue their education until leaving to attend secondary schools. This decision meant that a small percentage of teachers were likely to work in schools offering the curriculum inclusive of years One to Eight.

Research Sample

The research involved an extreme case, purposive sample of proficient, accomplished and experienced internet-using teachers from within the three target populations. Selection of the sample participants served a dual purpose.

First, the sample was selected to elicit the experiences, perceptions and practices of a special population of teachers, specifically, a group of teachers either nominated to be proficient or perceived to be accomplished in their use of the Internet for learning and teaching. The study of these teachers was thought to have the greatest potential of meeting the research objective, in that a purposive sample would offer a more illuminative analysis of the way in which the Internet has affected learning and teaching in the naturalistic context of schooling. It was further anticipated that the sample might provide a better indication of the crucial role of teachers' experiences and perceptions in shaping different patterns of Internet practice.

Second, the sample was intended to provide the basis for identifying at least three experienced internet-using teachers for more in-depth study. The use of the term "experienced" was quite deliberate. It recognizes that there is no one profile of the good teacher but experience is an important contributing factor to the level of expert teaching practice. This phase acknowledges the need for rich contextual data on teachers' Internet use beyond traditional surveys. A refined sample of experienced teachers was conducive to gathering some of the "folk wisdom" associated with the adoption and implementation of a new educational technology in schools.

This selection strategy would help to enhance the validity of the research findings and possibly support a deeper level of critical self-reflection by the participants. A related goal of the research was to encourage teachers to question the role of the Internet in education—for better and worse. In this sense, the study included an emancipatory dimension and encouraged the participants to become genuine research partners.

In the past, research on "good teachers" has offered valuable insights into the nature of effective classroom practice (e.g., Berliner, 1986; Knight & Smith, 1989; Ramsey & Oliver, 1993). The literature review showed that a lot can be learnt from these teachers. In the context of the Internet, those teachers who are perceived adept practitioners and good exponents of educational technology are likely to have a major influence on their colleagues. Accordingly, the sample has the potential to help identify key factors in the successful implementation of the Internet in schools from the teachers' perspective. It might also provide some important lessons for other schools, especially in planning future professional development initiatives. Hence, the study of proficient, accomplished and experienced internet-using teachers would address a current gap in the literature. Although a number of previous studies document successful (Shavelson *et al.*, 1984), accomplished (Sheingold & Hadley, 1990), effective (Sherwood, 1993), competent (Vockell & Sweeney, 1993), exemplary (Becker, 1994; Berg et al., 1998), and proficient (Brown 1995b) computer-using teachers, these predate widespread use of the Internet. Moreover, the aforementioned studies have important conceptual and methodological weaknesses. With few exceptions, as discussed in Chapter Two, prior research has failed to acknowledge that the identification of good teaching is highly problematic.

Sample Selection

The identification of proficient, accomplished and experienced teachers was considered problematic, as the literature reviews shows that it depends how these terms are defined and what criteria is being applied. In recognition of this problem, the internet-using teachers selected at each phase of the research were defined as:

Phase 1	*Any teacher who was nominated by other educators and/or professionals to be proficient in the use of the Internet for learning and teaching.*
Phase 2	*Any teacher who was perceived by the researcher in consultation with a selected group of professionals (Research Advisory Group) to be accomplished in the use of the Internet for learning and teaching based on clearly defined criteria.*
Phase 3	*Any teacher who was judged by the researcher in consultation with a selected group of professionals (Research Advisory Group) to be experienced in the use of the Internet for learning and teaching based on clearly defined criteria.*

Research Advisory Group

The researcher invited five well-known professionals with different background experiences in the use of new educational technologies to assist with the sample selection process (Appendix A). The group included the following people:

(a) Senior Teacher with considerable practical experience and advanced qualifications in educational computing;

(b) Teacher Educator based in a local College of Education with responsibility for courses in new educational technologies;

(c) School Principal with extensive experience in schools that use computers within and across the curriculum;

(d) University Researcher with advanced knowledge of the leadership literature and previous experience at conducting educational computing research; and

(e) Technical Expert with considerable skill and experience in the practical networking of schools to the Internet.

These professionals constituted the Research Advisory Group. The above people operated independent of the supervision process and they were chosen on the basis that they contributed different practical and theoretical knowledge. In particular, this group brought together people with different perspectives on what constitutes teaching proficiency both with and without the Internet. The inclusion of a range of professionals with contrasting experience was consistent with the concept of cross-perceptual analysis in which people with different perspectives are consulted to reach consensus. The addition of the Research Advisory Group helped to address the shortcomings of previous research, which had depended upon undefined and/or restricted selection processes. The Research Advisory Group provided a more robust and systematic way of selecting the purposive sample of proficient, accomplished and experienced internet-using teachers for further study.

Research Timeline

The research was completed over three calendar years with the preliminary nomination phase beginning in April 1999. Final data collection was completed in November 2001. Figure 4.1 outlines the research milestones and timeline by phase.

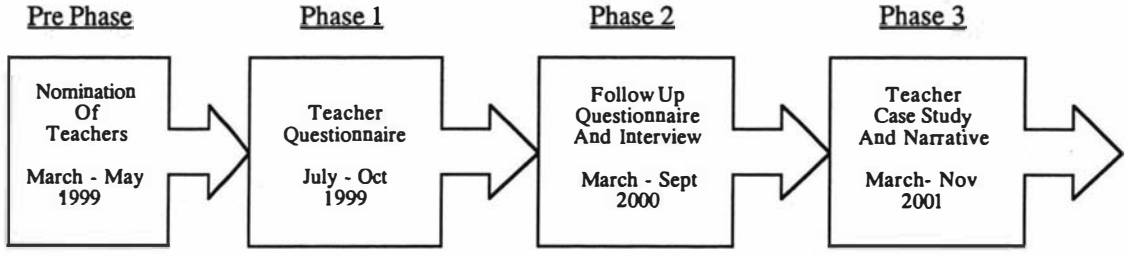

Figure 4.1 Research timeline by phase

4.2 PRELIMINARY PHASE

The Preliminary Phase was designed to gather information that would lead to a list of teachers suitable for the initial research sample.

Sample Selection

The sample of nominated proficient internet-using teachers was selected using a process adapted from Berg et al. (1998), Brown (1995b), MacArther and Malouf (1991) and Sheingold and Hadley (1990). It was selected by the nomination of teachers who were perceived by three different groups of professional educators to be proficient at using the Internet for learning and teaching. The professional educators included:

i) School principals (n=104);

ii) Board of Trustees staff representatives (n=104);

iii) Local ICT consultants and well known specialists in the computers in education field (n=18).

There were no specific selection criteria given to these professional educators in an endeavour to make the initial sample as inclusive as possible. At this initial stage, the researcher accepted the nomination of proficient internet-using teachers based on the referral process. This was acceptable due to the problematic definition of proficiency.

The three groups were chosen on the grounds that they had personal knowledge of which teachers were using the Internet, and had different perspectives on what constitutes proficiency with computers and related educational technologies. The inclusion of a range of professionals with contrasting experiences and perceptions was judged necessary to address the shortcomings of previous research. Although the nomination process itself had obvious shortcomings, of the alternative techniques it offered potentially the most inclusive sample. It also provided a means of replicating the selection process in any future study of internet-using teachers.

Sample Procedure

In March 1999, a letter explaining the purpose of the research and detailed Information Sheet was sent to principals, Board of Trustee staff representatives, ICT consultants and educational specialists within the target population (Appendix A). The letter invited people to nominate any teacher who in their opinion was "proficient" at using the Internet for learning and teaching. A stamped, return addressed, envelope along with a Nomination Form was included with this letter (Appendix A).

Nomination forms were colour coded to distinguish potential nominees from the different regions and to indicate the source of the nominator; forms were numbered for administrative purposes only. To both ascertain and potentially increase the response rate, respondents were asked to return the nomination form regardless of whether or not they were able to nominate any proficient internet-using teachers. In total, 115 nomination forms were returned and 49 teachers nominated through this initial letter.

After three weeks, a follow up letter, with an additional Information Sheet and Nomination form, and stamped return addressed envelope, was sent to those people who had not returned the original material (Appendix A). This second letter resulted in 45 further returns and 24 additional nominations. Notably, 16 of the "null" nomination forms indicated that their school did not have Internet access or was only beginning to develop this area. At this point, it was deemed inappropriate to send another letter or telephone those people who had not responded. The researcher assumed nomination material was received and people simply did not wish to nominate any teacher for participation in this study. On receipt of nominations forms, a letter of appreciation was sent to all those who responded, whether or not they nominated a proficient internet-using teacher (Appendix A). Overall, a 71% response rate was achieved through the nomination process.

Profile of Nominated Proficient-Internet-using Teachers

There were 76 teachers nominated by other teachers, principals and ICT specialists as proficient at using the Internet for learning and teaching. However, three of the nominated teachers worked in schools outside of the selected locations for this study and subsequently were excluded from the research. The remaining 73 nominated proficient internet-using teachers (28 male and 45 female) constituted the initial research sample. The sample consisted of (a) 34 teachers from Central Region East; (b) 18 teachers from Central Region South; and (c) 21 teachers from Central Region West. These teachers were employed in 44 schools, the majority urban (n=37), with a number (n=22) nominated by more than one person. Table 4.3 shows the representation of the sample by region and nomination source. Dual nominations indicated that there was at least some consensus on a core number of teachers who were perceived to be proficient at using the Internet for educational purposes.

Table 4.3
Nominated Proficient Internet-using Teachers By Region and Nominator

Region	Principal	BOT Rep	Consultants	Dual	Total
Central Region East	12	9	2	11	34
Central Region South	7	4	2	5	18
Central Region West	9	5	1	6	21
Total	28	18	5	22	73

4.3 PHASE ONE

The purpose of Phase One was to gather baseline information on teachers' background experiences, perceptions and practices in terms of using the Internet for learning and teaching.

Procedure

In August 1999, a letter and Information Sheet was sent to the sample of 73 nominated proficient internet-using teachers, which explained the purpose of the research and informed them of their nomination by other professionals as being someone suitable for this study (Appendix B). Teachers were invited to complete an enclosed questionnaire and return this using a stamped addressed envelope provided for this purpose. Those teachers who had not returned the questionnaire after a period of four weeks were sent a follow up letter, with another copy of the questionnaire and stamped return addressed envelope (Appendix B). As this material was sent out just before a holiday break when teachers were particularly busy, a final letter was posted three weeks later to check that the questionnaire had been received and whether the teachers wished to participate in the study (Appendix B).

Table 4.4
Summary of Questionnaire Responses for Phase One

Research Population	Nominated Teachers	Returned Questionnaires	Response Rate
Central Region East	34	27	79 %
Central Region South	18	14	77 %
Central Region West	21	15	76 %
Total	73	56	76 %

A letter of appreciation was sent to all nominated internet-using teachers within seven days of receipt of their returned questionnaire (Appendix B). Overall, there was a 76% response rate to the postal questionnaire. A summary of questionnaire responses is presented in Table 4.4 by region.

Questionnaire Development

The questionnaire was designed to collect relevant background information on teachers' experiences, perceptions and practices in relation to both computer and Internet use in schools. Many of the questions were adapted from, based on, and informed by, previous surveys in this area (e.g., Berg et al., 1998; Brown, 1995b; Chiero, 1997; Drain, 1999; Mathinos & Woodward, 1988; Sheingold & Hadley, 1990; Woodrow, 1991a; Zammit, 1992).

The questionnaire drew on the design of the national survey of Teaching, Learning and Computing (TLC) in the United States (US) by utilizing a primary source copy of the main survey booklets (Becker & Anderson, 1998). Specific questions and the style of questionnaire were guided also by the general literature on survey design (e.g., De Vaus, 1995; Foddy, 1993). The instrument was designed with both "open" and "closed" questions to gather baseline data on the way teachers were using the Internet for pedagogical purposes.

A pilot questionnaire was developed with a group of 10 computer-using teachers outside of the research population. These teachers were asked to complete the instrument and note on the questionnaire itself any questions they had difficulty answering. A follow-up focus group discussion enabled the researcher to determine: (a) the time the questionnaire took to complete, (b) whether the nature and sequencing of the questions were appropriate, and (c) if the questions and terminology could be clearly understood. As a consequence, the length of the questionnaire was reduced and a question was added to elicit information about the time devoted to specific learning outcomes. Further consultation with experienced researchers helped refine the final questionnaire used in Phase One of the study (Appendix B).

Description of the Questionnaire

The questionnaire consisted of five main sections: (a) background information, (b) personal Internet experience, (c) use of Internet for learning and teaching, (d) approach to teaching with the Internet, and (e) opinions about the Internet in education. These sections were presented in a booklet consisting of 14 pages with each questionnaire individually numbered for analysis and administrative purposes. Questions were numbered separately under each section and these consisted of a mixture of Likert-type scales, ranking and list formats, and fill-in-the-blank short answers. No space was provided for coding responses, as this can de-personalise the questionnaire, and adversely affect the quality of responses and potentially the response rate (Anderson, 1990). The design of the questionnaire built on a number of other attitude scales (e.g., Chiero, 1997; Gardner, Discenza, & Dukes, 1993; Woodrow, 1991b) along with contemporary research emerging on internet-using teachers in the United States (e.g., Robin & Harris, 1998). Several questions were adapted from Becker and Anderson's (1998) survey booklet even though the findings had yet to be published.

In sum, the questionnaire was an efficient means of gathering descriptive information on teachers' background experiences, perceptions and practices over a short space of time. A postal questionnaire can be a valuable research technique when it is used to gather baseline information from a relatively large sample (De Vaus, 1995). Given the size of the sample, it was certainly beyond the resources of the researcher to interview all of the nominated teachers. Thus, a written questionnaire was considered the best way to yield a large amount of baseline data that could also be used for the purpose of selecting participants for the next phase of the study.

Data Analysis

Questionnaire responses were coded, entered, and analyzed using a Microsoft Excel spreadsheet. Data were presented in figure and table format for preliminary analysis and consideration by the Research Advisory Group. Responses were later re-analyzed using Excel and SPSS 6.0 (Macintosh version) where basic statistical comparisons were undertaken to determine any within-group or across-group patterns. This involved limited statistical and multivariate analysis because the main research objective was to understand how individual teachers were personally experiencing the Internet. Questionnaire findings are presented in Chapter Five in accordance with the main outcome variables.

4.4 PHASE TWO

The purpose of Phase Two was to gather more context specific information on teachers' experiences, perceptions and practices in terms of using the Internet for educational purposes. This Phase was intended to amplify baseline data and elicit rich contextual information pertaining to the main research questions. In this regard, it sought to situate data in what Mishler (1986) describes as a meaningful context. A survey using a second postal questionnaire, followed by an informant interview, was likely to offer deeper insight and provide an indication of the status of the innovation, given the rapid growth of Internet use in New Zealand schools.

Sample Selection

After consultation with members the Research Advisory Group, based on a preliminary analysis of initial questionnaire responses, the researcher selected a refined sample of internet-using teachers for this phase. The questionnaire results from Phase One provided sufficient data for making a trustworthy selection of teachers for further study. From a sample of 56 teachers employed in 36 schools, the refined purposive sample of accomplished internet-using teachers was selected.

As discussed in Chapter Two, the failure of educational computing research to consider the mainstream literature on good teaching is a serious conceptual flaw. In recognition of this flaw, the research adopted a dual strategy in the sample selection process. First, specific criteria were developed based on two separate but equally important areas of literature: (a) accomplished teaching *per se* and (b) accomplished teaching with computers and the Internet. This was to ensure that accomplished internet-using teachers would have a sound understanding of good pedagogy, as well as specialised skill and knowledge of using computers in the classroom. Second, the aforementioned Research Advisory Group was used to better represent the interests and perspectives of different stakeholders. Although the advisory group strategy has a number of shortcomings, this at least provided a forum to justify the sample and self-regulate the selection process.

Selection Criteria

The Research Advisory Group was guided by some foundation principles in the selection of teachers who were deemed to be "accomplished" at using the Internet for learning and teaching. These principles were grounded in a review of the empirical and theoretical literature on the good teacher presented in Chapter Two. There were four main principles. First, it was assumed that accomplished internet-using teachers would have a critical philosophy of education anchored by a strong sense of social justice. Second, the teachers would have a lot of knowledge acquired through a blend of theory, research and practical experience. Third, teachers would have a disposition toward innovation, risk taking and the promotion of active and meaningful learning across the curriculum. Lastly, teachers would demonstrate a strong commitment toward critical self-reflection supported by their school culture and professional relationships. Above all, accomplished internet-using teachers would be trusted and learned professionals with a critical understanding of pedagogy.

The aforementioned principles were extrapolated into a number of general indicators of accomplishment (Appendix C). These indicators sought to identify full-time teachers with: (a) a minimum level of teaching experience; (b) a clearly articulated philosophy of teaching; (c) an up-to-date knowledge of learning theory; (d) a critical understanding of recent developments in educational policy and practice; (e) regular access to the Internet in their professional work; (f) practical experience using the Internet for learning and teaching; (g) emerging knowledge of how different internet applications can be used for educational purposes; (h) previous history of innovation in teaching and a high sense of efficacy when using computers in education; (i) evidence of critical self-reflection leading to some action at both an individual and school level; and, (j) advanced qualifications and/or specialised professional development in the educational technology area.

The above indicators were operationalised through 10 specific criteria that guided the sample selection process. These criteria required that:

i) *The teacher has at least three years teaching experience.*

ii) *The teacher has at least two years teaching experience with computers.*

iii) *The teacher has regular access to the Internet in their classroom and/or school.*

iv) *The teacher makes use of a computer in the classroom and/or school most days of the week.*

v) *The teacher makes use of more than one computer and/or Internet application most weeks of the year.*

vi) *The teacher is knowledgeable about learning and teaching and is aware of recent developments pertaining to the use of ICT in New Zealand schools.*

vii) *The teacher is enthusiastic toward innovation and has emerging skill, knowledge and experience at using the Internet for learning and teaching.*

viii) *The teacher can clearly articulate their reasons for using the Internet and recognises the opportunities that computers provide (and do not) for the development of active and meaningful learning across the curriculum.*

ix) *The teacher can critically reflect on how their teaching has been affected by the use of different educational technologies—for better and worse—and generally feels supported by colleagues and school.*

x) *The teacher is confident about using computers in the classroom and has completed a formal educational computing course and/or some type of professional development on using the Internet for learning and teaching.*

Criteria were designed to be as inclusive as possible. Unlike previous research, each individual criterion was informed by the literature on good pedagogy *per se.* There is a wealth of such literature and the researcher was mindful of this work. In addition, criteria were based on insight from prior research on the experiences, perceptions and practices of computer using-teachers. Specifically, the criteria were informed by studies of accomplished (Sheingold & Hadley, 1990), competent (Vockell & Sweeney, 1993), effective (Sherwood, 1993), exemplary (Becker, 1994; Berg et al., 1998) and proficient (Brown, 1995b) computer using-teachers. Selection criteria also took cognizance of Becker's recently published research on teacher beliefs and practices (Becker, 1999; Becker & Riel, 1999; Becker & Rivitz, 1999; Dexter, Anderson & Becker, 1999). Finally, criteria took into account Scheffler and Logan's (1999) study of what teachers should know and be able to do with computers along with Harris and Grandgenett's (1999) research on the demographic profile of internet-using teachers.

Selection Process

At the beginning of this phase, an outline of the research objective along with the proposed methodology and formal information sheet was sent to each member of the Research Advisory Group (Appendix C). The Group's role in the sample selection process was clearly defined in this material. Because of the protracted nature of the sample selection process, the researcher endeavoured to keep the Research Advisory Group informed of progress. This included a number of verbal progress reports at various times throughout the study.

In February 2000, the Research Advisory Group was contacted to arrange a suitable time for briefing on Phase Two of the research. Due to the difficulty of arranging a mutually convenient time, and the fact that the group's original membership was changed because of changes in professional status, this meeting took place with individuals rather than the entire group. Individual meetings took place over a period of three weeks. At the meeting, the researcher justified the proposed selection criteria and a copy of this was left with each member for reflection and feedback (Appendix C). After further consultation, the Research Advisory Group accepted the proposed criteria with one minor modification. Concern was expressed that in light of the embryonic nature of networking technology, an accomplished internet-using teacher might not have regular access to the Internet in their school.

As the study did not wish to exclude any potentially accomplished internet-using teachers it was agreed by consensus that the Research Advisory Group expand this criterion to include the home environment. The researcher was comfortable with this decision and justified it in light of the problematic definition of what constitutes accomplishment *per se.* It is noteworthy that this decision did not ultimately lead to any additional teachers being included in the sample for Phase Two of the study.

The sample selection process took place in March 2000. At a meeting of the Research Advisory Group on the Hokowhitu site of the Palmerston North Campus of Massey University, the researcher presented a brief synopsis of the questionnaire findings. For reasons beyond the researcher's control, one member was absent from this meeting. This person was later briefed on the selection process. With the consensus of the group, the researcher eliminated all internet-using teachers who did not meet the first two criteria. This decision eliminated four teachers from the sample largely because of insufficient teaching experience.

With the agreement of the group, the researcher then identified those questionnaire responses that in his opinion loosely met the criteria (n=36). These questionnaires were circulated around group members for consideration. After some discussion, the Research Advisory Group endorsed the decision to include these teachers in the sample.

The group then proceeded to evaluate the remaining questionnaire responses (n=16) in terms of the agreed criteria. These questionnaires were circulated around the group in order to assess the relative merits of each internet-using teacher's response. After some deliberation, the participants were systematically assigned to one of two groups: (a) those who met the criteria and (b) those who did not. Where initially a unanimous decision could not be reached, the group deferred the final decision until all of the teachers had been considered. Any contentious responses were then re-examined and in all instances it was possible to reach a unanimous decision. Consequently, by consensus, a further eight teachers were eliminated from the sample for Phase Two of the study.

Throughout the selection process, the participants' names and their respective schools were covered on the original questionnaire to protect their identity. This also helped to maintain the integrity of the selection process, as there was a chance that individual group members may have known some participants. Hence, participants were referred at all times only according to the number that appeared on their respective questionnaires.

At the end of the selection process, the researcher thanked the members for their dedication to the task and a letter of appreciation was sent to each member of the Research Advisory Group (Appendix C).

Profile of Accomplished Internet-using Teachers

There were 44 teachers perceived by the researcher, in consultation with the Research Advisory Group, as accomplished at using the Internet for learning and teaching. One teacher stated on their original questionnaire that they did not wish to participate any further in the study. This teacher was contacted by telephone in order to confirm that this was still the case. The person was moderately interested in the research but declined a further invitation to participate. The remaining 43 teachers from 23 schools constituted the research sample, which was atypical of the wider population on a number of demographic variables. For example, the mean number of years teaching in all schools was over 17 years. Table 4.5 provides a demographic profile of the teachers invited to participate in Phase Two of the study.

Table 4.5
Profile of Perceived Accomplished Internet-using Teachers

Region	(n) East	(n) South	(n) West	(n) Total
Male	7	4	6	16
Female	12	7	7	27
Total	19	11	13	43
Lower School	1	1	1	3
Middle School	7	3	4	14
Senior School	10	6	7	23
Intermediate Level	1	1	1	3
Scale A Teachers	4	2	2	8
Senior Teachers	11	6	8	25
Senior Management	4	3	3	10
Teachers with a Degree	15	9	10	34
Teachers with ICT Qualification	7	3	3	12
Teachers with Responsibility for ICT	15	10	11	36

Questionnaire Procedure

In April 2000, a letter and Information Sheet was sent to the 43 accomplished internet-using teachers inviting them to participate further in the research (Appendix C). Prior to this a letter was also sent to the respective principals seeking their consent (Appendix C). Both of these letters restated the overall purpose of the study and explained the need for more detailed and precise information. Teachers were requested to complete the follow up questionnaire and return this using a stamped addressed envelope provided for this purpose. Those teachers who had not returned the questionnaire after four weeks were sent a follow up letter, with another copy of the questionnaire and stamped, return addressed, envelope (Appendix C). A letter of appreciation was sent to all accomplished internet-using teachers within seven days of receipt of their returned questionnaire (Appendix C).

Table 4.6
Summary of Questionnaire Responses for Phase Two

Research Population	Accomplished Teachers	Returned Questionnaires	Response Rate
Central Region East	19	15	78 %
Central Region South	11	9	81 %
Central Region West	13	11	84 %
Total	43	35	81 %

Overall, there was an 81% response rate to the second postal questionnaire. One questionnaire was returned to the sender with a brief note stating the teacher was no longer in employment at the school. This questionnaire was excluded from the responses. A summary of questionnaire responses by region is presented in Table 4.6.

Questionnaire Development

The follow up questionnaire was designed to build on the findings from Phase One. Because of the dynamic nature of the Internet, the second postal questionnaire was intended to collect more up-to-date information on teachers' experiences, perceptions and practices—in keeping with the main research questions. The use of a postal questionnaire was once again considered an efficient means of gathering information from teachers over a short period of time. Given the size of the sample, it was still beyond the resources of the researcher to interview all of the perceived accomplished internet-using teachers. A questionnaire was, therefore, considered the best way to yield additional data that could also be used for the purpose of selecting participants for the final phase of the study.

The questionnaire was piloted with three internet-using teachers outside of the research population. These teachers were asked to complete the pilot questionnaire and report any questions they had difficulty answering. Their feedback enabled the researcher to determine (a) the appropriateness of the questionnaire, (b) whether the order and style of questions were suitable and (c) if the terminology could be clearly understood. The pilot questionnaire resulted in a number of changes, especially to questions on learning and teaching with the Internet and those pertaining to the teacher's pedagogical and philosophical approach. It was apparent from the pilot that attempts to elicit data on teacher beliefs using a written questionnaire were problematic. Accordingly, the revised questionnaire reflected a more circumspect interpretation of the technique adopted by Becker (1999), Becker and Ravitz (1999), and Becker, Ravitz, and Wong (1999) to identify constructivist teachers. It also took cognizance of recently published research on teachers' Internet use in New Zealand schools (e.g., Sullivan & Anso, 2000). A number of questions were adapted from these recent publications. Consultation with experienced researchers helped refine the final version of the questionnaire used in Phase Two (Appendix C).

Description of the Questionnaire

The questionnaire consisted of five main sections: (a) background information, (b) personal Internet experience, (c) use of Internet for learning and teaching, (d) approach to teaching with the Internet, and, (e) opinions about the Internet in education. In this regard, its format was similar to the first questionnaire. There were a number of questions in common and the final instrument took account of both new research and limitations that arose from the initial survey. Questions were individually numbered according to each section and these consisted of a mixture of case scenarios, Likert-type scales, ranking and list formats, and fill-in-the-blank short answers. The questionnaire was contained within a 14 page A4 booklet. Each questionnaire was individually numbered for administrative and identification purposes. Again, no coding was included on the questionnaire. Its design was specifically informed by prior research on teacher beliefs (e.g., Fang, 1996; Pajares, 1992) and teacher worldviews (e.g., Unger, Draper & Pendergrass, 1986). In addition, a number of questions were adapted from recent studies of internet-using teachers, including Becker and Anderson's (1998) national United States (US) survey. Although later on in the study Becker's research became increasingly problematic, his questions provided a useful basis for comparison.

Data Analysis - Questionnaire

Questionnaire responses were coded, entered, and analyzed in a Microsoft Excel spreadsheet. Data were presented in figure and table format for preliminary analysis and consideration by the Research Advisory Group. Responses were later re-analysed using Excel and SPSS, where some basic statistical comparisons of subgroups were undertaken. Again, limited multivariate analysis was completed due to the fragile nature of teacher beliefs and because the main objective was to understand how teachers were personally experiencing the Internet. Later in the analysis process, questionnaire responses were combined with qualitative interview data in NUD*IST for further interrogation. Questionnaire data are presented in Chapter Seven integrated alongside the interview responses.

Interview Procedure

In June 2000, a letter was sent to all those teachers who indicated on the second questionnaire they were willing to participate in a follow up interview (Appendix C). The interview sample for this phase totalled 24 teachers. This consisted of (a) 10 teachers from Central Region East, (b) six teachers from Central Region South, and (c) eight teachers from Central Region West. The interview sample represented 68% of the questionnaire responses and 56% of the original research sample for Phase Two. Although the response rate to the interview was slightly disappointing, two teachers were unavailable because they were about to take leave from their current teaching position. The sample was deemed, therefore, acceptable for this type of survey research.

Prior to contacting the participants by telephone, a letter and Information Sheet was sent to each principal in order to check that it was appropriate for an interview to take place. This letter invited the principal to contact the researcher by the end of June if they had any concerns or they did not approve of the research (Appendix C). One principal took advantage of this invitation. As there were no objections to the research, it was assumed that the researcher could go ahead and contact the teachers. In the first week of July, a follow up letter was sent to each principal confirming that the research was about to take place unless contacted otherwise (Appendix C). From the second week of July 2000, teachers were telephoned to see if they still wished to participate in the interview. An affirmative response was followed by the negotiation of formal consent and an invitation to select the time, place and location of the interview. Participants were reminded of the need for the interviews to have uninterrupted time, and in all but five loci (where the interview was at home) these were scheduled at the teacher's school, after regular hours. Although it was difficult to arrange a time of mutual convenience, with one exception the researcher was able to complete the interviews within a single visit to each region. The interviews were completed over a five week period with the last interview conducted toward the end of September, 2000.

A letter of appreciation was sent to all the teachers who participated in the interview within seven days of the interview itself (Appendix C). In this letter, the researcher indicated that the participants would be contacted over the next few months in order to validate the interview transcripts. A letter of appreciation also was sent to each school principal (Appendix C).

Interview Development

An interview technique was selected to gather more context specific information concerning teachers' experiences, perceptions and practices in relation to their educational use of the Internet. A semi-structured interview would complement the written data already gathered through two postal questionnaires. The interview was intended to amplify these data by capturing the voices of individual teachers, consistent with the main research objective. The value of an interview technique in eliciting teacher perceptions and beliefs is well-documented (Kagan, 1992). Happs and Kinnear (1990) maintain that interviews can present teachers' views in greater depth and are an important research technique in helping to bridge (and understand) the traditional gap between theory and practice in educational computing. It is noteworthy that the interview allowed the researcher to have an active role in the data collection process, where responses could be drawn out and fully explored in relation to the research questions. This technique also enabled the researcher to remain open to the emergence of other issues that were important to teachers in their use of the Internet for learning and teaching. Hence, the interview was more than just a speaking questionnaire (Potter & Wetherell, 1987).

The interviews were designed to follow an informant style (Powney & Watts, 1987). This style encourages the participant to express their own opinions, perceptions and beliefs, and to converse in such a way that control lies with the interviewee, rather than the interviewer. In discussing their practice in a conversational manner, participants are more likely to reveal their commitment to particular beliefs about the value of certain types of pedagogy. Thus, the intention was to get participants to "tell their story" of how they use and perceive the Internet as an educational innovation. The precise style and structure of the interview schedule was informed by the research methods literature on conducting face-to-face interviews (e.g., Cohen & Manion, 1997; Foddy, 1993; Gillham, 2000; Minichiello, Aroni, Timewell & Alexander, 1990; Mishler, 1986; Morton-Williams, 1993; Tolich & Davidson, 1999). Likewise, specific interview questions were prepared with reference to recently published information (e.g., ERO, 2000) along with previous research on computer-using teachers, particularly studies which had utilised interview techniques (e.g., Dexter, Anderson & Becker, 1999; Krendl & Broihier, 1992; MacArther & Malouf, 1991). In short, the interview was based on an informed synthesis of the aforementioned literature.

A pilot interview schedule was trialled with two teachers known by the researcher and who taught in schools outside of the research population. The teachers were informed of the purpose of the research and asked to comment on the style of the questions immediately after a simulated interview. Although the pilot interview was rather contrived, it enabled the researcher to: (a) gain experience using the audio recording equipment; (b) get valuable practice at the informant technique; (c) determine which questions were most likely to draw out teacher's opinions, perceptions and beliefs; and, (d) ascertain the time it took to explore the different interview themes. A brief section of one pilot interview was transcribed and imported into NUD*IST to judge the effectiveness of the software in analysing the responses under the research themes. After further consultation with other researchers, a less structured interview schedule was finalised for use in Phase Two of the study (Appendix C).

Description of the Interview

The Interview Schedule explored five main themes: (a) the use of the Internet to support learning and teaching; (b) beliefs about learning and teaching processes; (c) beliefs about how the Internet supports learning and teaching processes; (d) changes to teaching practice as a result of using the Internet for educational purposes; and, (e) factors that inhibit and/or enable the use of the Internet in schools (Appendix C). The researcher was free to ask questions and probe responses under each theme, as and when appropriate. However, a number of questions were also prepared in advance, so that the researcher could explore some of the potential issues related to each theme. These questions were not designed to constrain the interview; they were seen as a way of ensuring that at least some common ground was covered at some stage during each interview.

At the beginning of each interview, participants were reminded of the purposes of the research and asked to sign a consent form granting permission for the interview to take place (Appendix C). A copy of the Information Sheet and Interview Consent Form was left with the participants. With the participant's permission, the interview was then taped using an audio cassette recorder. The interview began with the researcher handing back the teacher's questionnaire, asking the participant if they had any comments or additional feedback in terms of their response. They were also asked whether there were questions that should have been included, but were not in the follow up questionnaire. Having teachers hold a copy of the questionnaire was a symbolic way of giving control to the interviewee. It helped make a real connection to the research. This was an initial "ice breaking" strategy to get the participants to converse about their use of the Internet for learning and teaching.

In most instances, the interviews followed a conversational style with free discussion, where the main research themes were explored in a spontaneous way. However, some of the interviews were more conversational than others and they differed markedly. While some teachers went into a great deal of detail without further prompting, other people needed a lot more questioning to elicit a similar level of response. Those more confident teachers had few difficulties with the intent of the questions and provided comprehensive responses without inhibition. Others, particularly those less experienced with the Internet, required more direction or needed questions rephrased when their initial answer lacked sufficient detail. The interviews varied in length from 25 to 55 minutes. Immediately after each interview, the researcher recorded on tape any immediate impressions to emerge from the interview.

In November 2000, participants were sent a copy of their transcript and asked to check for mistakes, and to confirm that what was recorded was an accurate account of the questions and responses discussed during the interview (Appendix C). They were also invited to make changes to the transcript and expand upon their views, as appropriate, by either writing on the transcript or ruling a line through any relevant comments. These changes were then added or deleted to the official interview transcript. No substantive changes were requested although some minor typographical errors were corrected. Complete interview transcripts are not included in the Appendix for reasons of anonymity and confidentiality.

Data Analysis - Interview

Informant interviews were transcribed by the researcher and thematically coded in terms of the main themes. The researcher personally transcribed the interviews, as this was considered an important part of the coding and analysis process (Mishler, 1986). This proved to be invaluable in helping the researcher to analyse the interview responses, especially the way teachers had experienced the Internet within its situated context.

The coding process was highly iterative and began by importing the interview files into NUD*IST and carefully reading each transcript. Initially each interview was coded and thematically cross-referenced based on the main themes. A number of additional themes and research notes were created as these emerged from the coding process. In addition, some of the questionnaire responses were added as separate electronic documents to the research database. Various reports were produced in NUD*IST to highlight important responses as they related to each theme. Coded interview themes were then re-analysed in terms of the main research questions with cogent extracts presented as direct quotes in Chapter Seven.

4.5 PHASE THREE

The purpose of Phase Three was to gather a richer description of teachers' experiences, perceptions and practices with the Internet. At this deeper level, the intention was to gain insight into their pedagogical beliefs—that is, the teachers' internalized values and worldviews. For this reason, the phase involved assisted autobiographical narratives supported by micro ethnographic case studies of three experienced internet-using teachers. A purposive sample of experienced teachers was ideally suited to the study, as the "old hands" are likely to reveal some of the tacit knowledge associated with the Internet as a rapidly growing phenomenon. Moreover, we know that experience is a key variable in the pursuit of expertise (Berliner, 1986). Thus, in-depth study of a smaller sample of teachers would help to enhance the validity of the research findings and support a deeper level of pedagogical analysis. A related goal was to encourage teachers to become genuine partners in the research process, in order to promote critical self-reflection on learning and teaching and the impact of the ICT-related school reform movement.

Sample Selection

The researcher, in consultation with the Research Advisory Group, selected the sample of experienced internet-using teachers for this phase of the study. Selection was based on questionnaire and interview responses from Phase Two. It was considered that these instruments provided sufficient data for a trustworthy selection of three internet-using teachers for more in-depth study. The decision to select three teachers from Phase Two, one from each region, was made on the basis that a smaller sample offered greater potential for gathering fine grain data on the participants' experiences, perceptions and practices. This would, in turn, help to meet the research objective of better describing what has been going on, and what is happening at present in terms of the Internet as a social, economic and educational phenomenon. The selection of a teacher from each region also increased scope for comparison and enhanced the potential generalisability of the research findings. Lastly, a comprehensive study of three internet-using teachers drawing on ethnographic and narrative techniques was all that was feasible given the limited resources of the researcher.

The Research Advisory Group were guided by the aforementioned principles and general indicators of accomplishment in their selection of teachers who were judged to be experienced at using the Internet for learning and teaching. Criteria were expanded, however, to identify those teachers with considerable teaching experience and, in particular, a critical pedagogical orientation toward using the Internet for educational purposes.

The following 12 specific criteria were used to guide and operationalise the selection process of experienced internet-using teachers:

(i) *The teacher has at least five years teaching experience.*

(ii) *The teacher has at least two years teaching experience with the Internet.*

(iii) *The teacher has good access to the Internet in their classroom and/or school.*

(iv) *The teacher makes use of the Internet in their classroom and/or school most weeks of the year.*

(v) *The teacher makes use of more than one Internet application and/or Internet-related classroom activity most school terms.*

(vi) *The teacher is very knowledgeable about learning, teaching and the wider socio-political factors that influence the educative process.*

(vii) *The teacher is very well-informed about recent developments pertaining to the use of ICT and the Internet in New Zealand schools.*

(viii) *The teacher has a sound understanding of the different ways that computers can be used across the curriculum and advanced skill, knowledge and experience at using the Internet for learning and teaching.*

(ix) *The teacher is highly articulate in explaining their reasons for making use (or not) of the Internet and can identify, with examples, the opportunities new educational technologies provide for better learning and teaching.*

(x) *The teacher is innovative and very confident about their ability to use computers in the classroom and perceives there is a wide level of support from colleagues and their school for using the Internet for educational purposes.*

(xi) *The teacher adopts a deep and critically reflective approach toward their pedagogy and demonstrates a high level of analysis when discussing positive and negative changes to their teaching practice framed by a strong sense of social justice.*

(xii) *The teacher has an intrinsic commitment toward becoming a better educator and is either participating in some type of ICT professional development or has completed an advanced educational qualification in this area.*

Overall, the criteria for this phase attempted to identify teachers with a critical teaching philosophy shaped by lived experience, theories of practice and a deeply rooted knowledge of education. Teachers were expected to have considerable knowledge acquired through a mix of formalized theory, research and personal experience. Their philosophy would embrace a critical thinking-centred pedagogical approach, where students are encouraged to challenge accepted knowledge and mindfully use technology to solve problems in active and meaningful contexts. The teachers would demonstrate a strong commitment to innovation and risk taking, as flair and imagination was viewed as a hallmark of reflective practitioners. At the same time, experienced internet-using teachers would acknowledge the ethical, moral and political dimensions of teaching and have a disposition toward critical self-reflection, which is actualized in their practice. The reflection process would be automatized and institutionalized throughout their daily work. It would be guided by a strong sense of social justice and an emerging awareness of their second self (Preskill, 1998). In short, the aforementioned criteria sought to identify "wired educators" who were both crafted artists and knowledgeable scientists in the pursuit of critical pedagogy.

The criteria, of course, were an ideal drawn from the literature review. Few, if any, teachers were expected to fully meet each criterion. The key point is that these criteria were based on two separate but equally important areas of literature, namely experienced pedagogy *per se* and experienced teaching with computers and the Internet. As previously stated, in the past research on computer-using teachers has tended to ignore the literature on good teaching and the criteria sought to address this deficiency. Criteria attempted to combine the literature on expert (Berliner, 1986), good (Knight & Smith, 1989) and quality (Ramsay & Oliver, 1993) teaching with that on the study of good computer-using teachers (e.g., Becker, 1994; Berg et al., 1998; Ryba & Brown, 2000; Shavelson *et al.*, 1984; Sheingold & Hadley, 1990; Sherwood, 1993; Vockell & Sweeney, 1993). Selection criteria also took account of emerging work by Becker and colleagues in the US on teachers Internet use.

At a deeper level, the criteria were informed by the literature on critical pedagogy (Freire, 1972). Pedagogy is where political ideas about education enter the classroom; where theory, in the form of ideas about education, ideology and even personal histories interface with teaching practice (Knupfer, 1993). In this regard, the criteria made explicit the socio-political nature of teaching and sought to locate good teaching in the context of good education, with or without technology. This has been a fundamental failure of prior research. Thus, it was intended the research would contribute to new knowledge through its critical pedagogical focus. Although the criteria were still problematic, in that the definition of pedagogical experience was dependent upon a particular interpretation of the psycho-cultural and socio-political literature, there was an explicit set of guiding principles and indicators of accomplishment for the selection of the internet-using teachers. Unlike previous research, these principles provided an explicit framework for analysis, critique and replication.

Selection Process

In November 2000, a letter was sent to individual members of the Research Advisory Group seeking their assistance with the selection of teachers for the final phase (Appendix D). A copy of the revised selection criteria was included with this letter to give members an opportunity to become familiar, in advance, with this information (Appendix D). In the middle of December 2000, the sample selection process took place during a meeting of the Research Advisory Group. The meeting had six items on the agenda (Appendix D) and was held on the Hokowhitu Site of the Palmerston North Campus of Massey University.

The researcher started the meeting with a brief progress report and then described and justified the revised selection criteria. After some discussion, the group accepted the criteria without alteration. The Research Advisory Group then considered the most appropriate sample selection process. At the researcher's suggestion, it was agreed to initially eliminate those teachers who failed to meet the first five criteria. This eliminated 13 teachers from the sample based on lack of Internet and teaching experience. The group then decided to examine the questionnaire and interview responses in a systematic way by judging the merits of the remaining participants on a case-by-case basis.

The researcher presented a series of overhead transparencies with selected interview extracts from each of the remaining 11 participants. At the same time, a copy of the second questionnaire was circulated around group members to assess the relative merits of each internet-using teacher's response. After some brief explanatory comments, the Research Advisory Group was invited to give their own interpretation of data. The researcher facilitated this discussion and typically after further deliberation, the participants were systematically assigned to one of two groups: (a) those who generally met the criteria and (b) those who clearly did not. If there was any doubt, the decision was deferred until all 11 teachers had been considered. The doubtful participants were then re-examined and in every instance it was possible to make a clear-cut and unanimous decision on the suitability of the participants for further study.

As a consequence of this process, four teachers were identified by group consensus as suitable for Phase Three. All three regions were represented and two of the teachers resided in one region. The researcher had already decided that if more than three internet-using teachers were deemed experienced the final selection would take place on the basis of either gender, teaching level, school type, etc. In the event that no teachers were selected from one of the regions, then the study planned to concentrate on all of the participants in just one locality. In other words, during this phase the research was not dependent upon the representation of all three regions.

Because each region was represented, it was decided to eliminate one teacher on the basis that he was employed in an intermediate school, whereas the other three worked in contributing primary schools. While this decision was relatively pragmatic, a number of factors were taken into account including the potential for across sample comparison. The Research Advisory Group fully supported the decision to focus on the primary level.

Throughout the selection process, the participants' names and those of their respective schools were covered on the original questionnaire to protect their identity. This also helped to maintain the integrity and validity of the selection process. At all times throughout the process the research participants were known only by the number that appeared on their questionnaire and/or interview summary. On conclusion of the meeting, the researcher thanked the members for their assistance with the sample selection process and promised an executive summary of the results on completion of the study. A letter of appreciation was sent to individual members of the Research Advisory Group within seven days of the meeting (Appendix D).

Profile of Experienced Internet-using Teachers

There were three primary school teachers judged by the Research Advisory Group to be experienced at using the Internet for learning and teaching. The validity of the final sample was supported by the fact that in each case more than one person in the original selection process nominated these teachers. Notably, the remaining experienced internet-using teacher at the intermediate level received a single nomination only. The dual nominations enhanced the trustworthiness of the sample selection process and, in particular, the role of the Research Advisory Group. There was at least some triangulation between the two main sample selection techniques. The following section describes the different background characteristics and teaching experiences of the three experienced internet-using teachers under the pseudonyms of Andrea, Barry and Catherine.

Description of Andrea

Andrea was a Scale A Teacher of Year 4, 5 and 6 students in a small primary school within a low to middle socio-economic community (Decile 5). She was of European descent and still relatively new to the profession with seven years of teaching experience. Andrea was well-qualified with a Bachelor of Education (BEd), which included several educational technology related courses, including one specifically on computers in education. She had owned a home computer for more than seven years, had personal Internet access for the last three years, and considerable experience using a range of software applications for both personal and educational purposes. Andrea was very conscious of equity issues and drew heavily on her religious faith when discussing the role of technology in society.

Over the last two years, the School had purchased sufficient computers for two in each classroom, but Andrea had three. In addition, there was a pod of five computers in a resource area attached to the Library. These computers and a single machine in each senior class were connected to the Internet. Andrea had mixed feelings about integrating the Internet into her classroom despite having specific responsibility for the use of computers and related educational technologies within the school. At the time of the research, Andrea was in the process of helping to build the school's website. In recent years, she had taught other teachers how to use computers in the classroom and given formal presentations to the Board of Trustees and parent community on the benefits and dangers of using the Internet in education. Andrea was conversant with recent developments in ICT and had been involved in several computer-related professional development initiatives within the region. She was currently studying toward a postgraduate ICT related qualification.

Description of Barry

Barry was a Senior Teacher of year 5 and 6 students in a large primary school within a mid to high socio-economic community (Decile 7). He was of European descent with a Diploma of Teaching and had almost two decades experience as a classroom teacher. Barry had attended and conducted various workshops over a number of years on the use of computers in education. He had recently decided to return to formal study in order to complete his Education degree. The previous year, as part of his degree, Barry successfully completed an online course in the ICT area. Barry had owned a home computer for more than 16 years, had personal Internet access for at least five years, and considerable experience using a variety of educational software for learning purposes.

The School had an established reputation and long tradition of using computers in the classroom. In 1997, it was one of the first schools in the region to create a website. Just over three years ago, the School had built a small computer suite as part of an extension to its Library. The suite contained 10 networked computers; with two exceptions, all classrooms could connect to the Internet. This included a number of computers in the School Administration Block. Barry had two network capable computers in his classroom. This was common across the school although some of these computers were quite old machines. Until recently, Barry had thoroughly enjoyed working with computers and considered "IT" as one of his hobbies. Nevertheless, he was growing less enthusiastic about his role as the school's ICT Coordinator. Indeed, Barry was quite cynical about the drive to wired schools and the lack of commitment from staff toward using new educational technology. Other teachers relied heavily upon his expertise and he was widely regarded as the technology "trouble shooter" within the school. Barry was in a leadership role that required him to plan and initiate a number school-based computer-related professional development experiences.

Description of Catherine

Catherine was a Senior Teacher of year 3 and 4 students in a medium sized primary school within a mid to high socio-economic community (Decile 6). She was of European descent and well-qualified with a postgraduate qualification. This qualification included a course devoted to learning with computers although she had completed her postgraduate degree several years earlier. Catherine was in the middle stages of her career with 17 years teaching experience. She was committed to her career and described herself as a professional educator. Catherine had owned a home computer for more than six years, had personal Internet access for the last two years, and considerable experience using a range of hardware and software for both personal and educational purposes.

The school was well-resourced with computers, the majority of classrooms having two machines, although some were quite old. There was at least one computer with Internet capability within the middle and senior school. One of these computers was in Catherine's classroom. Recently the school had established a mini technology suite, including eight networked computers. The suite was in its second year of operation. In addition, the school possessed a number of Alpha Smart type keyboards for general classroom use. These portable word processors were incompatible with many of the older standalone computers. At the time of the research, the school was in the process of revising its website so that there would be a page for each class to publish material directly on the Web. This was part of the school's ICT long-term plan and gradual shift toward greater electronic publishing.

Catherine was rather cautious in her approach toward the Internet and openly questioned its role in the learning and teaching process. She did not have specific responsibility for ICT coordination in her school. Nevertheless, for many years Catherine had taught other teachers how to integrate computers into their classroom programmes. She was familiar with the educational computing literature along with recent developments in the ICT area. Over the years, Catherine had conducted a number of practical workshops for staff on the benefits of using computers in education. At an informal level, she was well connected to the ICT-related teacher education community. For various reasons, Catherine was highly critical of the ICT-related school reform movement.

Description of the Research Methods

The final phase involved the convergence of two mutually compatible research methods, namely narrative-biographical and micro ethnographic case study. A dual methodological strategy, merging two schools of thought from different philosophical traditions, had the advantage of allowing both the participants and the researcher to tell their own story. The method helped to provide a multi-layered narrative from more than one perspective.

On the one hand, narrative research is ideally suited to telling the story of three experienced internet-using teachers through their own voices. It is justifiably claimed that the narrative-biographical approach elicits knowledge of teachers and the teaching process that cannot be obtained through any other method (Gudmundsdottir, 1997; Kelchtermans, 1993). The basic assumption of the narrative approach is that people build their own worlds and construe their own lives, and it is problematic to leave the interpretation of lived experiences to the task of researchers. Indeed, assisted autobiographical narratives often tell a very different story from that of the researcher (Clandinin & Connelly, 2000).

In contrast, the micro ethnographic case study provides a method for the researcher to gain "lived insight" into teacher's experiences, perceptions and practices within the naturalistic context of their classroom. It provides some of the background and context that is often lacking from traditional narrative research. In the past, narrative-biographical research has been criticised for its focus on lived experience at the expense of the wider context (Goodson, 1992). Micro ethnographic case study provides some of this context and acknowledges that the researcher also has a story to tell. It legitimizes the researcher's voice and provides a methodological vehicle for critical self-reflection (Anderson, 1989).

In sum, the combination of two methodological approaches through the lived experiences of the participants and the researcher was consistent with the research objective. It provided a robust methodological framework that was well suited to meeting the objective and answering the research questions.

Description of Narrative-biographical Method

A narrative-biographical approach is the study of how teachers experience social and educational phenomena—indeed the world itself. In the tradition of John Dewey, the ultimate aim of social research is the study of human experience (Clandinin & Connelly, 2000). Narrative investigates experiences as people live them in person, in time, in space and in relationships (Conle, 1999; Syrjala & Estola, 1999). In this regard, the past exists in the present and teacher's lives are like interwoven stories. As Heilbrun (1988) asserts, people construct their identities through their own and others' stories; they really are the only models we have for living. It follows that this approach draws on the phenomenographic literature in that the world is best understood as it is perceived. The intention of narrative-biographical methods is to learn the stories people tell to better understand their lived experience. The role of lived experience and personal knowledge in educational research has often been ignored and attempts to attain an holistic understanding of teachers' work remain scarce (Goodson, 1994). For this reason it is understandable that the narrative approach has gained increasing attention in recent years (e.g., Butt & Reymond, 1989; Connelly & Clandinin, 1995). Indeed, narrative inquiry has evolved into a credible methodological approach for studying teachers' work and their adoption of new educational technologies.

The narrative method brings together a number of strands of contemporary research on teachers' thinking with emerging interest in the role of emotions (Hargreaves, 1994) and the ethical and moral dimension of people's lives (Goodson, 1994). We know that teachers' work is full of moral challenges, which must be understood in relation to their lives. The key point is that autobiographical stories can offer insight into teachers' lives and thereby answer the call for research that encapsulates the essential personal voice, largely missing from the empirical literature. In this sense, narrative inquiry can tell us what teaching with the Internet is really all about. It has the potential to uncover the deep pedagogy that reflects the personal identity and political subjectivity of the teacher.

The approach includes a dimension of action research. While telling a story, participants are given an opportunity to re-assess their own lives and this, in turn, sows the seed for personal growth (Gudmundsdottir, 1997). Syrjala and Estola (1999) claim that a person who tells a life-story simultaneously reflects on their life. Therefore, narratives promote self-reflection and can facilitate personal and professional development. Thus, storytelling is a powerful pedagogical tool; writing one's life-story is demanding and potentially very painful (Griffiths, 1994). At the same time, the process of reflection and re-thinking can be very therapeutic (Gudmundsdottir, 1997). It can help clarify the participants' view of themselves, as experiences only become meaningful in retrospect and through reflection. In this way, narratives can empower teachers to better understand their private and public identities.

The concept of identity strikes at the heart of narrative research. Narrative identity is defined as a constantly evolving and unfolding story, which builds on the prior experiences of human life (Syrjala & Estola, 1999). It assumes that we perceive our life as a narrative. As Widdershoven (1997) maintains, life is a hermeneutic circle where lived experiences and our narrative life intertwine. The relationship between experience and narrative is reciprocal as life is a recurrent process of narrative interpretation. In short, life is a hermeneutic construction where one constantly re-creates one's own narrative.

The narrative approach assumes that data reflect the participants' life experiences. Data collection must acknowledge, therefore, individual teachers' biographical and historical backgrounds and other external conditions in which people live (Syrjala & Estola, 1999). Typically, narrative techniques include written and orally narrated biographies, diaries, letters and other archival products. The researcher's role during data collection is that of a listener and co-researcher. Accordingly, the researcher wanted to listen to teacher's stories to hear about the factors that motivate their interest in teaching and technology, along with the things that inspire and frustrate them in their personal and professional lives. These lived experiences and narrative reflections, arguably, lie at the heart of understanding how the Internet has affected teachers. In sum, the narrative methodology provides an opportunity for teachers to talk about their work and retell stories of the past, which not only reflect their lived history but the present as well as the future.

Description of Micro Ethnographic Case Study Method

A micro ethnographic case study is defined as a microscopic level of ethnography (Levine, 1990). Ethnography attempts to gain a picture of the "way of life" of some identifiable group of people (Wolcott, 1988). It is the study of culture and lived experience from the inside. A micro ethnographic case study differs from ethnography primarily in its focus on a more microscopic level of analysis (Levine, 1990). The micro ethnographic method helped to define the unit of analysis while retaining the overall complexity of the dynamic interactions within the Internet learning environment. In this regard, the method was ideally suited toward an exploratory investigation that sought to observe, understand and yield insights into the practices of experienced internet-using teachers in a naturalistic context. The strength of the ethnographic case study approach was that it allowed the researcher to be a participant-observer and to gather a range of thick descriptive information on teaching practices in the natural setting of the classroom (Zaharlick, 1992). This style of research, therefore, helped to overcome the limitations of prior work in artificial and/or contrived conditions.

The micro ethnographic case studies offered the researcher a flexible methodology that acknowledged the idiosyncratic nature of teaching and the reciprocity between theory and practice. In this sense, ethnography gives the opportunity to build grounded theory (Altricher & Posch, 1989) with those working within the culture of the Internet learning environment. It helps to understand how regular people in regular settings make sense of experiences in their everyday lives. This is why, potentially, an ethnographic case study can lead to the development of more authentic and mutually comprehensible theories directly relevant to classroom practice (Cohen & Manion, 1985). Importantly, this recognizes the researcher's responsibility to bridge theory with practice. By using multiple research techniques and data sources, the researcher can collaborate with participants in the construction of tentative theory through reflection in, on and about action (Schon, 1983).

The multi-site case study of three experienced internet-using teachers gave the chance to compare the similarities and differences between the viewpoints held by the participants across each case. This was a strength of the study given that the participants were located in three different regions. Furthermore, the decision to complete three case studies was based on the need to validate previous data and obtain more fine grain information on the teachers' practice. It is claimed that a collective of case studies, each with a high level of construct validity, has potential to provide a more secure basis for generalisation across the research population (Ebbutt, 1988). In the future, the case study material may, therefore, provide a cumulative resource that with further replication could have the potential for widespread generalisation. It would at least provide a useful archive of the Internet as an educational innovation for future reference.

In sum, the micro ethnographic case study approach was judged to be the most appropriate methodology to provide lived insight into the culture of innovation associated with Internet use in New Zealand schools. It was ideally suited to studying the context of Internet-based teaching under naturalistic conditions. Moreover, a multi-technique approach would help to triangulate observations and generally enhance the validity of the researcher's voice. There was every indication that this style of case study was appropriate given: (a) the research objective, (b) the size and feasibility of the sample, (c) the limited resources and experience of the researcher, and (d) the time-frame of the study.

Research Procedure

In February 2001, a letter was sent to the three experienced internet-using teachers as an initial contact before formally inviting them to participate in the research (Appendix D). This letter restated the purpose of the research and explained the need to collect more in-depth information through narrative and an ethnographic case study. The teachers were telephoned several days later to check whether they had received the letter and to confirm their willingness to participate in Phase Three. All three teachers were enthusiastic about their further participation and arrangements were made to negotiate access and formal written consent. At the end of February, the school principals were sent a letter and Information Sheet, which sought their permission for the study to take place (Appendix D). Each principal was telephoned a few days later to provide further information about the research and to ascertain whether they were willing for one of their staff to participate in the study. After consultation with their respective Boards of Trustees, the principals gave their written permission for the teachers to be involved (Appendix D).

Before each case study, the school published on the researcher's behalf a brief notice about the research in its regular newsletter for parents and caregivers. Although the detail of the notice varied from school to school, it generally outlined the purpose of the research and informed people that in the next week or so the researcher would be a participant-observer at the school. The newsletter item emphasized that students were not directly involved in the research and that the focus of the study was on how teachers were utilizing the Internet for educational purposes. The newsletter invited parents and/or caregivers to contact the school if they had any concerns or if they wanted more information about the research. By all accounts, no one contacted the schools seeking further information.

The narrative and case studies commenced in April and initial data collection was completed by the end of June 2001. This involved the researcher participating for five days in each of the three internet-using teachers' schools. A week was considered sufficient time to observe the teachers in action and gather data on the nature of Internet use in the classroom. There was a minimum break of two weeks between the case studies to allow the researcher to fully document the first case and prepare for the demands of the next study.

At a practical level, the boundaries of each case were defined as the teacher and the physical confines of their classroom practice. While this restricted the case to the individual teacher, an extension of the research to the wider context of the entire school was beyond the scope of the present study. Nevertheless, data collection included archival material from the classroom by way of unit plans and school policies developed over the years, along with information gathered from the teacher on the nature of Internet use by other staff. Thus, the case study was more than a "snap-shot" of the researcher's lived experience, as it yielded multiple sources of information from a brief but intensive period of investigation.

On completion of the final phase, a letter of appreciation was sent to the three participating teachers (Appendix D). A letter was also sent to each school (Appendix D). This letter indicated the ongoing nature of data analysis, the possibility of the need to verify some of the information, and an anticipated timeline for disseminating the research findings. An executive summary of the results was promised on completion of the study.

Data Collection – Narratives

The narratives followed a specific research protocol that involved two main techniques, namely a biographical interview and written autobiographic story (Appendix D). The interview was conducted before the case study began; it served the multiple purpose of re-establishing contact with the participants, obtaining formal consent and laying the practical and philosophical foundation for documenting a narrative of the teacher's lived experience. In addition, the opportunity was taken to once again validate the interview transcripts from Phase Two as it is doubtful how many teachers actually take the time to review their own transcripts. Each teacher was given another copy of the transcript as a symbolic gesture and they were invited to comment on whether their views had changed since the interview.

All three participants were genuinely astonished that someone wanted to tell or retell their professional story. Accordingly, it was important that the participants clearly understood the purpose of the research. By giving teachers information about the research, and their role in it, the researcher provided an essential orientation to the study. Oakley (1981) states that it is important to establish a relationship, not just a rapport. Mindful of the need to build a relationship of mutual trust, the researcher invited participants before the interview commenced to ask questions about the study, including ethical considerations such as confidentiality, access to publications and potential misuse of the results. Some of these questions often arose during the interview itself as specific issues emerged. In responding to questions openly and honestly, the researcher deliberately shared information about his background, general interest in educational technologies and teaching position within the University. The pre-interview period was quite informal with the orientation conversation lasting between 15 to 20 minutes.

The interview itself was taped using an audio cassette recorder (Appendix D). In keeping with the aim of documenting lived experience, it started with a general question about the teacher's background. This acknowledged the value of starting the interview with something the person is already comfortable with (Ely et al., 1991). The life-story interview then explored five main themes: (a) why I became a teacher; (b) what teaching means to me; (c) what the Internet means to me; (d) how my teaching and use of educational technology has changed over the years; and, (e) the most significant effects of Internet use—both good and bad. These themes conceptualized the participants as people who construct meaning and significance from their own realities. It was assumed that teachers interpret their experiences drawing upon a complex personal framework of beliefs and values that have developed over their lives to explain and predict the events of the world (Fang, 1996). Put simply, the core assumption was that teachers are active and purposeful learners (Fullan, 1992).

The interviews were designed, again, to follow an informant style. Most of the conversation was expected to come from the interviewees. At the same time, Ely et al. (1991) state that an interviewer should be sensitive to clues given by participants, probe, question, listen, amalgamate statements and generally be as involved as possible. Thus, the intention was the participant and researcher should be equal partners in the story telling process. For these interviews, this meant expanding on the theme if required and responding honestly to any questions, without leading the interview or taking up too much of the air time. Ely calls this "judicious entering" whereas Lather (1989) describes this type of interview as interactive, reciprocal self-disclosure. Without exception, the interviews provided an ideal context for uninhibited discussion and story telling, where the research themes were gradually unwoven at a deep personal level. Interviews varied in length from 55 to 95 minutes.

On completion of the case study, participants were invited to write an autobiographical story based on their lived experience. This was an opportunity for participants to tell their own story in their own words with limited assistance. The story was intended to be a written narrative or collection of short vignettes of significant experiences related to teaching and technology over their career. Hence, the personal and idiosyncratic nature of the task made it virtually impossible to pilot this research technique. It was very much uncharted water for the researcher although the narrative techniques were informed by the contemporary literature (e.g., Errante, 2000). For this reason the task was open ended but a number of guiding questions were posed to help scaffold the reflection and writing process. The following questions were used for this purpose:

i) *What have been some of the crucial moments or defining experiences in shaping your identity as a teacher?*

ii) *What have been some of the crucial moments or defining experiences in shaping your use of educational technology for learning and teaching?*

iii) *What key event, person or single incident has most significantly changed or contributed to your understanding of educational technology in the learning and teaching process?*

iv) *What impact or contribution has the growth of the Internet had on your life and how is it influencing your work as a teacher -- for better and worse?*

v) *What lessons or guiding principles have you learnt over the years about the role of new educational technologies in the learning and teaching process?*

The aforementioned questions were provided to participants as part of an Autobiographic Schedule under the heading "My Personal Story" (Appendix D). The Schedule gave brief instructions but left the interpretation and response entirely open to participants. No indication of length or format was given. Initially participants were asked to complete their story within a month of the case study. All three teachers were unable to meet this target, which was unrealistic in hindsight. A draft version of each story was eventually submitted by August and it subsequently went through a number of iterations. In October 2001, on completion of the assisted autobiographical story, the researcher personally telephoned each participant to thank them for completing this demanding task. The telephone call was followed a few weeks later by a final letter of appreciation (Appendix D).

Data Collection – Case Studies

The micro ethnographic case study followed a specific research protocol that involved both qualitative and quantitative data collection techniques (Appendix D). This was designed to answer each of the research questions while at the same time allowing an open ended exploratory investigation of the way teachers were using the Internet for educational purposes. The Research Protocol contained four main sections: (a) the research objective; (c) the research questions, (c) the specific research techniques, and (d) the general research plan that would be followed in order to complete the investigation.

The protocol and data collection techniques were prepared with reference to previous research on computer-using teachers, particularly prior case studies (e.g., Blomeyer & Martin, 1991; Happs & Kinnear, 1990; MacArther & Malouf, 1991; Miller & Olsen, 1994). In addition, data collection was informed by the research methods literature on doing qualitative (Burgess, 1985; Delamont, 1992; Ely, 1991), ethnographic (Coe, 1991; Wolcott, 1988; Zaharlick, 1992) and case study research (Yin, 1989). This methodological knowledge meant the micro ethnographic case studies were designed, as much as possible, to allow the researcher to fully participate in the classroom programme, and to converse with the teacher (and students) in natural and unobtrusive ways. The decision to adopt a participant-observation style was made easier in that, by all accounts, the class was use to frequent visitors.

Case Study Techniques

This section outlines the different research techniques that were employed in the data collection process. It describes six specific research techniques: (a) Participant-Observation; (b) Research Diary, (c) Self-Reflection Record, (d) Documentation Schedule, (e) ICT Capability Schedule, and (f) Teacher Interview Schedule.

Participant-observation

A participant-observation role was adopted by the researcher as a way of immersing himself within the culture and social practice of the classroom. The researcher prepared for the participant-observation by accepting an invitation to observe a local teacher's classroom while students were involved in several computer-related activities. This experience was invaluable in understanding the demands of ethnography and in determining the style of participant-observation that was adopted. It was subsequently decided that the most appropriate style was to act as a privileged observer (Wolcott, 1988). This style of participant-observation provided opportunities for natural interaction within the classroom, and the school at large, and allowed the collection of a range of data using various research techniques. Each case study involved a minimum of 8 hours participant-observation over a period of five days. The precise length and time spent in each classroom varied depending upon the nature of the programme.

Research Diary

A Research Diary was prepared by the researcher to document anecdotal experiences, keep field notes and log classroom observations (Appendix D). The diary was developed and piloted during the period of observation prior to the case study in a local teacher's classroom. It was initially structured in terms of the main research questions with a separate and different coloured page for each question, for each day of the week. An additional page was included for notes and classroom observations that were not specifically related to the research questions, but within the parameters of the study. However, the pilot demonstrated that the organisational structure of the diary was too difficult to operationalise and it was subsequently condensed and revised according to key research variables. There were five main sections: (a) the teacher; (b) the school; (c) the students; (d) the Internet; and, (e) general observations. The researcher used these sections to help focus the investigation and to maintain a chronological record of observations throughout the study. A new template page was used for each section for each day of the Case Study; the diary itself was contained within a loose-leaf ring binder/folder.

Self-Reflection Memos

A record of the researcher's reflections was maintained using a small personal tape recorder. This machine was used during periods of participant-observation when the diary was inaccessible and at other moments throughout the study to quickly record analytical memos (Delamont, 1992). These memos included any thoughts that came to mind from classroom observations and/or from informal discussions in and out of the classroom. The tape recorder was also used for administrative purposes and to accurately record information about teaching and technology in the school where it was not practical to immediately note this type of detail in the research diary. At the end of each day, the researcher listened to these self-reflections, recorded further insights and where appropriate added relevant material in the research diary.

Documentation Schedule

A Documentation Schedule was prepared to collect archival data and information related to the school's strategic vision, ICT policy, Internet policy, professional development plan, long term plan, and individual teacher's unit and lesson plans (Appendix D). This schedule also included the documentation of available Internet resources and web sites that were used by the teacher, or school, for learning, teaching and professional purposes. It was apparent from prior research, and conversations with other professionals known by the researcher, that such material was essential to understanding the use of the Internet by teachers in schools. On occasions, the relevant documentation were copied, with permission, but in the main written notes were kept to record the extent and nature of this material.

ICT Capability Schedule

A basic ICT Capability Schedule was constructed to determine the teacher's perceived skill and knowledge of how to operate different computer and internet applications (Appendix D). The pilot schedule was developed based on a number of instruments that attempt to define technology standards for teachers (e.g., Australian Council for Computers in Education, 1999b; International Society for Technology in Education, 2000a; Teacher Training Agency, 1999) and trialled with a group of pre-service teachers working in a local primary school. The schedule was originally designed such that teachers could self-report on their capability to perform a number of prescribed computer and internet-related operations. The pilot demonstrated that a self-report checklist was problematic, in that teachers did not understand some of the specialised terminology, and more meaningful results would be obtained if the schedule was administrated by the researcher on an individual basis. The revised "tell me what you can do" Capability Schedule was completed by each teacher, under the researcher's supervision, at a mutually convenient time during the Case Study.

Teacher Interview Schedule

An informant post-observation Teacher Interview Schedule was designed to gather additional data about the integration and organization of computers, and the Internet specifically, within the classroom programme (Appendix D). These interviews were not piloted because of the nature of the purposive sample and due to time and resource constraints. An unstructured interview was deemed the best way to get the teacher to converse about their classroom practice and to reflect on any internet-related activities over the course of the week (or year). The researcher noted key points during and after the interview but this final conversation was not recorded. The interviews were spontaneous from the outset with a lively discussion of the teacher's professional use of the Internet both within and beyond the classroom programme. There were, of course, numerous other informal discussions with the teachers throughout the case study.

It was clear from the interview that teachers thoroughly enjoyed their participation in the research—albeit this claim is based on nothing more than the researcher's perception of the participants' response. By this stage of the study, the teacher and researcher were very much at ease in each other's company. The final interview, therefore, helped to address some of the loose ends related to the case study and provided an important sense of closure. Importantly, it also gave the opportunity for the researcher to discuss the requirements of the autobiographical story and to personally thank teachers for their contribution.

Data Analysis

The analysis of narrative-biographical data was undertaken on completion of the case studies. On this occasion, the autobiographical interview was not fully transcribed. It was decided to transcribe relevant extracts only, because of the length of the biographical interview and sensitivity of data. These extracts were coded thematically in terms of the main interview themes. A number of additional themes and headings were created, as these emerged from the transcription process. Again, the researcher personally transcribed the tapes, as this was an important part of the coding and analysis process. Indeed, it was essential given the iterative nature and deeply personal content of the interview material.

The coding process followed a more traditional method; it was decided that qualitative analysis using NUD*IST was unnecessary for these parallel stories. A word processor was used to record and then re-arrange selected extracts of conversation in terms of the respective interview themes. The clustered interview extracts were later re-analysed in terms of the research questions, with cogent points selected and presented as direct quotes under the individual teacher's narrative. Presentation of narrative material from the interview was done via electronic collaboration with the teachers. Each teacher was sent a draft copy of the researcher's thematic reconstruction for feedback and, if necessary, revision. Several minor changes were requested before the narratives were approved for inclusion in the results.

The analysis of the autobiographical stories first required the researcher to proof-read the work and suggest minor mechanical and meaning-level changes. These changes were made only after approval from, and consultation with, the participants. Typically this process was done by electronic mail. Minor editorial work helped to clarify terminology, develop structure and improve the sense of audience. In the editorial process, the researcher was very conscious of the participants retaining authorship. To this end, the assisted autobiographic stories appear in the results as a "softly edited" reconstruction of the teachers' voices. While the entire story was the major unit of analysis, a number of common and emergent themes were identified across all three participants.

The analysis of qualitative case study data was ongoing and simultaneous throughout the period of participant-observation. During this period, the researcher was mindful of, and guided by, Ely's et al. (1991) distinction between inductive and deductive forms of qualitative data analysis. At the end of the case study period data were reorganised for more intensive analysis. Data were analysed by systematic documentation of each research technique and thematic coding in accordance with the main research questions.

The Research Diary and Self-reflection Record were converted into word processed documents and data subsequently coded with separate colours according to the research questions. Different colours were used to code any points that emerged but that did not fit within the study's original framework. In a similar way, documentation collected throughout the case was collated and, if necessary, converted into word processed documents. A similar technique was used for data from the post-observation interview. This material was coded by using a different colour to highlight observations or primary source data which appeared to relate to one or more of the research questions. The coded material was initially stored in a file devoted to each research question. In some cases, a crossed referenced copy of the material was produced when these data related to more than one aspect of the study.

The analysis of quantitative case study data was done using a Microsoft Excel spreadsheet. These data were coded, tabulated and later analysed using basic statistical calculations. Responses to the ICT Capability Schedule were coded according to the teacher's ability to perform each computer and internet operation, with data presented in figure and table format within Chapter Nine. The combined case study database was then systematically re-categorised in terms of five main areas: (a) the teacher, (b) the Internet, (c) the school, (d) the students, and, (e) the curriculum using several sub categories. In coding these data for further analysis, the researcher explored the potential of several software management packages, including NUD*IST. An evaluation, however, of commercially available analysis packages highlighted a number of deficiencies. For this reason, a standard computer database was used with fields for each category and a coding system relating back to raw data. This was the least complicated and most efficient data analysis strategy for the size of the study.

The subsequent interrogation of this database involved further electronic consultation with the participating teachers. Indeed, the teacher-researcher relationship continued via mail, telephone and electronic communication for some time after the study. This was an unexpected outcome of the methodology and it played a significant role in the analysis and triangulation of data in terms of the aforementioned categories. Thus, data analysis was an iterative and recursive process, which continued through to November 2001. In many ways, this was an example of case study and ethnography moving from the field to the Internet (Whittel, 2000). Cogent points and emerging themes were eventually presented in Chapter Nine as a combination of direct quotes, archival information, interview extracts, teacher and researcher narrative and where appropriate figures and tables.

4.6 ETHICAL CONSIDERATIONS

The research design abided by the *Massey University Code of Ethical Conduct for Teaching and Research Involving Human Subjects* as written at the time (Massey University, 1998). In addition, it was guided by the ethical requirements of both the New Zealand and American Educational Research Associations of which the researcher is a member. When potential ethical issues arose, the researcher discussed these with his supervisors, senior colleagues, and/or members of the *College of Education Human Ethics Committee.* In addition, the researcher attended a *Massey University Training and Development Unit (TDU)* workshop to learn more about recent developments in the ethics of social research. The appreciation of ethical issues in social research has matured considerably in recent years (e.g., Burgess, 1989; Tolich, 2001) and the researcher endeavoured to be well-informed of the shifting ground in this area.

The study presented a number of potential ethical concerns. The main concern related to the anonymity of the participants and their informed consent, but there were also important issues related to confidentiality, conflict of interest, the sample selection process, access to and storage of data, collection of data during the regular classroom programme, and the potential misuse of the research findings.

At each phase of the research and throughout the sample selection process participants' names were kept private by the researcher. The researcher maintained anonymity as much as possible. The Research Advisory Group, for example, knew of the internet-using teachers by only the codes that appeared on their respective questionnaire and interview responses. That said, the researcher made no guarantee of absolute anonymity. The limited assurance of anonymity was explicit in the information sheets prepared for each research phase. These showed that one of the main risks associated with the research related to the participants' anonymity. The information sheets stated that the researcher could only give a personal guarantee of anonymity and this was limited to the extent allowed by law.

In keeping with this guarantee, the specific geographical location of each city/town is not identified in the research. Although this information was less problematic in earlier phases, it was a reasonable step the researcher could be expected to take to protect the identity of the participants in Phase Three. It was felt that public disclosure of the precise geographical locations would potentially jeopardize the participants' anonymity. Establishing a relationship of trust where participants felt safe to share their teaching experiences, perceptions and practices was crucial. In light of the high political profile of ICT in the professional discourse, it was considered that public disclosure might compromise the teachers' position and the nature of the research relationship. In the end, the decision to provide a limited definition of the research population was a compromise between retaining sufficient contextual information and preserving the ethical integrity of the research.

From the outset, the researcher was aware of potential for conflict of interest. There was potential for conflict between the teachers' views and those held by their school. In addition, there was a chance that some teachers may be, or may have been, students at Massey University. More specifically, participants may be enrolled in a course taught by the researcher. For this reason, the implementation of Phase One was delayed until after completion of the Autumn Semester. This was a time when conflict of interest was least likely. Similarly, during Phase Two, the interviews took place at the end of the first semester when the researcher had fewer teaching commitments. The final phase of data collection was negotiated and originally scheduled to begin prior to the academic year.

In data analysis, care was taken to avoid reporting information that would identify the participating teachers and their respective schools. The interview transcripts are not included in the Appendix to further protect the participants' anonymity. All research data were kept secure in a locked cupboard, which was only accessible by the researcher. A password was used to protect all electronic files. At all times, the information provided was treated as confidential and participants were informed they had the right to view their own data on request. An assurance was given that as soon as possible raw data, such as audio tapes and personal files, would be either returned or destroyed by the researcher. Tapes were subsequently destroyed and the interview transcripts were returned to the participants. Teachers were given opportunities to comment on data and no one was involved in the study without their prior permission. The participants were informed of the purpose of the research, made aware of their rights and were free to withdraw at any time. In short, at all times, the participating internet-using teachers gave their informed consent.

The principals and school boards involved also granted their consent prior to each research phase. In Phase One, consent was obtained through the nomination process. In hindsight, however, the researcher should have contacted the principals before sending out the questionnaire to each teacher. This would have helped to address the delay between the nomination process and the first postal questionnaire.

In Phase Two, principals were sent a letter to establish that it was appropriate for a second questionnaire to be sent to a member of their staff. They were also sent a letter to seek permission for an interview to take place. These letters explained the purpose of the research and included a revised copy of the Information Sheet. There were no objections to the study but the researcher should probably have sought a written response to this letter.

In terms of the internet-using teachers, it was clearly stated on the Information Sheet that completion of the questionnaire implies consent. Participants were informed of how they were selected for the study and promised that information was being provided on the understanding that their name would not be used without explicit permission. Indeed, there was no intention of using participant's actual names. At all times, the research design was mindful of social and cultural sensitivity. Data were only requested when personal information was relevant to the study.

Prior to each interview, teachers were reminded of the research objective, given a revised copy of the Information Sheet and asked to sign a written consent form. A copy of the Consent Form was left with the participants. Before signing the form, sufficient time was allocated for the prospective participants to consider the request, ask questions and think about the implications of their involvement in the study. When participants accepted the invitation to take part in the interview, it was clearly explained they could ask questions and request the tape to be turned off at any time. One teacher made such a request at a specific time during their interview.

In Phase Three, consent was obtained from the principals and respective Boards of Trustees before negotiating access and data collection with the teachers concerned. The negotiation process involved a revised Information Sheet along with a separate procedure for obtaining written consent. Participants were once again informed of how they were selected for the study and the consent process followed a similar protocol to Phase Two.

The signing of consent forms was preceded by a thorough discussion of the potential implications of participation. In particular, issues of anonymity and public disclosure were discussed in relation to potential harm, especially after dissemination of the research findings. This was done mindful of the commercial and political interests driving the Internet fever and ICT-related school reform movement sweeping through New Zealand. A personal commitment was given that no participant would be disadvantaged from publication of the results. At the same time, it was clearly stated that interpretation and use of the study by others was beyond the researcher's control. The school and teacher's names were changed in the final report to honour the personal guarantee of anonymity and to limit any potential harm from the misuse of the results.

The researcher was conscious of including an emancipatory dimension throughout the research process. Thus, wherever possible, the researcher encouraged participants to critically reflect on their teaching practice as part of a journey in search of their second self. For this reason, after data collection the researcher invited the internet-using teachers to join an email list devoted to the use of computers in New Zealand schools. At the time, the NZCompEd email list had an active membership of 350 teachers. The list was established in 1998 with a goal of promoting critical debate and building a stronger sense of community amongst New Zealand computer-using educators. At the end of 2001, the researcher also launched a website known as *ICT-Online,* in order to better disseminate information about the use of new educational technologies in New Zealand schools—for better and worse.

Overall, the researcher felt a moral responsibility to ensure the study did not merely retell the current story, and thereby consolidate prevailing views, but rather empower change. As others can misconstrue research, and there is often a question of whose voice is being heard, the final phase involved more than just story telling. This phase engaged people in genuine dialogue and critical self-reflection; it attempted to conceptualise the participants and the researcher as equal partners in the research process. Accordingly, throughout the research partnership, final approval of data interpretation resided with the participants. The interpretation of the teacher's voice was, therefore, an interwoven, recursive and mutually reciprocal process of reconstructing lived experiences over an extended period. This resulted in more authentic and original interpretations of lived experience, which Polkinghorne (1995) describes as "storied narratives". In this study, Andrea, Barry and Catherine's experiences are storied narratives jointly composed by the researcher in the quest of the second self.

In the case study, the researcher did not examine documents, files or correspondence without explicit permission from the principal or participating internet-using teachers. The researcher ensured that parents and caregivers were informed of the research using a method deemed most appropriate by the school. They were given the opportunity to request further information about the study even though students were not the focus of the research and provision was made for children to be removed from the class without disadvantage if necessary. Every effort was made to minimise disruption to the regular classroom programme. The researcher attempted to collect data in as unobtrusive a way as possible, and assisted both the teacher and students whenever asked.

Finally, the researcher stated his commitment to disseminating an accurate and fair account of the study to the teaching and research community. Beyond the dissertation, the results will be disseminated through appropriate presentations and academic publications in both research and practitioner journals. The participants were informed of the way in which the research would be disseminated before agreeing to take part in the study. All participants will receive an executive summary of the findings on completion of the research.

4.7 ISSUES OF TRUSTWORTHINESS

The research was designed to ensure that it is, as much as possible, a trustworthy study of internet-using teachers. The study attempts to satisfy four main criteria of trustworthiness: (a) confirmability; (b) credibility; (c) dependability; and, (d) transferability (Lincoln & Guba, 1990).

The criterion of confirmability (objectivity) refers to the degree with which the method and data collection techniques appear to reflect and further the researcher's self-interest. This is an important consideration especially in narrative research, as the researcher can easily become the all-knowing narrator (Conle, 1999). This criterion was met by ensuring that the researcher's theoretical orientation and philosophical assumptions were explicit throughout the research process. In like manner, decisions made throughout the research process were transparent and fully justified by the researcher. In this respect, the involvement of the Research Advisory Group enabled an independent and systematic sample selection process. There also remains an adequate record of data such that someone else could follow the decisions and transactions in relation to the research findings. The researcher has sufficient residue of material to confirm and justify his personal interpretations of data.

The criterion of credibility (internal validity) refers to the findings, interpretations and analysis being found acceptable by the research participants, and by other researchers who judge the reported results as being faithful to data. In this regard, the researcher was involved in the study over a prolonged period and developed considerable rapport with many of the participants. This meant that completed questionnaires, interview transcripts, biographical narratives and case interpretations (and reinterpretations) could be offered to participants for validation. The triangulation of data gathering techniques over several phases, along with the use of parallel stories (Craig, 1999) and the involvement of a Research Advisory Group, enhanced the overall credibility of the research process.

The criterion of dependability (reliability) refers to the consistency of the research findings and the fit between the reported data and what actually occurred in the collection of data. The study involved a number of research and data gathering techniques in several contexts, over an extended period of time. Despite the rapid growth of the Internet, there was a reasonably consistent response from teachers to this social, economic and educational phenomenon. Indeed, there was every indication that the findings would be consistent if the research were replicated with the same participants—albeit the results are likely to reflect a creeping evolution in Internet use. As part of fulfilling the requirements of a doctorate, the research was supervised (and to some extent audited) by staff with expertise on methodological issues and knowledge on the use of computers in educational settings. This, in turn, added to the dependability of the methodological framework and research findings.

The criterion of transferability (external validity) refers to the researcher giving sufficient descriptive information for another researcher to be able to transfer the research design to a similar population such that they could produce similar conclusions. In this regard, the research involved a nominated and purposive sample of internet-using teachers that could be replicated in another study. The methodology chapter provides a detailed account of the procedures, research techniques and selection processes used with more than enough information to permit another person to contemplatie replication in a different setting. Suffice to say the methodology is generally transferable to other regions and populations if researchers want to make comparisons.

Importantly, in addition to the above criteria, the research was designed to maximise catalytic validity. Lather (1986) states that catalytic validity represents the degree to which the study reorients, focuses and energizes participants toward knowing their reality in order to transform it. This is a process Freire (1973) terms conscientisation. It was hoped that the research would challenge and encourage the participants to critically reflect on their lived experience and current teaching practices. The intention was to facilitate new insights and self-understandings about life, learning, teaching and the role of the Internet in education, especially in the latter phases of the study. Of course, due to the relatively short duration of the study, and limited resources of the researcher, this criterion was problematic and very difficult to demonstrate.

4.8 PERCEIVED METHODOLOGICAL LIMITATIONS

Before undertaking the study, the researcher was aware of a number of potential methodological limitations. The following section outlines the major methodological limitations perceived for each phase of the research.

Preliminary Phase

In the Preliminary Phase, the nomination process may not be sufficiently inclusive to canvass the full range of people with knowledge of teachers who are proficient at using the Internet for learning and teaching. After all, the study does not seek the views of parents and caregivers nor does it solicit the views of all the members of the teaching staff and Board of Trustees. The opinion of teachers within the different regions is obtained from the staff representative on the Board and, in some situations, these people are not teachers. Furthermore, the study does not consult with another major stakeholder—namely the students. This is considered impractical and potentially unethical. The nomination process itself is fraught with problems. Although the researcher is aware of the potential deficiencies, the sample has obvious limitations which may undermine the value of the study.

Phase One

In Phase One, the postal survey may be too crude a technique for eliciting the experiences, perceptions and practices of internet-using teachers. We know that postal surveys have limitations, especially in obtaining information beyond fragile opinions and perceptions. Furthermore, as the Internet is a relatively new phenomenon, the technical language of the questionnaire itself may obscure teacher's understanding. This highlights that the questionnaire seeks written data only and in the translation of responses to numerals and text some of the important contextual information may be lost. The researcher is aware that the instrument may not accurately convey teachers' perceptions of their own lived experiences. In turn, the questionnaire is not necessarily a trustworthy source of data for selecting a purposive sample of accomplished internet-using teachers for further research. There will always remain doubt over those teachers who do not respond to the questionnaire. Undoubtedly, some teachers will be eligible for Phase One but their names will not be put forward by colleagues for various reasons. The researcher will never know what can be learnt from these teachers. Thus, the survey will not provide a complete picture. After all, it largely ignores internet-using teachers in remote schools. In sum, Phase One will provide a highly selected snap-shot of the experiences, perceptions and practices of internet-using teachers in three regions where there was no official ICT Lead School.

Phase Two

In Phase Two, there are similar limitations with the follow up questionnaire. The gap between the two questionnaires may lead to a poor response rate, and we know that a written survey is an unsophisticated way of eliciting teacher perception and beliefs data. Moreover, if too many teachers decline to participate in the follow up interview this might make it difficult to judge the validity of the questionnaire responses. Indeed, it may leave a nagging doubt over the experiences, perceptions and practices of these teachers and raise the question: What did the research miss because of a disappointing response? In addition, we know that the interview technique is prone to misconceptions of what actually happens in the classroom. The teacher's account of their personal and professional lives could easily be based on false consciousness. In other words, the interview may not elicit an accurate account of lived experience and work culture. There are potential limitations resulting from the researcher's gender, inexperience with the interview technique and prior knowledge of the participants. The proposed coding process in terms of the main research themes may also be insensitive to the grounded nature of the discourse. Hence there is a danger that the interviews might inadvertently become the researcher's story of the participating teachers' story. Finally, due to time constraints the Research Advisory Group may not have had long enough to study the questionnaire and interview data in-depth to make trustworthy judgments of the individual merits of each internet-using teacher.

Phase Three

In Phase Three, it is impossible to pilot the narrative or case study protocol due to time constraints and the nature of the purposive sample. There are obvious limitations associated with the narrative approach, especially in terms of the power relationships between the participants and the researcher. It is fair to say the narrative stories are inherently subjective. After all, the narrator's voice is always present and this inevitably results in some reconstruction of the teacher's lived experience. Thus, the narrative inquiry is tightly interwoven with the researcher's own story and, at times, it may be very difficult to separate the different voices.

The case boundaries, furthermore, may be too restrictive in that the important unit of analysis is not necessarily just the teacher and their classroom practice. Clearly, the case studies will be limited by the time of year and the restricted period of participant-observation. At best they might provide a snap-shot of experienced teaching practice with the Internet over a given period. There are potential limitations in relation to the time available for lived experience from an insider's point of view, and the amount of data that can be collected on the complex interactions within the case. Thus, the methodology is potentially a study that applies mini ethnographic techniques, as opposed to research that actually does ethnography (Wolcott, 1988). In addition, the effects of the researcher will be difficult to ascertain. The research design does not control for the researcher's presence nor does it study the wider context—such as the overall approach to ICT within the school culture.

The study of three single cases means that generalization of the results is potentially weak, with poor transfer to other contexts beyond the population—unless there is further replication of the research. Of course, the restrictive definition of experienced teachers along with the dynamic nature of the Internet makes the potential to replicate the results highly problematic. Thus, the research is fixed in time; it may be of historical significance rather than an enduring study with lasting implications for teaching practice. Despite the participatory nature of the research, observations and interpretations of data are not free from covert imposition of theory, and ultimately the study reflects the researcher's gaze on the experiences, perceptions and practices of internet-using teachers. Other researchers may well develop different relationships and observe different phenomena, thereby forming quite different conclusions based on their own theories and worldviews. Lastly, the narrative and case studies are not designed solely for the purpose of critique. Although the researcher is attempting to encourage a critical perspective on learning and teaching with the Internet, the dual methodology does not prescribe for action. Participants may critically reflect on their lived experience and Internet use, but there is no guarantee that this reflection will translate into better classroom pedagogy.

4.9 SUMMARY

This chapter has described the overall methodological approach and outlined the three main research phases. It has provided a detailed account of the specific research techniques and the sample selection processes, along with a description and profile of the sample participants at each phase of the study. An extensive justification has been given for the decisions made throughout the research process, with a full account of the procedures and techniques used for piloting, gathering and analysing data within each phase. The ethical considerations of the study were discussed along with issues of trustworthiness and the potential methodological limitations of the research.

The following chapter presents the results for the first survey—that is, questionnaire phase of the study.

CHAPTER FIVE

Results: Phase One

'It is a capital mistake to theorise before one has data' (Sherlock Holmes, cited in Sanger, 2001, p.9).

5.0 INTRODUCTION

This chapter presents the results for Phase One of the research. It describes the experiences, perceptions and practices of nominated proficient internet-using teachers, as elicited through a survey using a postal questionnaire. The findings are divided into five sections in accordance with the main questionnaire themes. Section one presents background demographic information on the participants and their teaching experience. The second section describes the teachers' personal computer and Internet experience. Section three presents data on the use of the Internet for learning and teaching, and section four describes the pedagogical and philosophical approach teachers adopt when using new educational technologies. The final section presents data on teachers' opinions of the Internet as a social, economic and educational phenomenon and factors that inhibit and/or enable its use in New Zealand schools.

5.1 BACKGROUND TEACHING EXPERIENCE

This section presents demographic data on the participants' background teaching experience. The results relate to the research question: What are the background characteristics of internet-using teachers?

Table 5.1 displays the total number of nominated proficient internet-using teachers participating in the research. Out of the original sample, there were 56 teachers involved in Phase One of the study. Herewith data and statistical calculations are reported only in terms of those teachers participating in the research.

Table 5.1
Sample of Nominated Proficient Internet-using Teachers by Region

Research Population (n)	Nominated Teachers	Participating Teachers	Response Rate
Central Region East	34	27	79%
Central Region South	18	14	77%
Central Region West	21	15	76%
Total	73	56	76%

Table 5.2 presents the number of men and women involved in the study. Although the majority of nominated proficient internet-using teachers were women (62%), the percentage of male teachers (37%) is over representative of the total number of men in the primary teaching profession. It was noteworthy that the gender ratio across all three regions was relatively similar.

Table 5.2
Gender Distribution of Nominated Proficient Internet-using Teachers by Region

Participating Teachers (n)	Male Teachers	Female Teachers	Total Sample
Central Region East	10	17	27
Central Region South	5	9	14
Central Region West	6	9	15
Total	21	35	56

Table 5.3 shows the age distribution of the nominated proficient internet-using teachers. It was notable that the sample of teachers spanned a wide age range, but that the largest group fell within the 40-49 age cohort. Of those in this cohort, 63% were women.

Table 5.3
Age Distribution of Nominated Proficient Internet-using Teachers by Region

Participating Teachers (n)	Age 20-29	Age 30-39	Age 40-49	Age 50-59	Total Sample
Central Region East	4	7	12	4	27
Central Region South	2	3	8	1	14
Central Region West	2	4	7	2	15
Total	8	14	27	7	56

The gender distribution across regions and within age cohorts was largely consistent with the overall research sample. The distribution was remarkably similar with one exception, a slightly higher percentage of younger males (50%) in the 20-29 age range.

Table 5.4
Ethnic Profile of Nominated Proficient Internet-using Teachers by Region

Participating Teachers (n)	European	Maori	Polynesian	Other	Total Sample
Central Region East	26	1	0	0	27
Central Region South	12	1	0	1	14
Central Region West	14	1	0	0	15
Total	52	3	0	1	56

The ethnicity profile of the nominated proficient internet-using teachers is shown in Table 5.4. The majority of teachers (93%) were of either European or Pakeha descent. It was notable that three teachers only were of Maori descent. There were no Polynesian teachers and one teacher was of Asian descent. The non-European teachers were distributed across all three regions.

Table 5.5
Mean Teaching Experience of Nominated Proficient Internet-using Teachers by Region

Participating Teachers	Years Teaching (M)			
	All Schools	SD	Current School	SD
Central Region East	14.62	7.11	6.40	3.27
Central Region South	15.35	6.30	6.71	3.65
Central Region West	15.33	7.10	6.26	3.55
Total	15.21	6.86	6.44	3.38

Table 5.5 shows the teaching experience of the nominated proficient internet-using teachers. The mean number of years teaching in all schools was over 15 years. There was little variation in the mean and range of teaching experience across each region. The sample, therefore, constituted a homogeneous group of highly experienced teachers. On average, the internet-using teachers had worked for over six years in their current school. This indicated that at the time of the research the sample of teachers was in relatively stable employment.

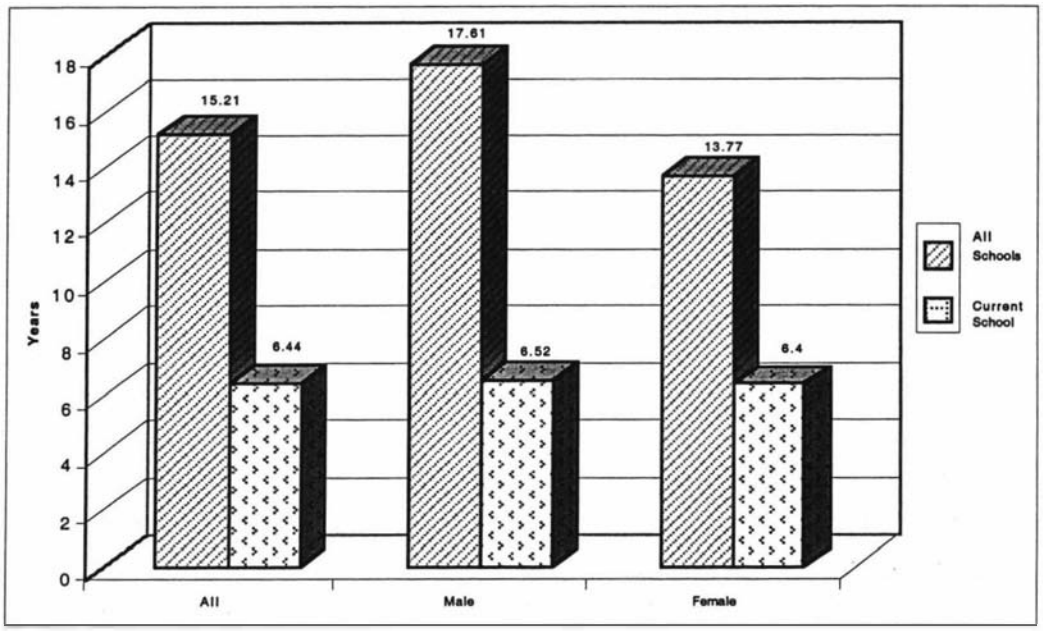

Figure 5.1 Mean prior teaching experience of nominated proficient internet-using teachers by gender

Figure 5.1 shows that male teachers had considerably more teaching experience in all schools than the women. In all three regions, male teachers also had a wider variance of teaching experience (SD=8.49) compared to their female colleagues (SD=5.29), which was consistent with the disproportionate number of younger men. There was little or no difference between men and women in teaching experience within their current school.

Table 5.6 presents the teaching positions of the participating teachers within their current school. The sample included a wide cross section of teachers at different levels of professional status. It was notable that the majority of participants (52%) were senior teachers and many were in senior management positions (n=11).

Table 5.6
Teaching Position of Nominated Proficient Internet-using Teachers by Region

Participating Teachers (n)	Scale A	Senior Teacher	Assistant Principal	Deputy Principal	Total Sample
Central Region East	9	13	3	2	27
Central Region South	3	8	2	1	14
Central Region West	4	8	2	1	15
Total	16	29	7	4	56

The teaching level of the nominated proficient internet-using teachers within their school is presented in Table 5.7. The majority of the teachers (82%) were in either the middle or senior levels of the school. However, male teachers was under represented (20%) in the lower school and over represented (75%) at the intermediate level. It was common, nevertheless, in the ICT area for teachers to work across levels and data shows only participants assigned to their home level.

Table 5.7
Teaching Level of Nominated Proficient Internet-using Teachers in Current School by Region

Participating Teachers (n)	Lower School	Middle School	Senior School	Intermediate School	Total Sample
Central Region East	2	10	13	2	27
Central Region South	1	6	6	1	14
Central Region West	2	5	7	1	15
Total	5	21	26	4	56

Table 5.8 reports the mean decile level of the schools in which the participating teachers were employed. The decile level is an outcome of a complex formula used by the Ministry of Education to indicate the socio-economic background of a school community. Under this formula, the lowest decile is one and the highest decile is ten.

The sample was relatively homogeneous across all three regions but there was a notable lack of teachers in low decile schools. Most teachers (64%) worked in schools with a Ministry of Education decile level of six and above.

Table 5.8
Mean School Decile of Nominated Proficient Internet-using Teachers by Region

Participating Teachers	M Decile	SD
Central Region East	6.48	1.45
Central Region South	6.14	1.46
Central Region West	5.87	1.64
Total	6.23	1.50

Table 5.9 shows the most advanced teaching qualification held by the nominated proficient internet-using teachers. The participants were well qualified in the New Zealand context with the majority of teachers (55%) having completed a minimum of an undergraduate degree. Another 16% of teachers had an advanced postgraduate qualification and at the time 25% of the research sample was currently studying toward a higher qualification, which was typically ICT-related.

Table 5.9
Most Advanced Teaching Qualification of Nominated Proficient Internet-using Teachers by Region

Participating Teachers (n)	Diploma of Teaching	Bachelor Degree	Undergraduate Cert/Dip	Postgraduate Cert/Dip	Masters Degree	Total Sample
Central Region East	7	14	1	5	0	27
Central Region South	2	8	1	3	0	14
Central Region West	4	9	1	0	1	15
Total	13	31	3	8	1	56

In sum, the background teaching experience of the nominated proficient internet-using teachers was remarkably uniform across all three regions. The most notable difference was that male teachers had more years of teaching experience, and a wider variance of experience in all schools, than women. There were, however, few significant regional differences within the sample. The lack of variation in teaching experience, as determined by variables of age, gender, ethnicity, level, status, length of teaching, school decile, and advanced qualifications meant that, herewith, regional data were no longer disaggregated from the wider research sample.

5.2 PERSONAL COMPUTER AND INTERNET EXPERIENCE

This section presents data on teachers' personal computer and Internet experience. It provides further information on the background characteristics of the internet-using teachers in accordance with the first research question.

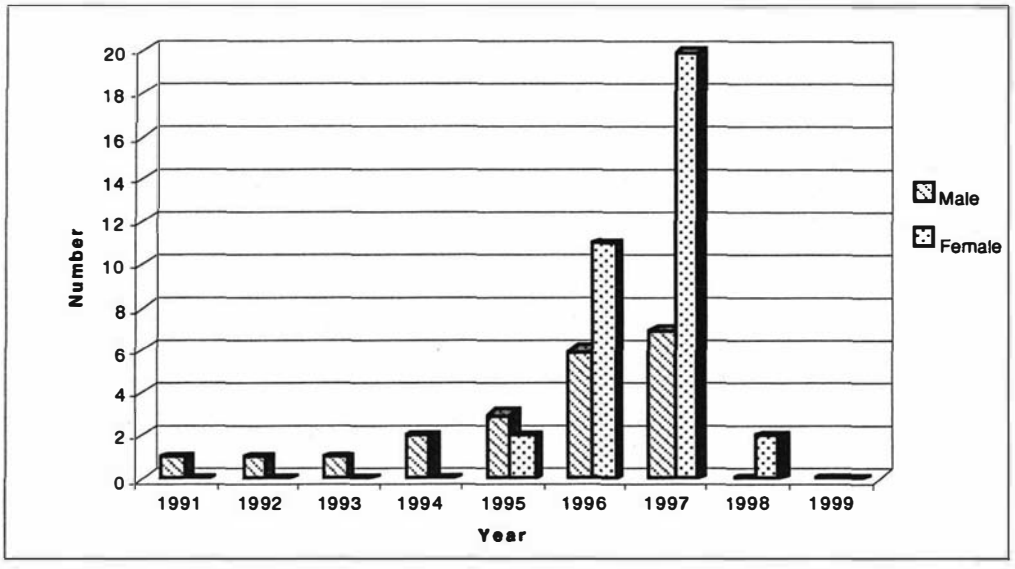

Figure 5.2 The year teachers first personally used the Internet by gender

The year that teachers first used the Internet is presented in Figure 5.2. Comparatively, male teachers nominated themselves as having more years of Internet experience than the women. By 1995, several male teachers (n=8) had already used the Internet. This compares with two only of the female teachers. The majority of women (57%) first used the Internet in 1997. At the time of the research, 96% of the total sample of teachers had been using the Internet for at least two years.

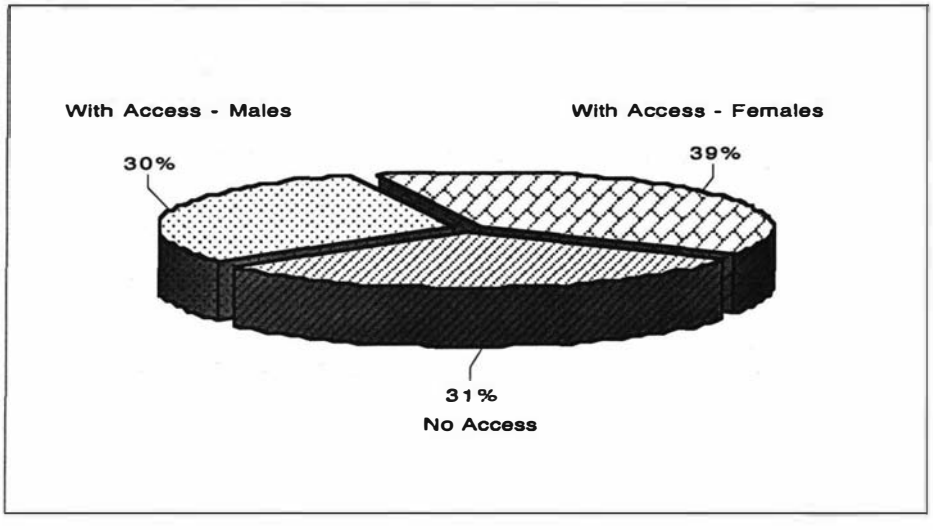

Figure 5.3 Percentage of teachers with personal Internet access at home by gender

Figure 5.3 shows there was a high percentage of teachers (69%) with personal Internet access at home. Although the majority of teachers had Internet access, this was more common among men. Indeed, 81% of men, in comparison with 63% of women, had access to the Internet at home. There was little variation in Internet access on other demographic variables. However, consistent with the under representation of teachers from the lower school, two teachers only reported personal Internet access at this level. The highest level of Internet access (79%) was by teachers in the senior and intermediate school.

The main use of the Internet at home was for personal email and to search the Web to locate information on topics of specific interest. It was common for teachers to use email to keep in touch with family overseas and to navigate the Web for recreational purposes. Indeed, a number of teachers (n=9) mentioned using the Internet to support their personal hobbies. Teachers accessing the Internet to support their academic study and locating professional development materials and resources on the Web followed this type of use. Some teachers, for example, reported using the Internet as a source of professional reading via library databases and online publications. Overall, few teachers (n=2) reported using the Internet at home to locate resources directly relevant to the classroom.

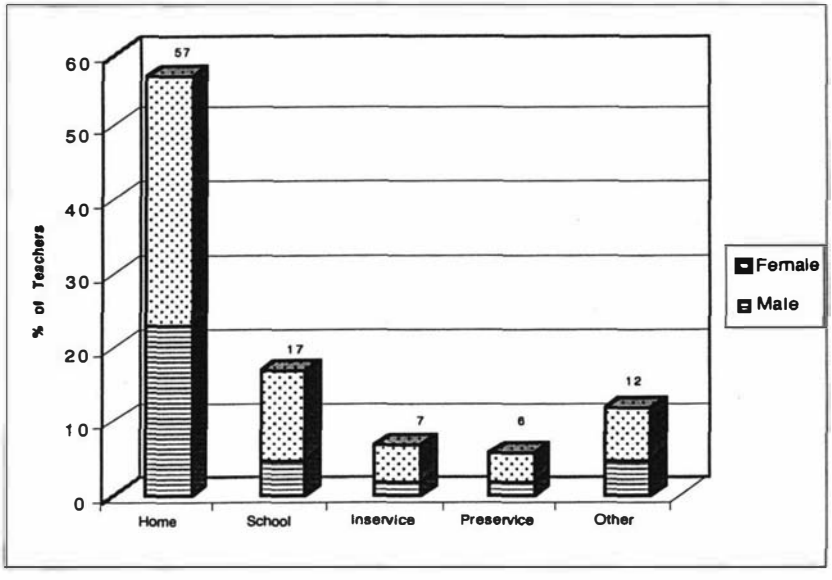

Figure 5.4 Setting in which teachers learnt to use the Internet by gender

Figure 5.4 presents data on the setting in which teachers first became reasonably comfortable using the Internet. The majority of teachers (57%) indicate that the home was the most common setting in which they learnt to use the Internet. This was similar for both men and women. It was noteworthy that few teachers (13%) indicated they became comfortable through either in-service or pre-service training. A number of teachers (n=7) reported they learnt to use the Internet in other non-formal settings including through friends, colleagues and neighbours. Indeed, several teachers commented that this type of support was crucial in coping with the technical demands of learning how to use the Internet.

Table 5.10
Percentage of Teachers with Specific Responsibility for Computers and/or the Internet

Question	Yes %			No %		
	Female	Male	All	Female	Male	All
Do you have any special responsibility for the use of computers and/or the Internet in your school?	69 (n=24)	86 (n=18)	75 (n=42)	31 (n=11)	14 (n=3)	25 (n=14)

Table 5.10 gives information on teachers who had specific responsibility for computers and/or the Internet in their school. A high percentage of the participants (75%) were either the designated ICT teacher, the person responsible for ICT, or a member of the school's ICT Committee. This involved comparatively fewer women than male teachers. The nature of their responsibility included strategic planning, the maintenance of hardware, the purchasing of software, the control of Internet access, the oversight of the network, the preparation of the technology budget, the update of the equipment inventory, and the delivery of ICT professional development. Notably, most of the teachers (n=9) without any specific responsibility in the ICT area worked at the lower or middle school.

The percentage of teachers who had completed a formal course or tertiary qualification on the use of computers in education is shown in Table 5.11. The majority of teachers (80%) had completed such a course or tertiary qualification. Comparatively, a higher percentage of women than male teachers had participated in some formal education in this area. It was also noteworthy that 93% of those teachers at the senior or intermediate level had completed some formal study. This meant that most of the teachers (n=9) without a formal course or tertiary qualification in educational computing taught at either the lower or middle school.

Table 5.11
Percentage of Teachers who have Completed a Formal ICT Course or Tertiary Qualification

Question	Yes %			No %		
	Female	Male	All	Female	Male	All
Have you ever completed a formal course or tertiary qualification on the use of computers in education?	86 (n=30)	71 (n=15)	80 (n=45)	14 (n=5)	29 (n=6)	20 (n=11)

The most common type of formal study was either a course within a higher diploma of teaching (n=9) or a paper toward an undergraduate university degree (n=18). Other type of study included the completion of courses in the area of information literacy (n=7) and work toward a specialised educational computing diploma (n=3). Several participants (n=11) were currently enrolled in a formal undergraduate or postgraduate ICT-related qualification.

In addition, a number of teachers (n=12) reported that they had attended other types of non-formal training related to computers, but not directly linked to the use of ICT and the Internet in education. The main type of non-formal training was at polytechnic or evening school classes where the focus was on learning computer applications for personal use (e.g., Excel and Outlook).

Table 5.12
Percentage of Teachers who have Participated in Internet-related Professional Development

Question	Yes %			No %		
	Female	Male	All	Female	Male	All
Have you attended in the last two years any type of professional development on the use of the Internet in education?	71 (n=25)	57 (n=12)	66 (n=37)	29 (n=10)	43 (n=9)	34 (n=19)
Have you ever been involved in the formal training of other teachers on the use of Internet in education?	51 (n=18)	76 (n=16)	61 (n=34)	49 (n=17)	24 (n=5)	39 (n=22)

Table 5.12 presents data on the percentage of teachers having recently participated in some type of professional development along with those involved in teaching other teachers on the use of the Internet in education.

The majority of teachers (66%) had received some type of professional development on the use of the Internet within the last two years. Responses indicated that men were less likely to have participated in internet-related professional development than women but the gender difference was not significant ($p > .05$). Teachers working in the middle and senior school completed most of the professional development. Some of the teachers (n=19) had participated in regional and school-based inservice professional development courses offered by the local ICT Advisor. A sizeable number (n=23) indicated they had received professional development from other staff and schools. This also included professional development by people outside of the region with known expertise in areas such as networking and information literacy. A few teachers (n=12) had received training during a *Telecom New Zealand* sponsored workshop.

More than half the teachers (61%) had been formally involved in teaching other teachers how to use the Internet for educational purposes. This typically involved running after-school courses and training for teachers on specific internet-related applications. These "hands on" and "in-house" training courses had both personal and professional outcomes. The most common outcomes in order of frequency were learning to: (a) use email, (b) send email attachments, (c) operate Internet search engines, (d) download files and pictures from the Web, (e) understand the functionality of the network, (f) insert and manipulate images from a digital camera, and (g) design and construct web pages.

Table 5.13 shows that the majority of teachers (77%) were using the Internet for their own professional development. An important aspect of this was locating and researching information on the Web to support formal study. While overall men report they are making more use of the Internet, this was not significant ($p > .05$) and a higher percentage of women at all levels were accessing online professional development resources for this purpose.

Table 5.13
Percentage of Teachers who use the Internet for Professional Development

Question	Yes %			No %		
	Female	Male	All	Female	Male	All
Do you use the Internet for your own professional development?	71 (n=25)	86 (n=18)	77 (n=43)	29 (n=10)	14 (n=3)	23 (n=13)

In total, teachers report a mean of 2.69 hours of Internet related professional development over the last 12 months. There was, however, a wide response from the nominated proficient internet-using teachers to this question, ranging from zero to more than 25 hours. This variation probably reflects a broad interpretation of professional development. It was likely that some teachers may have underestimated the extent of their informal professional development—that is, advice from colleagues and teachers' *just-in-time* learning.

Table 5.14
Percentage of Teachers who Provide Support for Informal Professional Learning

Question	% Never	% Some Weeks	% Most Weeks	% Every Week	% Most Days	% Every Day
How often do you have informal discussions with colleagues where you offer advice about using the Internet for learning and teaching?	7 (n=4)	27 (n=15)	35 (n=20)	25 (n=14)	4 (n=2)	2 (n=1)
How often do you provide informal or impromptu technical support for other staff who are trying to use the Internet?	5 (n=3)	64 (n=36)	18 (n=10)	7 (n=4)	4 (n=2)	2 (n=1)

The frequency of support for informal professional learning, both technical and pedagogical, is presented in Table 5.14. Notably, the majority of teachers (60%) engaged most weeks or every week in some type of informal discussion with colleagues on the use of the Internet for learning and teaching. However, 6% only provide this type of support most days or every day. The frequency of informal pedagogical advice is similar for both men and women. On other hand, the majority of teachers (66%) who provide most days or every day impromptu technical support are younger males. It was also noteworthy that comparatively few teachers (25%) provide most weeks or every week informal technical support for their colleagues.

Table 5.15
Perceived Level of Support for Using the Internet within their Teaching

Question	% Poor	% Adequate	% Good	% Very Good	% Excellent
How would you describe the level of support you receive from other staff for using the Internet within your teaching?	18 (n=10)	46 (n=26)	21 (n=12)	14 (n=8)	0 (n=0)
How would you describe the level of support you receive from the Principal and BOTs for using the Internet within your teaching?	18 (n=10)	30 (n=17)	32 (n=18)	16 (n=9)	4 (n=2)

Table 5.15 indicates the level of support nominated proficient internet-using teachers perceived from their colleagues and senior management. Few teachers (35%) considered they receive good or very good support from other staff. Most teachers who report poor levels of support for using the Internet within their teaching were male (n=7). Just over half of the teachers (52%) perceive they receive good, very good or excellent support from the principal and Board of Trustees. Nevertheless, a sizeable group of teachers (n=27) reported that the level of support was poor or adequate. Notably, school decile (r = .1.7) and years of teaching experience (r = -.2.2) were not determinant factors in the perception of support based on the conventional level of significance (p <.05) derived from a Pearson product-moment correlation coefficient. Again, male teachers were over represented in this group and they generally perceived less support than their female colleagues.

Table 5.16
Percentage of Teachers who Participate in Non Formal Professional Learning

Question	Yes %			No %		
	Female	Male	All	Female	Male	All
Have you ever been a member of a computer club or professional association?	17 (n=6)	48 (n=10)	29 (n=16)	83 (n=29)	52 (n=11)	71 (n=40)
Have you attended a conference, given a presentation or conducted a workshop the use of the Internet in education?	31 (n=11)	52 (n=11)	39 (n=22)	69 (n=24)	48 (n=10)	61 (n=34)
Do you or your school subscribe to any journals, magazines or online discussion groups on the use of computers in education?	37 (n=13)	62 (n=13)	46 (n=26)	63 (n=22)	38 (n=8)	54 (n=30)

The percentage of teachers who participate in non-formal professional learning related to educational technologies is shown in Table 5.16.

While the majority of teachers (71%) have never been a member of a computer club or professional association, nearly half of all men (48%) have been involved in such an activity. In comparison, 17% of women have participated in a club or association. All of these women (n=6) work at the senior school or intermediate level. The most common membership was participation at the local Apple Users Group, Computers in Education Society or Information Technology Teacher Network. Although most of these groups were now inactive, an informal meeting of ICT teachers was being reestablished in one region. In addition, one teacher was a member of an Australian professional association for computer educators and two people were individual members of the International Society for Technology in Education (ISTE).

Overall, a minority of teachers (39%) had attended an internet-related educational conference. Notably, 52% of men had participated at a conference with an Internet theme. Moreover, several teachers (n=4) had been involved in giving a presentation or workshop at a conference, which addressed the role of the Internet in education. Typically, these presentations were at conferences hosted by well-known national computer hardware suppliers.

The majority of teachers or schools (54%) did not subscribe to any journals, magazines or online discussion groups devoted to using computers in education. All the same, the majority of male teachers (52%) did with the most common subscription (n=9) to the journal *Computers in New Zealand Schools.* Three teachers singled out this publication as their best source of professional reading, and the Web was mentioned in this context as another valuable mine of information.

In addition, a number of teachers (n=7) subscribed to the *New Zealand Computers in Education (NZCompEd)* Listserv and several people (n=5) stated that they received newsletters and/or updates on ICT related topics via email. Lastly, three teachers received journal and magazine publications as part of their membership of an international association. In a similar vein, two people referred to the *Journal of Educational Leadership* as a good source of technology-related publications.

Table 5.17 presents data on the teachers perceived technical and pedagogical skill, knowledge and experience in relation to computers and the Internet. The majority of teachers (75%) perceived their technical skill and knowledge as accomplished or expert in relation to computers. Significantly, one teacher only considered their computer skill and knowledge to be less than proficient. In contrast, 22% of teachers perceived their Internet technical skill and knowledge to be accomplished or expert. However, the majority of teachers (59%) report proficient technical know-how in terms of using the Internet.

Table 5.17
Teachers Perceived Technical and Pedagogical Skill, Knowledge and Experience

Question	% Novice	% Emerging	% Proficient	% Accomplished	% Expert
How would you rate your technical skills and knowledge in relation to computers?	0 (n=0)	2 (n=1)	16 (n=9)	57 (n=32)	18 (n=10)
How would you rate your technical skills and knowledge in relation to the Internet?	3 (n=2)	16 (n=9)	59 (n=33)	20 (n=11)	2 (n=1)
How would you rate your level of teaching experience at using computers in the classroom?	0 (n=0)	7 (n=4)	25 (n=14)	61 (n=34)	7 (n=4)
How would you rate your level of teaching experience at using the Internet in the classroom?	5 (n=3)	43 (n=24)	43 (n=24)	9 (n=5)	0 (n=0)

In terms of using computers in the classroom, 93% of teachers considered themselves to be either proficient, accomplished or expert. The remaining teachers (n=4) reported their experience within the emergent category. Significantly, there were no novice computer-using teachers within the sample. On the other hand, 48% of the sample reported their teaching experience with the Internet in the classroom as novice or emerging. Nevertheless, the majority of teachers (52%) was at the proficient and accomplished level. There were no internet-using teachers within the expert category.

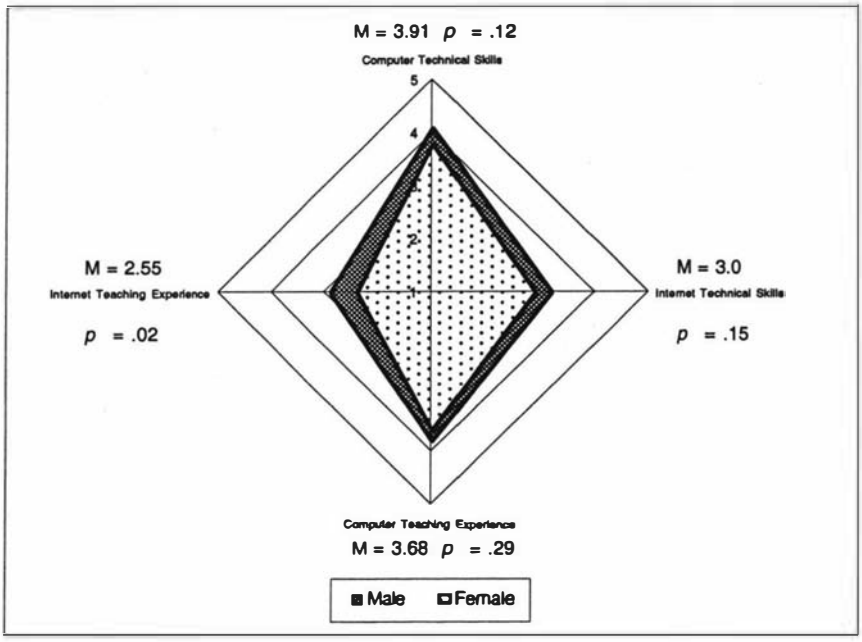

Figure 5.5 Profile of teachers' technical skill and pedagogical knowledge and experience by gender

Note: The level of significance is shown by the probability *(p)* values derived from a homoscedastic *t-test.*

Figure 5.5 shows the mean responses to the aforementioned questions by gender and presents these data as a multi dimensional profile of the teachers' technical skill and pedagogical knowledge and experience. On a five-point scale, in which one represents the novice category, male teachers self-report at a consistently higher level than women. In terms of internet technical know-how, for example, the mean for women was 2.9 as opposed to 3.2 for male teachers. Similarly, the mean teaching experience for women at using the Internet in the classroom was 2.37 with 2.86 for men and a significant degree of probability (p =.02) based on the conventional level of significance. However, these data must be interpreted with caution, as there remain a number of potential covariates.

Table 5.18
Teachers Perceived Knowledge of Current ICT Developments within New Zealand

Question	% Poor	% Adequate	% Good	% Very Good	% Excellent
How would you rate your current knowledge of recent ICT developments within New Zealand?	0 (n=0)	7 (n=4)	29 (n=16)	55 (n=31)	9 (n=5)

Table 5.18 indicates that the sample of proficient internet-using teachers was reasonably conversant with recent ICT developments in New Zealand. Almost all teachers (93%) reported their knowledge of recent developments as good or better. However, it was noteworthy that most of the teachers (n=4) who report excellent knowledge were younger women and those with adequate knowledge were predominantly men (n=3). These data are in contrast with the overall technical and pedagogical profile of the sample of nominated proficient internet-using teachers.

In sum, an analysis of data shows an interwoven relationship between gender, teaching experience, personal Internet access, number of years using the Internet and the teachers' perceived technical and pedagogical skill, knowledge and experience. Overall, male teachers report more teaching experience, more years using the Internet, higher levels of personal Internet access, and greater technical and pedagogical expertise. Although these gender differences should be interpreted with caution, as they are potentially influenced by a number of covariates, the results paint a picture of a sample of more skilled, knowledgeable and experienced internet-using male teachers.

5.3 USE OF INTERNET FOR LEARNING AND TEACHING

This section focuses more specifically on the use of the Internet for learning and teaching. It presents data pertaining to the research question: How do teachers use the Internet for learning and teaching?

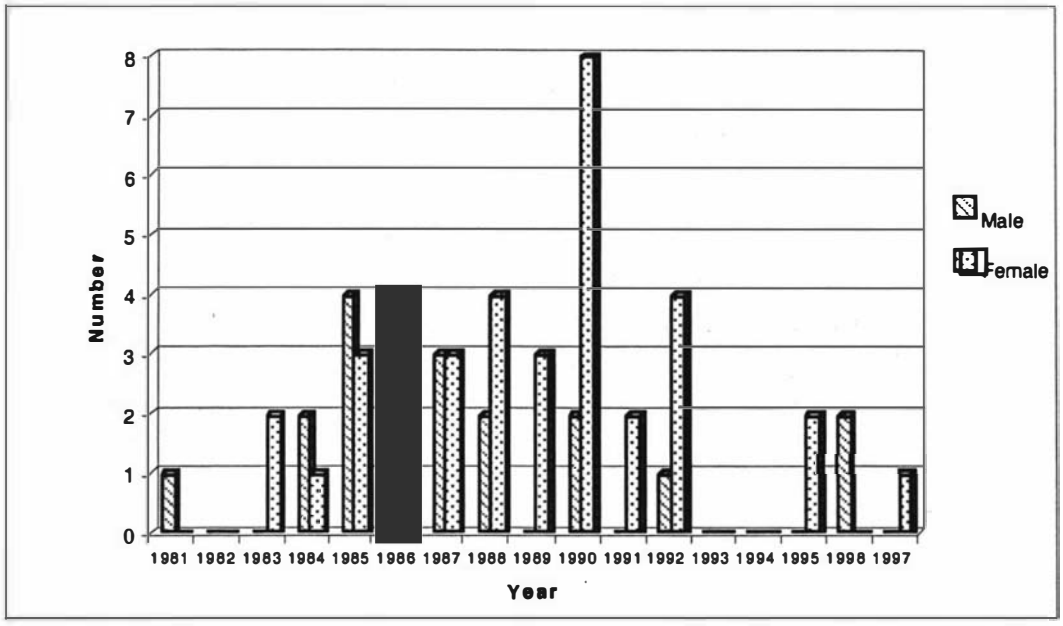

Figure 5.6 Year teachers first used a computer to support their teaching by gender

Figure 5.6 reports the year that teachers first used a computer to support their teaching. As a group, the teachers had been using a computer in their teaching for a considerable number of years. On average, male teachers (1987) had started teaching with computers two years earlier than women (1989). This difference is consistent with the fact that the men have more years of teaching experience than their female colleagues. Once again, these data confirm that the sample was a group of highly experienced computer-using teachers.

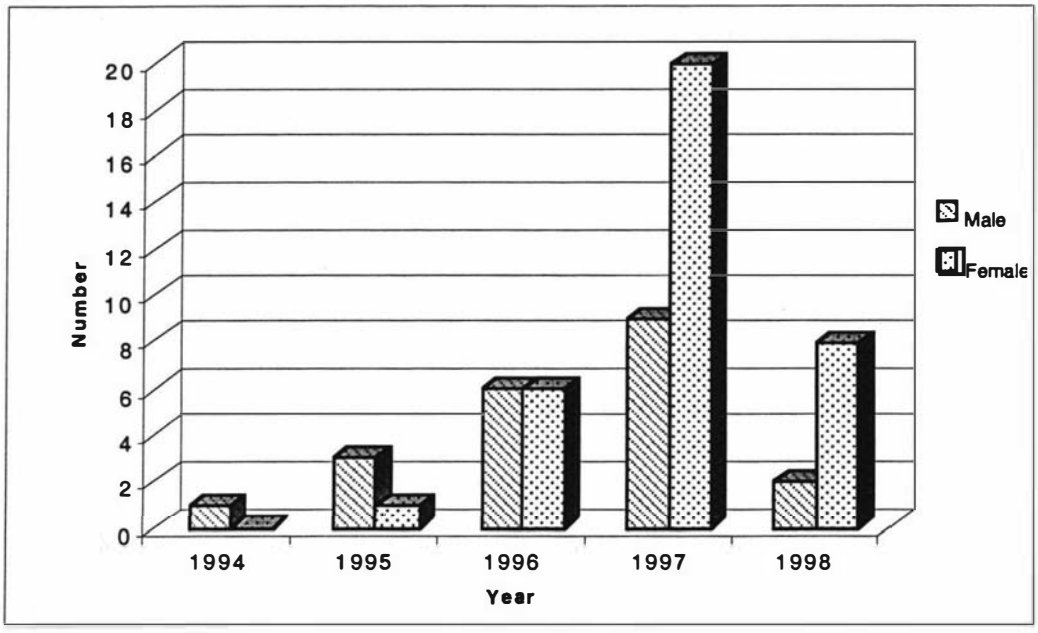

Figure 5.7 Year teachers first used the Internet to support their teaching by gender

The year that teachers first used the Internet to support their teaching is shown in Figure 5.7. For most people, the Internet was still an innovation in education. It was first used in 1994 and it was not until 1997 that the majority of the participants (52%) began experimenting with the Web in their teaching. At the time of Phase One, most of the teachers (82%) had been using the Internet in their teaching in some capacity for at least two years. There was a tendency for men to have first started teaching with the Internet earlier than women.

Table 5.19 shows the percentage of students (and teachers) with access to the Internet by level and type of connectivity. The minority of students (27%) had direct access to the Internet in their classroom. Access was usually limited to a single computer and it was most common within the senior school. At the intermediate level, there were, however, three full-time ICT teachers with a classroom of networked computers.

It was quite common for students to have access to the Internet in a school computer suite. Indeed, most students (52%) had this type of access but the Internet was not always available on all machines. Typically, it could be accessed from one or two machines within a suite of between three and 12 computers. The mean number of computers in each suite was seven. The concept of a "mini lab" was quite new and for some teachers (n=8) this was their first year of using such a facility.

Table 5.19
Percentage of Students with Access to the Internet by Level

Question	% Lower	% Middle	% Senior	% Intermediate	% All Teachers
Do children have regular access to the Internet in the classroom?	20 (n=1)	14 (n=3)	32 (n=8)	60 (n=3)	27 (n=15)
Do children have access to the Internet in a school computer suite?	20 (n=1)	38 (n=8)	60 (n=15)	100 (n=5)	52 (n=29)
Do children have access to the Internet in the school library?	60 (n=5)	76 (n=16)	80 (n=20)	40 (n=2)	73 (n=41)
Does your school have an intranet network between classrooms?	20 (n=1)	38 (n=8)	44 (n=11)	40 (n=2)	39 (n=22)

The majority of students (73%) could access the Internet from within the school library. This was by far the most common method of access. However, access was restricted to a dial up connection using one or two Internet enabled computers. Several teachers indicated that the current priority was to give teachers access before allowing students to use the Internet safely.

Some schools (39%) had an intranet between classrooms and a number of teachers (n=18) reported that Internet access was available from a central computer within the school administration. It would appear from the responses that it was common for Internet access to have originated as a dial up connection in the school administration block, and then for it to have migrated to the lab, library, and classroom.

An analysis of Internet access and type of connection by decile showed no significant difference from the aggregated sample ($p > .05$). The average decile for schools with Internet access in the lab (M=6.35), library (M=6.17), and classroom (M=6.0) was similar to the sample mean presented in Table 5.8. Lack of significant deviation from the mean indicates that school decile was not a determinant variable in the type of Internet access.

Table 5.20
Frequency of Internet Use by Teachers to Support Student Learning by Level

Question	% Never	% Some Weeks	% Most Weeks	% Every Week	% Most Days	% Every Day
Lower School	80 (n=4)	20 (n=1)	0 (n=0)	0 (n=0)	0 (n=0)	0 (n=0)
Middle School	57 (n=12)	33 (n=7)	5 (n=1)	5 (n=1)	0 (n=0)	0 (n=0)
Senior School	44 (n=11)	32 (n=8)	12 (n=3)	8 (n=2)	4 (n=1)	0 (n=0)
Intermediate School	20 (n=1)	40 (n=2)	20 (n=1)	0 (n=0)	20 (n=1)	0 (n=0)
All Teachers	50 (n=28)	32 (n=18)	9 (n=5)	5 (n=3)	4 (n=2)	0 (n=0)

Table 5.20 presents frequency data on how often teachers use the Internet with students to support their learning. Notably, two teachers report that students use the Internet most days and no one was using it every day. In total, 9% of teachers require students to use the Internet every week. Conversely, half the teachers (50%) were not using the Internet with their students. Most frequent use was in the senior and intermediate school, which significantly correlated ($r = .39$ / $p < .01$) with the level of classroom Internet access. Of those teachers (n=28) who were using the Internet, 55% were men and 45% were women.

When these teachers were asked how many hours in total students had actually used the Internet the previous week, the mean was less than 90 minutes. Of course, data were based on the teachers' best estimate. Their response, nevertheless, equates to approximately three minutes per pupil in a typical class of 30 students. It was probable that more than one student was using the Internet at the same time.

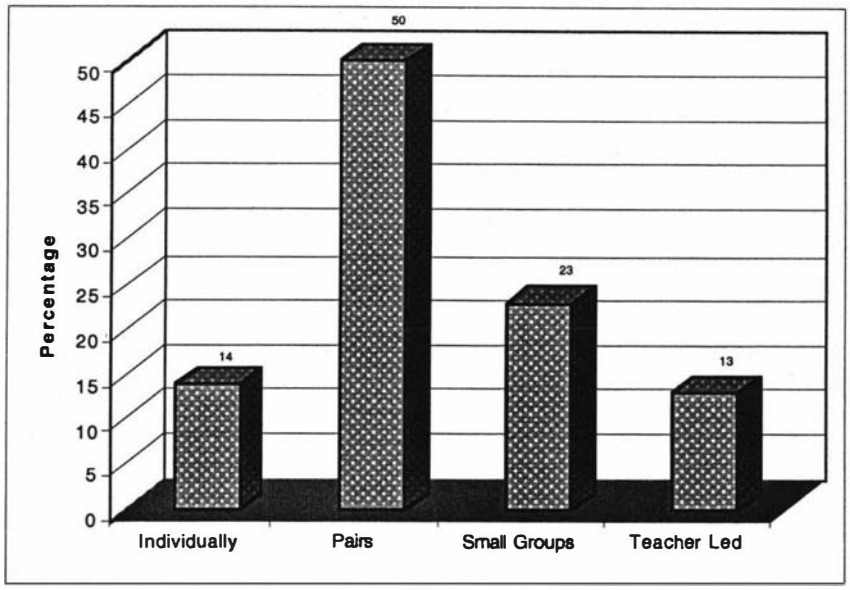

Figure 5.8 Mean percentage of time students use the Internet by instructional technique

Figure 5.8 indicates the instructional techniques that teachers employ when students in their class use the Internet. The majority of students (73%) work in pairs or small groups. Notably, there was little difference in the instructional technique employed by men and women. There was a tendency, however, for less small group work at the senior school and intermediate level.

Table 5.21
Teachers with a Method or System of Managing Student Internet Access by Level

Question	% Yes Lower	% Yes Middle	% Yes Senior	% Yes Intermediate	% Yes All Teachers
Do you have a method or system to manage the type of access children have to the Internet?	2 (n=1)	18 (n=10)	27 (n=15)	7 (n=4)	54 (n=30)
Do you have a procedure or written policy to ensure Internet safety?	2 (n=1)	18 (n=7)	27 (n=11)	7 (n=2)	37 (n=21)

The percentage of teachers with a method and/or policy to manage student Internet access is reported in Table 5.21. Despite the relatively infrequent use of the Internet by students, the majority of teachers (54%) report they have a management system. The most common system involves supervised access to the Internet when going online is part of the regular classroom programme. Responses indicate that this typically occurs during scheduled class visits to the library or computer suite. It was less common for teachers to have a procedure or written policy to ensure Internet safety. Indeed, most teachers and schools (63%) did not have a formal policy.

Table 5.22 shows the level of restriction that nominated proficient internet-using teachers impose on student Internet access. For the majority of students (77%), Internet access is available under some or tightly restricted conditions.

Table 5.22
Percentage of Internet Access by Level of Restriction

Question	% Unrestricted	% Few Restrictions	% Some Restrictions	% Tight Restrictions	% Teacher Only
What type of access do children in your class have to the Internet?	2 (n=1)	21 (n=12)	54 (n=30)	23 (n=13)	0 (n=0)

Figure 5.9 depicts the extent to which teachers were using specific computer applications more or less frequently compared to three years ago. Although most teachers were using word processing (54%), educational games (57%) and drill and practice software (57%) to the same extent, it was noteworthy that 80% of the participants were making less or much less use of interactive fiction. Indeed, no teachers were using this type of software more than before. In a similar vein, the use of databases and spreadsheets was less common with 39% of teachers reporting less or much less use of these applications. Only 11% of teachers claimed that they were using data processing tools more frequently.

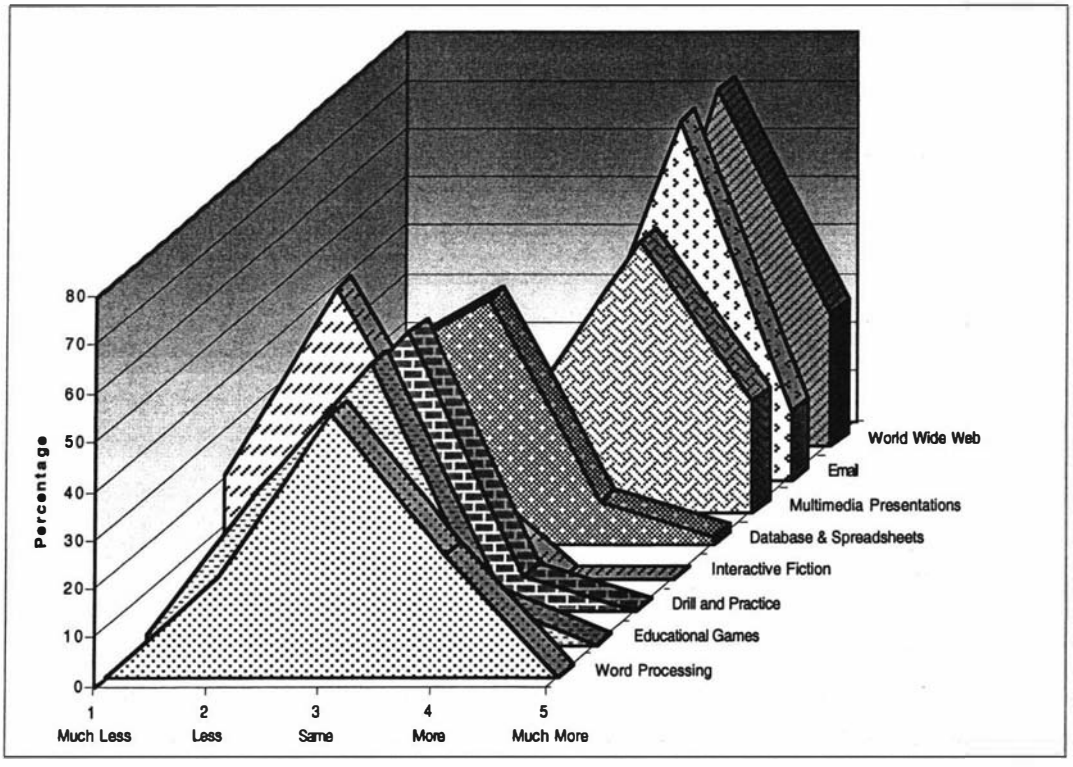

Figure 5.9 Frequency of computer use based on a three year comparison

It needs to be borne in mind that retrospective self-report data gives no indication of the extent or frequency with which teachers were previously using these applications. Nevertheless, the majority of teachers (78%) perceived that they were making more or much more use of multimedia presentations. There were no teachers using this software less than three years ago and Internet use had increased over this time. Indeed, 87% of teachers report more or much more use of email. All of the teachers were using the Web more than before.

Table 5.23
Frequency of Internet Applications used this Year by Students

Question	% Never	% Some Weeks	% Most Weeks	% Every Week
Electronic Mail	52 (n=29)	28 (n=16)	16 (n=9)	4 (n=2)
Web Page Browsing	41 (n=23)	36 (n=20)	16 (n=9)	7 (n=4)
Internet Search Engine	46 (n=26)	43 (n=24)	11 (n=6)	0 (n=0)
Internet Chat	95 (n=53)	5 (n=3)	0 (n=0)	0 (n=0)
Email Lists	91 (n=51)	9 (n=5)	0 (n=0)	0 (n=0)
Discussion Groups	98 (n=55)	2 (n=1)	0 (n=0)	0 (n=0)
Web Page Construction	89 (n=50)	9 (n=5)	2 (n=1)	0 (n=0)
FTP	98 (n=55)	2 (n=1)	0 (n=0)	0 (n=0)
Telnet	100 (n=56)	0 (n=0)	0 (n=0)	0 (n=0)

Table 5.23 presents data on the frequency that students had used different internet-related applications over the last year. The most frequently used internet application was web page browsing with 52% of teachers stating that their students engage in this activity either some weeks or most weeks. Notably, 7% of students use the Web every week. However, at least 40% of teachers do not anticipate using the Web or Internet search engines with their students. Moreover, few teachers (n=11) use email with students on a regular basis. Data indicate less than 10% of students use some of the more specialized internet applications, such as chat, email lists and discussion groups. In like manner, there was virtually no use of FTP and telnet and a minority of students (11%) engaged in web page construction.

In general, the frequency of Internet use was higher than that reported in Table 5.20. This was probably because these data included applications that were used, as well as those that were definitely planned for use during the year.

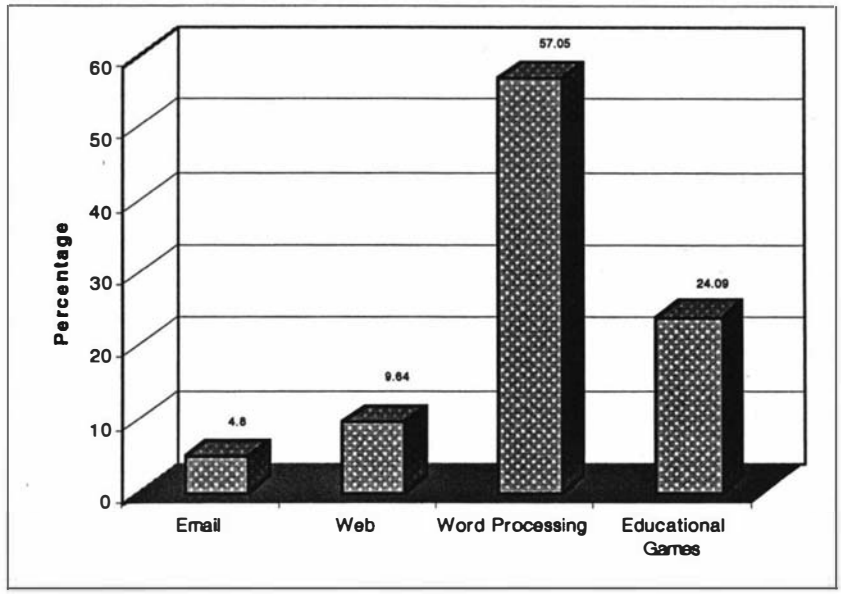

Figure 5.10 Mean percentage of computer time devoted by teachers to specific applications

Figure 5.10 shows the mean percentage of time devoted by teachers during a typical week to some of the main computer applications. Notably, most of the computer time was devoted to word processing (57%) and students were spending more time on educational games (24%) than the two combined internet-related applications. In other words, based on these data teachers were using the Internet for less than 15% of the available computer time.

Table 5.24
Mean Percentage of Computer Time Devoted by Teachers to Specific Applications by Level

Question	% Email	% Web	% Word Processing	% Educational Games
Lower School	1.7 (SD = 2.11)	6.3 (SD = 3.11)	64 (SD = 11.40)	25 (SD = 7.90)
Middle School	4.5 (SD = 3.41)	9.2 (SD = 8.01)	57 (SD = 11.34)	26 (SD = 10.76)
Senior School	5 (SD = 4.15)	9.6 (SD = 6.65)	57 (SD =8.77)	24 (SD = 10.13)
Intermediate School	8.2 (SD = 4.02)	15 (SD = 10.00)	61 (SD = 11.40)	16 (SD = 10.84)
All Teachers	4.8 (SD = 3.90)	9.6 (SD = 7.37)	57 (SD = 10.35)	24 (SD = 10.34)

Table 5.24 presents data on the mean percentage of time devoted by teachers to specific applications by level during a typical week. Comparatively, teachers at the intermediate level devoted a higher percentage of time to internet-related applications than their primary school colleagues. This was consistent with the results presented in Table 5.20. However, direct comparison of data was problematic because some of the participants at the intermediate level were specialist ICT teachers. Notably, at all levels, the most time was devoted to word processing. There was, nevertheless, a wide variance in teachers' responses to the percentage of computer time devoted to the more traditional applications. A further analysis of these data showed that this response was spread across a number of demographic variables.

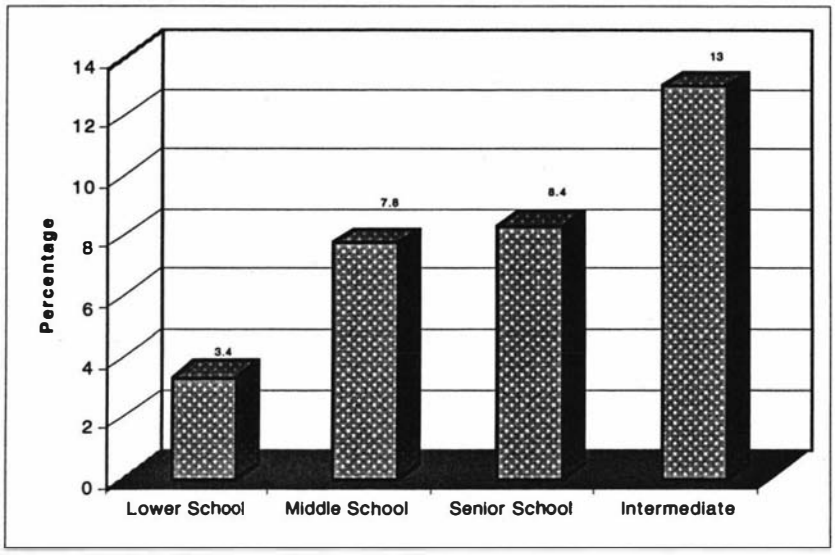

Figure 5.11 Mean percentage of classmates who use email per week by level

Figure 5.11 shows the mean percentage of students—that is, classmates—who use email per week in the teacher's class by level. Consistent with previous data, more students use email at the senior and intermediate levels. The overall mean was 8.12% (SD=6.76), which equates to less than three pupils per week using email within a typical class of 30 students. It was noteworthy that few teachers (n=9) had a dedicated email address for their class.

The mean percentage of students who use the Web weekly in the teacher's class by level is shown in Figure 5.12. Again, data suggest fewer students proportionately in the lower and middle school make use of the Web. Notably, at the intermediate level, 25% of students use the Web per week. There was, however, a wide variance of practice (SD=11.4) and this level of use no doubt reflects the specialist nature of ICT instruction by some of these intermediate teachers. When calculated on the overall mean (M=16.7%), data indicate relatively few students use the Web per week within a typical class.

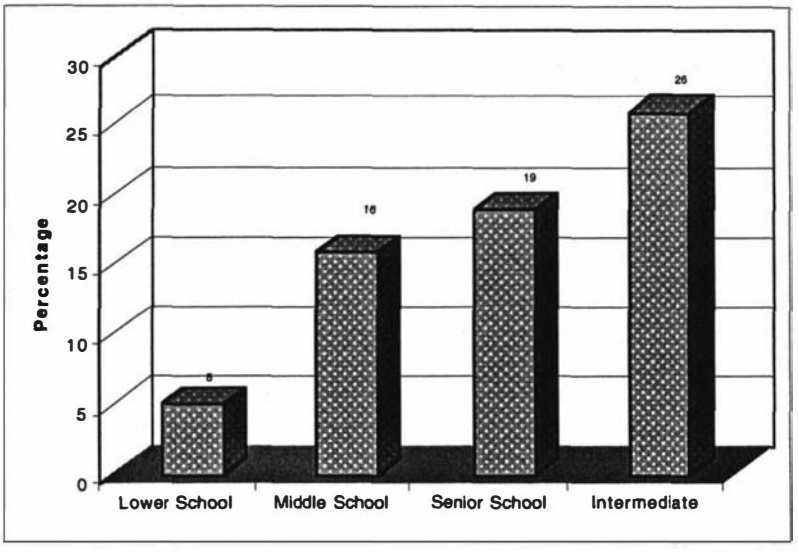

Figure 5.12 Mean percentage of classmates who use the Web per week by level

The number of days that teachers devote to specific internet-related learning experiences in their class is shown in Table 5.25. In 1999, students (and teachers) spent more days using the Internet for information searches than any other activity. The majority of teachers (54%) report having used the Internet in this way. However, few teachers (n=10) devoted more than six days to learning experiences requiring such information searches. It was noteworthy that more days were devoted to travel buddies and key/pen pal exchanges than any other internet-related experience. Indeed, several teachers (n=5) and presumably their students had participated in a travel buddy experience for more than 25 days. The time devoted to travel buddies by some teachers was corroborated by their description of the most innovative or successful Internet learning experience. As one teacher wrote:

> *The only thing that has been worth the time and effort so far is our travel bear. This didn't fall flat or disappoint the kids like some of the other things we have tried... It was an exciting and innovative experience for the kids.*

A few teachers had entered an Internet competition (n=7) while several other participants had attempted a virtual field trip (n=8) over an extended period. Likewise, some teachers (n=6) had participated in a social action project. Notably, few teachers (12%) had experience that encompassed the electronic publishing of material on the Web itself.

It was evident from the responses that some teachers were unfamiliar with terminology used to describe the full range of internet-related learning experiences. Thus, these responses were problematic—however, this observation also corroborates the minimal use of many potential internet-related learning experiences. After all, teachers using one of these learning experiences should have been at least aware of common internet-related terminology.

Table 5.25
Number of Days Devoted to Specific Internet-related Learning Experiences in the last 12 Months

Question	% 0 Days	% 1-5 Days	% 6-14 Days	% 15-24 Days	% 25+ Days
Web Quests	68	20	9	3	0
Information Searches	46	26	18	10	0
Internet Investigations	48	30	17	5	0
Information Exchanges	50	43	7	0	0
Key/Pen Pal Exchanges	54	22	13	9	2
Ask an Expert	88	9	3	0	0
Electronic Guests	89	11	0	0	0
Virtual Field Trips	73	13	9	5	0
Online Adventures	78	19	3	0	0
Internet Competitions	88	0	12	0	0
Sequential Stories	93	7	0	0	0
Electronic Publishing	88	3	9	0	0
Author Book Raps	93	0	7	0	0
Travel Buddies	82	2	2	5	9
Social Action Projects	89	4	7	0	0

While some teachers had attempted a variety of innovative Internet-related learning experiences, they were either critical of, or silent about, their success. When asked to describe their most successful experience, few teachers (n=11) responded and those who did were generally restrained in their enthusiasm for the Internet, and self-critical about the extent of their success. Indeed, none of the participants reported an unreservedly positive experience. The following response reflects the general sentiment:

> *We are still experimenting at the moment and I haven't got it to work yet. The children have tried a few things but there are still heaps of problems to sort out. It's hard to get access and you sometimes rely on other people. Our enthusiasm has not always matched the reality.*

The lack of success in integrating the Internet into the curriculum is shown in Table 5.26. Notably, few participants (n=4) rated their success as good or better and these teachers were all men.

Table 5.26
Perceived Success of Integrating the Internet into the Curriculum

Question	% Excellent	% Very Good	% Good	% Adequate	% Poor
How would you rate your success at integrating the Internet into the school curriculum?	0 (n=0)	2 (n=1)	5 (n=5)	41 (n=23)	52 (n=29)

Teachers were asked to list in order the three main Essential Learning Areas where the Internet was being used for learning and teaching. The main area was Language. This was the most common response from 65% of teachers who were actually using the Internet with their students. The next most common area was Social Studies. A number of participants (n=12) indicated they were using the Internet to supplement the study of current events. Science was also singled out by some teachers (n=6). From the list of the most popular web sites, it would appear the Internet was predominantly used as an online encyclopedia. As one teacher described the virtues of the Internet:

It is great for downloading real time information and pictures.

Table 5.27 reports the percentage of teachers who use the Internet for lesson planning and preparation. The majority of teachers (84%) utilize the Internet in this way but very few do so every week. Notably, data suggest more women (71%) than men (62%) access the Internet for this purpose.

Table 5.27
Percentage of Teachers who use the Internet for Lesson Planning and Preparation

Question	% Never	% Some Weeks	% Most Week	% Every Week	% Most Day
How often do you use the Internet in lesson planning and preparation?	16 (n=4)	36 (n=20)	36 (n=20)	13 (n=7)	0 (n=0)

The percentage of schools with an Internet homepage is shown in Table 5.28. Data indicate that the majority of schools (52%) had their own website. Further analysis showed that schools with an Internet homepage were of a higher decile (M=6.89) than those without any web presence (M=5.51) with a significant level of probability (p <.001).

Table 5.28
Percentage of Schools with an Internet Homepage

Question	% Yes	% No
Does your class or school have an Internet homepage?	52 (n=29)	48 (n=27)

In sum, the sample consisted of an experienced group of computer-using teachers. The Internet was still relatively new to them, which was reflected in the low level of use and the wide range of teaching practice. Despite limited access to the Internet in the classroom itself, some teachers had attempted a variety of internet-related learning experiences. In comparison to traditional computer applications however, teachers were making minimal use of both email and the Web for learning and teaching. Overall, the most frequent use of the Internet was at the senior school and intermediate level.

5.4 APPROACH TO TEACHING WITH THE INTERNET

This section reports data on the pedagogical approach that teachers adopt and their perceptions and underlying philosophical beliefs about learning and teaching, and the Internet. It relates to the following research questions: What perceptions and beliefs do internet-using teachers have about the learning and teaching process? What changes to their practice and work culture do teachers report from using the Internet for learning and teaching? What perceptions and beliefs do teachers have of how the Internet supports the learning and teaching process?

Table 5.29
Perceived Approach to Teaching with the Internet

Question	% Instructor	% Manager	% Coach	% Guide	% Facilitator
Which one of the following terms best describes your current approach to teaching with the Internet?	13 (n=7)	13 (n=7)	7 (n=4)	37 (n=21)	30 (n=17)

Table 5.29 reports the metaphor that teachers' perceive best describes their approach to teaching with the Internet. The most common term was Guide, which was selected by 37% of teachers. This term was then followed by Facilitator (30%). Few teachers (n=4) perceived they were a Coach when teaching with the Internet. Proportionally, older male teachers selected the terms Instructor (n=4) and Manager (n=4) more often than women.

When asked to describe their teaching philosophy, those teachers who obliged (n=42) provided a wide range of responses. A summary of selected responses is presented in Table 5.30 under the aforementioned metaphors used by teachers to describe their pedagogical approach. In other words, these terms were used to categorize the responses. While the philosophy statements did not strictly fit a simplistic continuum from teacher-centred to learner-centred methods of instruction, the classification technique helps to amplify how at least some teachers had interpreted these terms.

Table 5.30
Description of Teaching Philosophy by Metaphor

TEACHING PHILOSOPHY	
Descriptor	Comments
Instructor	"I believe my job is to teach the children. I am strong on them learning and I expect the kids to learn. I'm the boss but I always try to create a collaborative environment of mutual respect." "My philosophy is quite old school. I see myself as the teacher and whilst you can have a lot of fun you also have a responsibility to teach. It's a case of establishing clear boundaries." "Probably more teacher-centred these days. I work in a difficult school and you have to maintain your discipline with these children. It depends on the situation."
Manager	"I know that I've changed over the years and I now like to manage the learning environment. You have to set the rules and decide on what you expect the children to learn. Yes I manage the curriculum." "I selected manager because I think a lot of teachers fool themselves by adopting learner centered ways of teaching when in fact they're not. At the end of the day I'm responsible for managing the classroom." "I suppose conductor is the best word to describe my philosophy. I like to manage the learning environment so the kids learn effectively and efficiently."
Coach	"I have a very clear philosophy and I see myself like a coach who provides the training and the game plan. Then the children have the responsibility to implement the plan." "I like to think of myself as a coach. I have more knowledge than the children do and they have to learn from me but I can only do so much for them. They need me and I can't do my job without their support." "I think you have to maintain a balance between having control and giving control to the children. There is no simple answer and my approach changes according to the circumstances."
Guide	"I see myself as a guide on the side rather than sage on the stage. My role is to guide their learning and help the children to construct their own learning." "My philosophy is based on supporting the kids rather than telling them what to learn. I like to create a safe and happy classroom where the children can learn according to their own learning style." "I"m definitely a guide. I don't like telling the children or taking over their work like some people. Telling them is NOT teaching! They should see me as the best supporter of their work."
Facilitator	"It is my job to facilitate the children's learning. I've always believed this and that is how I teach in my classroom. We have a lot of fun!" "I'm a facilitator of learning not a manager. I like to identify the individual's learning style and facilitate their learning so that they can achieve their potential." "My philosophy is very much constructivist. We facilitate their learning and learn with the kids at the same time. The children should be in control of their own learning."

Table 5.31 describes the teachers' perceived instructional orientation toward learning as a product and/or process. It shows that the majority of teachers (62%) like to explain new concepts and provide students with appropriate practice. In a similar vein, 64% of participants claim that they ensure students learn correct answers and facts related to the curriculum.

Table 5.31
Perceived Instructional Orientation Toward Learning as a Product and/or Process

Statement	% Strongly Agree	% Agree	% Not Sure	% Disagree	% Strongly Disagree
I usually explain the concept and then give lots of specific practice in my teaching.	21 (n=12)	41 (n=23)	27 (n=15)	10 (n=6)	0 (n=0)
I use real problems with no easy solution for children to research in my teaching.	16 (n=9)	41 (n=23)	36 (n=20)	7 (n=4)	0 (n=0)
I ensure children learn correct answers and facts related to the curriculum in my teaching.	25 (n=14)	39 (n=22)	10 (n=6)	25 (n=14)	0 (n=0)
I prefer active learning experiences likes debates, projects and investigations in my teaching.	14 (n=8)	34 (n=19)	38 (n=21)	14 (n=8)	0 (n=0)

Conversely, most of the teachers (57%) perceived that they use real problems with no easy solutions in their teaching. Also nearly half of the participants (48%) claim to prefer active learning experiences, which involve debates, projects and investigations. None of the participants strongly disagree with any of these statements.

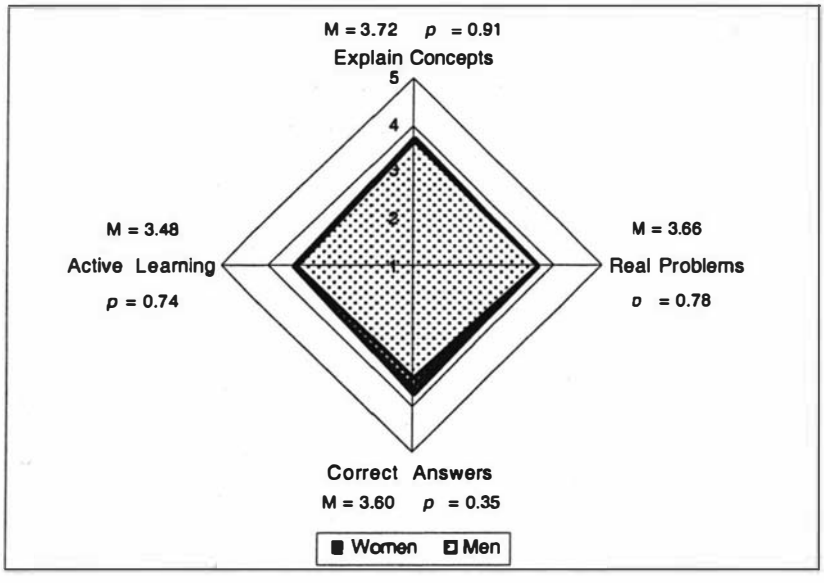

Figure 5.13 Profile of instructional orientation to learning as a product and/or process by gender

Note: The level of significance is shown by the probability *(p)* values derived from a homoscedastic *t-test*.

Figure 5.13 presents a multi dimensional profile of the teachers' perceived instructional orientation toward learning as a product and/or process by gender. On a five-point scale, in which five represents the strongly agree category, there was no significant difference between the profile of men and women on these dimensions (p >.05). As the Figure shows, the mean response to each statement was remarkably similar and the degree of probability is well above the conventional level of significance. In terms of active learning experiences, for example, the mean for women was 3.51 as opposed to 3.42 for male teachers. Similarly, the mean for correct answers for females was 3.71 whereas 3.42 for men.

Table 5.32
Perceived Level of Self-Reflection and Educational Critique

Statement	% Strongly Agree	% Agree	% Not Sure	% Disagree	% Strongly Disagree
I am committed to deeply reflecting on the quality of my teaching.	30 (n=17)	63 (n=35)	7 (n=4)	0 (n=0)	0 (n=0)
I often question how the use of the Internet is enhancing my teaching.	9 (n=5)	14 (n=8)	34 (n=19)	32 (n=18)	10 (n=6)

Table 5.32 reports the extent to which teachers perceive they reflect on their own teaching and question the use of the Internet in schools. It was noteworthy that 97% of the teachers agree with the statement that they are deeply committed to reflecting on the quality of their teaching. Significantly, no one disagrees with this statement. However, a sizeable minority of teachers (42%) seldom questions how the use of new educational technologies is enhancing their teaching. Indeed, few of the participants (n=5) strongly agree with the relevant statement.

Table 5.33
Perceived Change to Teaching Philosophy by Age

Question	Yes %					No %				
	% 20-29	% 30-39	% 40-49	% 50-59	% All	% 20-29	% 30-39	% 40-49	% 50-59	% All
Has the advent of the Internet changed your teaching philosophy?	50 (n=4)	29 (n=4)	7 (n=2)	0 (n=0)	18 (n=10)	50 (n=4)	71 (n=10)	93 (n=25)	100 (n=7)	82 (n=46)

The extent to which the Internet has changed the teacher's philosophy is shown by age in Table 5.33. Notably, 82% of all teachers did not consider the Internet had changed their teaching philosophy. A higher proportion of younger teachers offered an affirmative response but as one teacher wrote:

I have not changed the way I drive just because I have a fancy new car.

Table 5.34 reports the perceived effect of the Internet on the teacher's way of teaching. Few teachers (n=15) reported that the Internet had positively affected their teaching. In this regard, the responses were consistent with the lack of change to teaching philosophy but unlike the previous table there was no obvious demographic pattern based on age.

Table 5.34
Perceived Effect of Internet on Way of Teaching

Statement	% Strongly Agree	% Agree	% Not Sure	% Disagree	% Strongly Disagree
I believe the Internet has positively affected my way of teaching.	7 (n=4)	20 (n=11)	68 (n=38)	5 (n=3)	0 (n=0)

The perceived categories of Internet implementation for learning and teaching adapted from Hadley and Sheingold's (1993) study of accomplished computer-using teachers are shown in Table 5.35. There was an even distribution of teachers within the Enthusiastic Beginner, Struggling Adopter and Committed Innovator categories. The majority, however, of Struggling Adopters were women (65%) and more of the Committed Innovators (n=10) were men. Similarly, the two Accomplished Achievers were also male teachers. Although women (n=3) outnumbered the men (n=2) in the Cautious Integrator category, the aforementioned gender preferences should be interpreted with caution. There is a conglomerate of potential covariates, as demonstrated by some of the most experienced internet-using teachers identifying with the Enthusiastic Beginner category.

Table 5.35
Perceived Categories of Experience at Implementing the Internet for Learning and Teaching

Question	% Enthusiastic Beginner	% Struggling Adopter	% Committed Innovator	% Accomplished Achiever	% Cautious Integrator
Which term best describes your experience at implementing the Internet for learning and teaching?	27 (n=15)	30 (n=17)	30 (n=17)	4 (n=2)	9 (n=5)

Table 5.36 reports the perceived enthusiasm of teachers for using the Internet in their teaching. Notably, 87% of teachers were enthusiastic toward the Internet. Although a minority of teachers (21%) strongly agreed with this statement, none of the participants expressed an unenthusiastic response.

Table 5.36
Perceived Enthusiasm for Using the Internet in Teaching

Statement	% Strongly Agree	% Agree	% Not Sure	% Disagree	% Strongly Disagree
I feel enthusiastic about using the Internet in my teaching.	21 (n=12)	66 (n=37)	13 (n=7)	0 (n=0)	0 (n=0)

Table 5.37
Perceived Confidence at Using the Internet for Learning and Teaching

Question	% Excellent	% Very Good	% Good	% Adequate	% Poor
How would you rate your level of confidence at using the Internet for learning and teaching?	11 (n=6)	25 (n=14)	46 (n=25)	18 (n=10)	2 (n=1)

The perceived confidence of teachers at using the Internet for learning and teaching is presented in Table 5.37. Notably, the majority of teachers (82%) were confident of their ability to use the Internet. In the excellent category, this included both men (n=4) and women (n=2) spanning a wide age range. Few participants (n=11) were less sure of their ability to use the Internet, and it was apparent from the responses that these teachers were not simply those with the least Internet experience.

Table 5.38
Perceived Knowledge of Teaching and Contemporary Learning Theory

Question	% Excellent	% Very Good	% Good	% Adequate	% Poor
How would you rate your current knowledge of teaching?	11 (n=6)	62 (n=35)	25 (n=14)	2 (n=1)	0 (n=0)
How would you rate your knowledge of contemporary learning theory?	9 (n=5)	32 (n=18)	55 (n=31)	4 (n=2)	0 (n=0)

Table 5.38 reports the teachers' perceived knowledge of teaching and contemporary learning theory. While one teacher reports adequate knowledge of teaching, the majority of participants (62%) perceived they had very good knowledge. Similarly, 87% of teachers had good or very good knowledge of contemporary learning theory. Two teachers reported adequate knowledge, but nearly 10% of the sample perceived they had an excellent understanding of learning theory.

Table 5.39
Perceived Knowledge of Learning and Teaching with Computers and the Internet

Question	% Excellent	% Very Good	% Good	% Adequate	% Poor
How would you rate your knowledge of learning and teaching in relation to computers?	39 (n=22)	34 (n=19)	27 (n=15)	0 (n=0)	0 (n=0)
How would you rate your knowledge of learning and teaching in relation to the Internet?	0 (n=0)	15 (n=8)	41 (n=23)	39 (n=22)	5 (n=3)

Teachers perceived knowledge in relation to learning and teaching with computers and the Internet is shown in Table 5.39. The majority of the teachers (73%) perceive they have very good or excellent knowledge of learning and teaching with computers. Notably, none of the participants reported an adequate or poor level of knowledge. Conversely, there were no teachers with an excellent knowledge of learning and teaching in relation to the Internet. Few teachers (n=8) had very good knowledge and 44% of the participants perceived their knowledge to be adequate or poor.

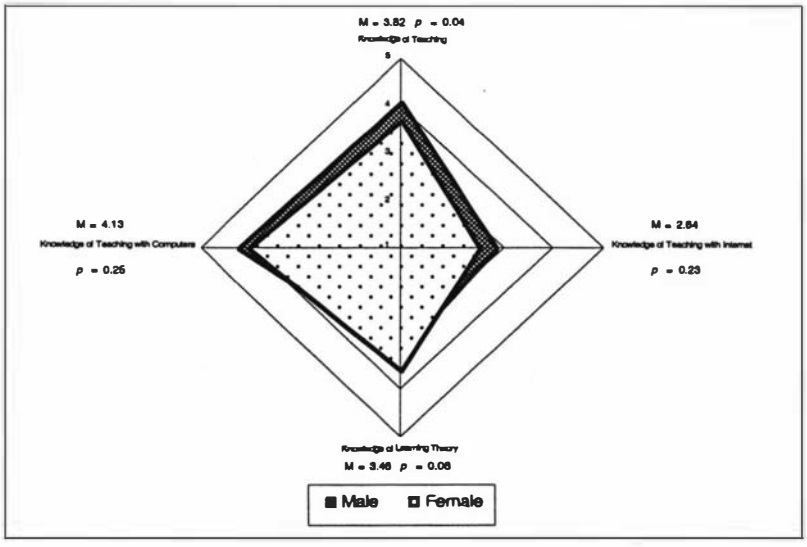

Figure 5.14 Profile of knowledge of learning and teaching with computers and the Internet by gender

Figure 5.14 presents a multi dimensional profile of teachers' knowledge of learning and teaching in relation to computers and the Internet by gender. On a five-point scale, in which five represents the excellent category, there were some significant differences between the mean profile of men and women. In terms of teaching knowledge, for example, the mean for women was 3.69 as opposed to 4.05 for male teachers (p <.05). In contrast, the women (M=3.61) self-reported higher levels of knowledge of contemporary learning theory than their male colleagues (M=3.23), which was on the boundary of significance. Despite this, women (M=4.03) reported less knowledge than men (M=4.29) in terms of learning and teaching with computers, although the results of a *t-test* analysis showed that this difference was insignificant (p >.05). An analysis of these data in relation to knowledge of teaching with the Internet also showed an insignificant gap between men (M=2.81) and women (M=2.54). Overall, male teachers perceived more knowledge of teaching and the use of technology than women, which was consistent with their greater computer and teaching experience. Clearly, the level of experience is an important covariate that must be considered when interpreting significance of gender differences.

The benefits that teachers perceive from students using the Internet are summarized in Table 5.40. Data reveal a clear distinction in the comments between the benefits of learning to use the Internet as opposed to using the Internet to learn.

Table 5.40
Perceived Benefits from Students using the Internet

LEARNING TO USE THE INTERNET		
ICT Skills	Vocational Prospects	The Future
"Learning ICT skills is the same as learning to read and write."	"This will help them get a better job when they leave school."	"Preparing them for the future."
"Learning to use the Internet should be an essential skill for all children."	"The main benefit is that they will be familiar with the Internet by the time they enter the workforce."	"It will help them in the future."
"The main value is familiarity with the Internet and the ability to manage the equipment."	"Most jobs in the future have not yet been invented. The Internet is going to be a huge source of employment."	"Learning the technology of the future will better prepare them for life."
"Learning keyboarding skills and general familiarity with the latest technology."	"I believe that knowing how to access information on the Internet will give children an advantage when they leave school."	"Introduction to new technology is important as this will be the kids' future ."
"The children learn so many skills and can easily grasp the technical requirements of using the Internet."	"Many of the kids will get high paid jobs with these skills and we have a responsibility."	"The future will be very different and we have to prepare children for using the technology of the future."
"The kids need to learn how to use the Internet as this is part of their basic literacy."		"Our society depends on children with hi tech skills and we have to prepare them to cope for life in the future."

USING THE INTERNET TO LEARN		
Active Learning	Research Skills	Student Motivation
"The Internet is a tool that helps to engage children in their own learning."	"Develop research skills and the ability to locate information."	"Motivation, learning through enjoyment, their self esteem."
"The children can communicate with other people around the world and share their ideas beyond the class."	"Children will need good research skills to sift through the maze of information."	"Confidence of using the Internet and finding things out by themselves is motivating."
"It makes learning more authentic and children learn a lot from working with one another on the Internet."	"The Internet makes so much information available we need to teach the kids how to use this information."	"An interactive and exciting resource for children that makes the classroom real."
"A great thought provoker tool that helps to deal with real issues in the classroom."	"The children can learn higher level research skills by locating up to date information on any number of topics."	"My kids love it as the Internet opens up the world and makes learning more fun."
"It supports cooperative learning and time management because you have to share the resource."	"It fits with the research cycle and helps teach information skills, which all children will need in the future."	"It stimulates children to learn and they get a real buzz from looking up information from around the world."

Table 5.41 reports the perceived instructional benefits from students using the Internet. A high percentage of teachers (61%) perceive the Internet helps to increase social interaction between students. Conversely, 41% of teachers agree that the Internet allows for better individualized instruction with their class. There were little or no gender differences in either response.

Table 5.41
Perceived Instructional Benefits from Students Using the Internet

Statement	% Strongly Agree	% Agree	% Not Sure	% Disagree	% Strongly Disagree
I find the Internet helps to increase the social interaction between children in my class.	11 (n=6)	50 (n=28)	38 (n=21)	2 (n=1)	0 (n=0)
I believe the Internet allows for better individualized instruction of children in my class.	0 (n=0)	41 (n=23)	34 (n=19)	25 (n=14)	0 (n=0)

The perceived curriculum benefits from teaching with the Internet are shown in Table 5.42. Most teachers (65%) find the Internet useful in a number of Essential Learning Areas within the *National Curriculum Framework.* Indeed, few teachers (n=3) disagree with the relevant statement. On the other hand, 18% of teachers disagree, and another 50% are not sure, whether the Internet allows them to link different subjects of the curriculum. Overall, 32% only of participants support this statement.

Table 5.42
Perceived Curriculum Benefits from Teaching with the Internet

Statement	% Strongly Agree	% Agree	% Not Sure	% Disagree	% Strong y Disagree
I find the Internet very useful in a number of Essential Areas across the school curriculum.	4 (n=2)	61 (n=34)	30 (n=17)	5 (n=3)	0 (n=0)
I find the Internet allows me to link different subjects of the curriculum in my teaching.	7 (n=4)	25 (n=14)	50 (n=28)	18 (n=10)	0 (n=0)

A range of responses were elicited from the question "Who or what has made the most significant contribution to your knowledge and understanding about use of the Internet for learning and teaching?". The most frequent response was "Other teachers" (n=18), which was followed by "School-based professional development" (n=16), and "Formalised academic study" (n=15). One teacher strongly emphasised the value of advanced study and professional reading. She stated:

The single most important factor for me has been my study. It has given me a different way of thinking about my teaching and the role of computers in education. I think more teachers should be required to undertake professional reading and study on a regular basis.

The contribution of professional reading was also evident from those teachers who singled out a particular individual in response to this question. Two teachers identified Nicholas Negroponte as someone who had greatly influenced their use of the Internet. Another teacher mentioned the book *School's Out* by Lewis Perelman, as having shaped his understanding of technology and the future of education. Lastly, the increasing access to thought provoking reading material on the Internet was a recurring theme throughout the responses.

In sum, the nominated proficient internet-using teachers reported a range of pedagogical approaches and beliefs. Their responses loosely spanned a pedagogical and philosophical continuum from manager of instruction to facilitator of learning. The teachers perceived themselves to be deeply reflective practitioners at different stages of Internet adoption but few people have begun to question how ICT is enhancing their teaching. While the participants were generally confident and enthusiastic toward the Internet, its advent to-date had not had a major impact on their teaching—nor had it greatly changed their teaching philosophy. Overall, the teachers were knowledgeable about teaching, learning and the use of computers for educational purposes, but they appeared to have considerably less knowledge of using the Internet for educational purposes.

5.5 OPINIONS ABOUT THE INTERNET IN EDUCATION

This section presents data on teachers' opinions and perceptions about the use of the Internet in education. It specifically presents data pertaining to the following two research questions: What perceptions and beliefs do teachers have of how the Internet supports the learning and teaching process? What factors do teachers believe inhibit and/or enable the use of the Internet for learning and teaching?

Figure 5.15 presents the two internet-related learning activities that teachers' perceive as having the most educational value. Most teachers (83%) ranked the statement about accessing up-to-date information on a current topic as the most valuable use of the Internet. To investigate problems and share findings with a wider audience was ranked by 12% of the teachers as the next most valuable statement. This statement was also ranked by 45% of the nominated proficient internet-using teachers as second most valuable, followed by the use of key pal exchanges between students. Notably the design and construction of web pages did not rank highly in the teachers' perceived educational value. There were no apparent age or gender differences in the response to these statements.

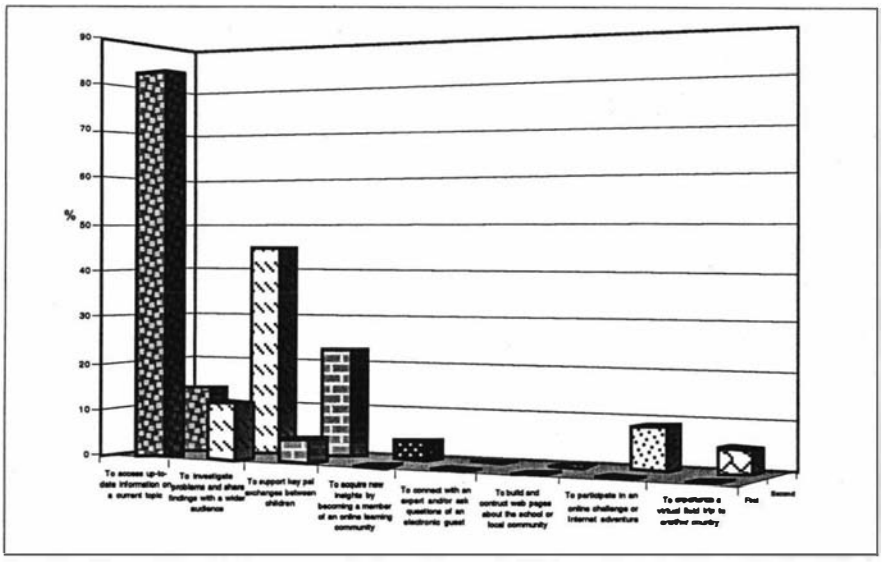

Figure 5.15 Perceived value of internet-related learning activities

The two statements that teachers' perceived as having the most educational significance for using the Internet in New Zealand schools are shown in Figure 5.16. The top ranking statement by 41% of teachers was split equally between "developing basic skills and computer literacy", as opposed to "developing students' thinking and problem solving skills". Some teachers (11%) supported the statement about "developing skills for future employment and meeting parental expectations", and this was also ranked by 28% of the participants as the second highest in terms of educational significance. The statement was just behind "the development of social skills for collaboration and working with others", which 32% of teachers supported. Notably, the aforementioned statement was more often ranked second by teachers who selected "thinking and problem solving skills" as their first choice. Conversely, teachers who selected "skills for future employment" as their second choice were likely to have chosen "basic skills and computer literacy" as their first. In other words, the statements tended to polarize the participants. Few teachers ranked the statements about "individualizing instruction" and "giving control and responsibility to learners".

A closer analysis of the responses showed that men were more inclined to rank highly "developing basic skills and computer literacy" than women. Of those who ranked this statement as their first choice, 43% were women and 57% were male teachers. A higher percentage of women (82%), as distinct from men (18%), ranked "the development of thinking and problem solving skills" as their first choice. While these data indicate that male and female teachers had somewhat different perceptions of the most significant reasons for using the Internet in schools, caution is required before attributing these differences to gender alone. It was apparent from the perceived curriculum benefits that a number of different factors were influencing the responses including age, professional status, teaching experience and the teachers' worldview.

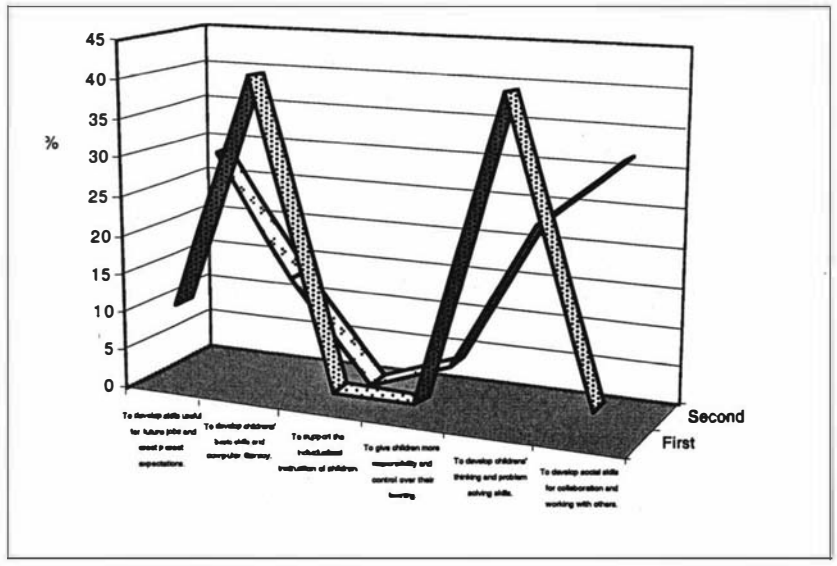

Figure 5.16 Reasons for using the Internet in terms of educational significance

Figure 5.17 reports the perceived educational value of different computer and Internet applications. The stacked columns show the three applications that teachers ranked as having the most educational value. Word processing was ranked by 67% of teachers as the single most valuable computer application in the classroom. The Web was ranked first by 27% of the participants as the next most valuable application. It was also ranked as the highest second choice overall just behind word processing. It was notable that with the exception of educational games, applications such as Logo, databases, interactive fiction, and drill and practice software did not feature highly in perceived educational value. Regrettably, the option of CD-ROMs and multimedia authoring was not included amongst the list of software applications.

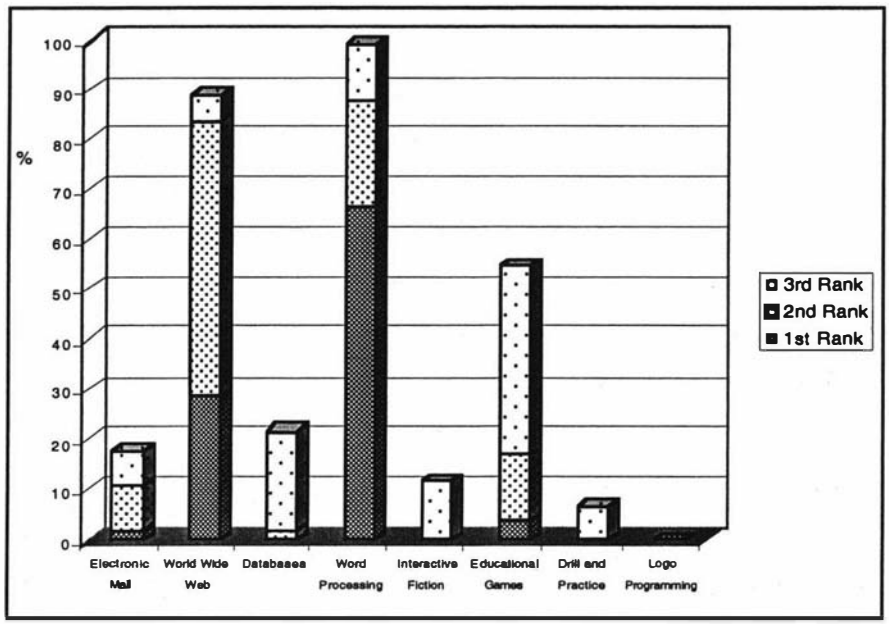

Figure 5.17 Perceived educational value of different computer and Internet applications by rank

The extent of technical and pedagogical knowledge required for teachers to make effective use of the Internet is shown in Table 5.43. It was noteworthy that a similar number of teachers agree as disagree with the statement that a lot of technical knowledge is required in order to make effective use of the Internet. Nevertheless, a higher percentage of female teachers (65%), particularly older women, perceived that technical know-how was important as opposed to their male (39%) colleagues. The majority of teachers (64%) agree with the statement, however, that a sound knowledge of learning theory is important in the effective use of the Internet in education. Few teachers (n=4) disagree with the relevant statement. Neither age nor gender appeared to be a major factor in the teachers' response.

Table 5.43
Perceived Type of Knowledge Required to Make Effective Use of the Internet in Teaching

Statement	% Strongly Agree	% Agree	% Not Sure	% Disagree	% Strongly Disagree
I believe that teachers need a lot of technical knowledge in order to make effective use of the Internet in their teaching.	2 (n=1)	39 (n=22)	16 (n=9)	41 (n=23)	2 (n=1)
I believe that teachers need a sound knowledge of contemporary learning theory to make effective use of the Internet in their teaching.	9 (n=5)	55 (n=31)	29 (n=16)	7 (n=4)	0 (n=0)

There were generally two types of response when participants were asked to elaborate on the skill and knowledge that they believed teachers require to enhance student learning with the Internet. The first type of response (n=22) was concerned with teachers' procedural knowledge of learning to use the Internet itself. As one teacher pointed out:

> *It can be confusing so teachers need to get their head around the language and then get some hands on experience with what the Internet entails. Training should involve heaps of hands on practical work and you need to provide enough time for practice and follow up.*

In contrast, the second type of response was much less common (n=4) and it focused on the opportunities that the Internet provided for personal, pedagogical and professional learning. These participants were primarily interested in making the Internet relevant to teachers' day-to-day work. According to one teacher:

> *I firmly believe PD must be relevant to the problems that teachers face. There is no point learning how to use the Internet if the skills don't address the difficulties of the day to day classroom. Identify the real problems and then use the Internet to your advantage to help solve those problems.*

Table 5.44
Perceived Importance of Home Internet Access

Statement	% Strongly Agree	% Agree	% Not Sure	% Disagree	% Strongly Disagree
I believe that it is important that teachers have access to email and the Web at home if schools are to make effective use of the Internet.	45 (n=25)	45 (n=25)	10 (n=6)	0 (n=0)	0 (n=0)

Table 5.44 reports the perceived importance of home Internet access if schools are to make effective use of the Internet. A high percentage of teachers (90%) agree that personal email and Web access was important. Indeed, none of the participants disagree or strongly disagree with the relevant statement.

Table 5.45
Perceived Gender Dominance of Boys

Statement	% Strongly Agree	% Agree	% Not Sure	% Disagree	% Strongly Disagree
I find that boys tend to dominate the Internet learning experiences in my class.	4 (n=2)	21 (n=12)	45 (n=25)	25 (n=14)	5 (n=3)

The perceived gender dominance of boys in terms of internet-related learning experiences is reported in Table 5.45. Notably, a sizeable proportion of women (71%) appeared to agree or strongly agree that boys tend to dominate girls. On the other hand, all of the teachers (n=3) who strongly disagree with this statement were female teachers. The largest group of teachers (45%) was unsure if boys were dominating girls.

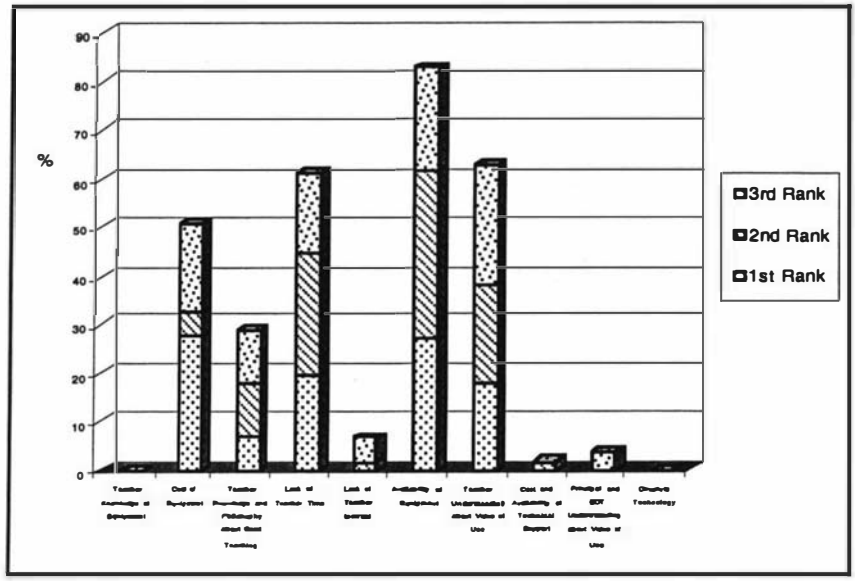

Figure 5.18 Perceived barriers to the effective use of the Internet in order of significance by rank

Figure 5.18 reports the barriers that teachers' perceive inhibit the effective use of the Internet for learning and teaching. Participants were asked to rank a list of well-known potential barriers identified in the literature (e.g., Fabry & Higgs, 1997; Information Technology Advisory Group, 1998) in order of significance. The stacked columns depict the combined responses in terms of the three most significant barriers with cost (28%) and availability of equipment (27%) evenly ranked as the first most significant barrier to effective Internet use. These two barriers were followed by lack of teacher time (20%) and understanding about value of use (18%). Notably, few participants (n=4) identified teacher knowledge and philosophy about good teaching as the first most significant barrier.

Availability of equipment was the highest second ranked barrier by 35% of teachers. It was also the highest ranked barrier overall. Another 25% of participants identified lack of teacher time as the second most significant barrier, which ranked highly overall alongside teacher understanding about value of use. It was noteworthy that obsolete technology, availability of technical support, teacher knowledge of equipment, lack of teacher interest, and principal and Board of Trustees understanding about value of use were not ranked highly. Moreover, the responses were spread across a range of demographic variables such as age, gender and teaching experience with no obvious pattern.

Table 5.46
Perceived Level of Caution in Relation to Using the Internet in Education

Statement	% Strongly Agree	% Agree	% Not Sure	% Disagree	% Strongly Disagree
I think teachers need to be very cautious about using the Internet in education.	9 (n=5)	59 (n=33)	21 (n=12)	11 (n=6)	0 (n=0)

Table 5.46 shows the level of caution that teachers' perceive is required when using the Internet in education. Most of the participants (68%), both men and women, agree that teachers need to be very cautious. In this regard, the issue of Internet safety was clearly an important factor. As one teacher stated:

> *You have to be very careful with the Internet. It can be a dangerous resource to have in the classroom. You have to watch for the nasty stuff!*

It was evident that at least one teacher was concerned about the hype associated with the Internet and its role in the globalization movement. She advocated a high level of caution on the basis that:

> *The Web is more than an online library. Yes, it is exciting for teachers, but look at whose pushing it. The Internet is dominated by business and global interests. I think the Internet and e-commerce demonstrate the worst of our society.*

Lastly, when invited to make additional comments, a number of teachers expressed further opinions about the role of the Internet in education. Many of these comments were enthusiastic about the Internet's potential for learning and teaching. Their enthusiasm for the Web, in particular, was evident in the following comment:

> *This is a revolution in action and for our kids' future we as teachers must embrace the new media. Like it or not. Personally I think the World Wide Web is going to change the classroom as we know it today.*

The majority of participants were more circumspect about the introduction of the Internet in schools, but they generally supported its use as a powerful new learning tool. As one teacher stated:

> *I have reservations about the Internet but we have to move with the times. This is the way our school is moving and I can see how the Internet can be a very effective tool in the hands of the teacher.*

This is how another teacher endorsed the Internet as a learning tool mindful of previous claims about the potential of technology to transform the curriculum:

> *The Internet is great but it must be used as a learning tool and not another overvalued games machine - unrelated to the curriculum. I think there is a real danger here for teachers. There is a history of teachers putting too much faith in technology.*

A small group of teachers was slightly more critical about the rapid growth of the Internet in schools. As one teacher stated:

> *I am not convinced (yet) that the Internet is any different from some of the other fads we have experienced over the years. I suppose time will tell but at this stage I'm reserving my judgment.*

In a similar vein, another teacher went on to say:

> *Teachers need to wary of the euphoria surrounding the Internet. I think it's shifting attention from the real problems schools face. Tell me how the Internet is going to solve the social and family issues we deal with on a daily basis. The Internet is NOT the solution.*

This last comment was indicative of the need to focus on genuine social and educational problems rather than technology *per se,* which was a sentiment throughout many of these critical remarks. Indeed, the key to harnessing the educational potential of the Internet was eloquently summarised in the following critical observation:

> *In my view, it is absolutely essential that the provision of the necessary equipment for schools is accompanied by teacher's expertise in and understanding of the problems teachers face and the fundamental changes that have taken place in learning. The emphasis must be on what we do with the Internet rather than on what we have or still need. Ideally, schools need experts in both educational technology and the learning, plus a shared philosophy that will ensure all staff understand the vision. Only then will the Internet really take off. There's no simple solution as it requires a major change in thinking at all levels.*

5.6 SUMMARY

This chapter has presented the results for Phase One of the research. It has described the background experiences, perceptions and practices of nominated proficient internet-using teachers, as gathered through a postal questionnaire. Findings indicate that the participants were highly experienced and well-qualified teachers, with a long association with the educational computing area. In terms of personal Internet experience, men had more teaching experience, more years using the Internet, more perceived technical and pedagogical knowledge, and were more likely to have personal Internet access than their female colleagues. Nevertheless, the use of the Internet for learning and teaching was still relatively new to all teachers. The novelty of the innovation is reflected in the diversity of practice, low frequency of use and different stages of Internet adoption. There were a range of pedagogical approaches toward the Internet and few teachers reported the technology has greatly changed their teaching philosophy. It was noteworthy that most teachers were less knowledgeable about using the Internet as a pedagogical innovation in comparison to their professional knowledge, and knowledge of the use of other computer applications for educational purposes. Finally, participants were divided when expressing their perceptions about the potential of the Internet in education. It was apparent that some teachers were highly supportive of ICT, whereas a small group of teachers were relatively critical of the Internet as a social, economic and educational phenomenon.

The following chapter presents a brief interpretation of the findings before the beginning of Phase Two.

CHAPTER SIX

Phase One: Interpretation of Findings

'Are teachers both the problem and the solution?' (Kirkpatrick & Cuban, 1998a, p.6).

6.0 INTRODUCTION

This chapter provides an interpretation of the results for Phase One. It interprets the responses to the questionnaire prior to, and in preparation for, the beginning of Phase Two. The chapter is divided into six sections that correspond to the main research questions. First, it considers the background characteristics of nominated proficient internet-using teachers. In the second section, the teachers' use of the Internet for learning and teaching is examined in relation to theoretical models and emerging research findings. This section is followed by an interpretation of the teachers' beliefs about learning and teaching. Section Four addresses perceived changes to teaching practice and work culture since the introduction of the Internet. Next, teachers' perceptions of how the Internet supports better learning as a new educational innovation are interpreted. The last section considers factors that inhibit and/or enable the pedagogical use of the Internet in schools. Finally, a brief synthesis of the emergent themes is provided serving a dual purpose: it summarises the key findings from Phase One and offers a useful basis for comparison with the results of Phase Two.

6.1 BACKGROUND CHARACTERISTICS

This section interprets the results that relate to the research question: What are the background characteristics of internet-using teachers? It considers three key findings, namely: (a) gender differences, (b) teachers' skill levels and (c) their level of training and professional support.

Gender Differences

Gender differences revealed by the demographic data are consistent with the greater experience of male teachers using the Internet. By 1995, two women only had used the Internet compared to eight of the men. Moreover, the male teachers were more likely to have personal Internet access. So, from the outset, the sample was skewed toward a group of male teachers with better access and greater personal experience of the Internet. It follows that access and the amount of computer experience is likely to have considerable bearing on teachers' use and perception of the Internet as a pedagogical innovation.

It was established in the Literature Review that experience is a significant contributing variable in accomplished teaching practice with computers (Becker, 1994; Sheingold & Hadley, 1990). Recently, Becker (1999) confirmed this finding in his preliminary report on Internet use by teachers as part of the National Survey of Teaching, Learning and Computing (TLC) in the US. The results of this new research involving 1150 schools and close to 6000 participants show that access to, and experience of, the Internet correlates with teachers' use of the Internet themselves and with the perceived value of email and the Web as a teaching resource. Despite the methodological limitations of this study, which gathered data through a 21 page postal questionnaire (e.g., Becker & Anderson, 1998) taking over an hour to complete, from a combined stratified national probability sample and purposive sample of high end technology-using teachers, Becker (1999) declares that 'teachers have to have access to the Internet in order to use it' (p.9). Thus, access to, and experience of, the Internet rather than gender alone may be the most important variables to consider when interpreting the results of Phase One.

This observation is given further weight from the findings of a recent study of 558 teachers in Texas, US who had personally used Internet accounts over the previous 12 months (Harris & Grandgenett, 1999). The research compared the teachers' response to a postal and web-based questionnaire with the network records of their Internet accounts. Although the research raises some ethical questions, and the findings are based on a low response rate, there was a significant correlation between age, years of teaching experience, years using a computer and to a lesser degree the use of telecomputing activities. Notably, teachers who had used computers longer reported more teacher-centred beliefs about teaching, which challenges many traditional assumptions about the pedagogical orientation of early adopters. Despite this, the research reports no significant gender relationships for any of the variables measured. At the time, the Internet was still new to most teachers leading the researchers to suggest that men and women were likely to have similar levels of experience.

While significant differences in Internet experience may emerge in the fullness of time, the findings from Phase One show that gender is not an independent variable, as there were a number of potential covariates such as age, level and teaching experience. It was noteworthy, for example, that few teachers worked in the lower school, which may explain why Becker (1999) excluded teachers below 4th grade in aspects of his national TLC survey. Moreover, like previous research using a nomination technique to elicit a sample of computer-using teachers, the largest proportion of participants, men and women, fell within the 40-49 age cohort. In this regard, the similar age of the participants in Phase One but less teaching experience of many women is probably explained by periods of broken service. Whatever the explanation, the initial sample was skewed toward a group of older male teachers with more years of teaching experience.

This profile contrasts with Becker's (1999) claim that youth rather than teaching experience is a more important factor in determining whether teachers will be drawn to the Internet. He found from a multiple regression equation of conditions that predict Internet use/value that the younger the teacher the more likely they were to use the Internet themselves and with students, and the more they perceived it had an essential role in the classroom. More specifically, Becker stated that teachers under the age of 30 in their first few years of teaching are more likely to use the Internet professionally. This led Becker (1999) to conclude 'the greater comfort with technology that younger teachers display outweighs advantages of greater teaching experience' (p.29).

As demographic data shows, this hypothesis contrasts with the characteristics of the sample from Phase One that included relatively few teachers in the 20-29 age range. Becker's conclusion brings into question the selection criteria for Phase Two, which is intended to exclude teachers based on limited teaching experience. In the past, wealth of teaching experience has been a common attribute to emerge from the study of good teachers. It has previously been a determinant factor in the identification of proficient, accomplished and exemplary computer-using teachers, as demonstrated in the Literature Review. Accordingly, the influence of a relatively inexperienced group of teachers in shaping Internet use in schools may not be entirely positive. For this reason, a study of experienced teachers who utilize the Internet within their teaching practice and work culture remains a fruitful area of inquiry.

Although Becker (1999) fails to mention gender in his multivariate analysis of teachers' Internet access, frequency of use and perceived value, which is surprising given the study includes elementary, middle and high schools, this latest research offers valuable insight into the interlocked nature of variables associated with the Internet as a pedagogical innovation. In this sense, it complements Harris and Grandgenett's (1999) research showing the complex correlations that potentially exist in teachers Internet use. The lesson from this new research is that data comparison based on gender alone may do little to unravel the mutually nested nature of the variables that contribute to internet-using teachers' experiences, perceptions and practices. In short, gender differences must be treated with caution, as they are overly simplistic and can wrongly be construed to perpetuate traditional stereotypes.

On the other hand, we know from prior research including Becker's (1994) study of exemplary computer-using teachers that educational computing has historically involved a disproportionate number of male teachers. Indeed, gender differences in computer access, use and perceptions have been observed ever since the introduction of the microcomputer in schools (Sutton, 1991). As Kilpatrick and Cuban (1998b) point out:

> *Studies over the past ten years show that males and females differ in terms of their access to and use of computers—when, where, and how they use them (p.57).*

A recent New Zealand survey of the general population claims that men are more likely than women to have ever accessed the Internet (Doczi, 2000). Therefore, there is reason to be concerned that male teachers began to use the Internet before many of their female colleagues and that men have higher levels of personal access to the Internet at home. What does this tell us about the Internet? Traditionally, in terms of computing, women have been defined as "hosts" in a male enterprise (Elkjaer, 1992). On the surface, the greater experience of men, and their higher level of involvement in computer clubs and attendance at ICT-related conferences, gives additional support to the popular perception that girls and women have less personal interest in computing (Kilpatrick & Cuban, 1998b). If this is the case—which is controversial and open to debate—does greater personal interest in the Internet translate into men having a pedagogical advantage in the classroom?

It must be borne in mind that Becker (1999) claims computer expertise, no doubt an outcome of experience, was the strongest predictor of how likely a teacher was to report that Internet resources were essential to good teaching. This type of observation, of course, makes an assumption that has yet to demonstrated—that is, that good teachers require and use such resources—and it tells little about how the Internet is used by students for educational purposes. Nevertheless, Becker (1999) states that '...computer expertise predicted teachers' professional use of the Internet better than any variable besides classroom connectivity level...' and prior computer knowledge is clearly '...an important pre-requisite for a teacher to make the Internet a valuable resource' in their teaching (p.28).

Consequently, should the teaching profession be concerned that women self-report less technical skill and knowledge than their male colleagues and that a higher proportion of male teachers have specific responsibility for computers and the Internet in their school? Regardless of whether or not the pedagogical value of the Internet has been overstated, the short answer is yes.

On a positive note, the results show a reasonable number of female teachers are early adopters of the Internet. This must be encouraging, especially as these women may prove to be important "opinion leaders" in the future (Harris, 1998a). As the Internet is relatively new in schools, their limited access to, and experience of, email and the Web may not be a pedagogical disadvantage in the long-term. This might explain, in part, the absence of any gender differences in the research from the US where the Internet has been more accessible

and readily available to teachers and the public. Another mitigating factor in terms of Internet experience is that in Phase One women were more likely to have completed formal courses or qualifications in educational computing and to have participated in related professional development. This begs the question: Why have the men in this study not pursued such qualifications?

In sum, on first impression the results paint a picture of a sample of more experienced internet-using male teachers of European descent. However, apparent gender differences should be interpreted with caution, as it is too early in the evolution of the Internet to identify the covariates that influence its use by teachers. Phase Two should provide further insight into the conglomerate of mutually dependent variables associated with teachers access to, and experience of, the Internet as a social, economic and educational phenomenon.

Teacher Skill Levels

Differences in skill levels stand out from an analysis of the background characteristics of internet-using teachers. As previously stated, men self-report a higher level of technical skill and knowledge with computers and the Internet than their female colleagues. In a similar vein, they report a higher level of pedagogical experience with both traditional computer and internet-based applications in the classroom. Despite this, over half of all teachers self-report their teaching experience with computers and/or the Internet at the proficient level or above. Although the difference in self-reported proficiency between men and women in teaching experience with the Internet was significant, we need to remember that correlation is not causal. Again, the greater level of Internet access and experience of men can explain gender differences. After all, one would expect those teachers with the most experience of the Internet to report greater technical know-how and pedagogical familiarity in the classroom.

These data may reflect, of course, inherent differences in the self-reported efficacy toward educational technology of male and female teachers. Although controversial, we should not rule out this interpretation, as gender differences are common in teacher self-report data. This is shown in a recent Australian study involving 1258 teachers in a representative sample of 399 schools from all states and territories where males were found to report a higher level of technical skills than their female counterparts (Department of Education, Employment, Training and Youth Affairs, 1999). In this "Real Time" survey, which claims to be the first and largest national snapshot of information technology (IT) skills in Australian schools, a list of 13 core and 13 more advanced computer operations were defined to determine the overall skill level of teachers (and students). From this rather technocentric orientation the report concludes:

> *There is a marked gender difference in teachers' skill profiles. Women teachers, especially those over 50 and those in primary schools, are falling behind in both basic and advanced skills (Department of Education, Employment, Training and Youth Affairs, 1999, p.30).*

The research found that younger teachers were entering the teaching profession with more advanced IT skills than older colleagues. While those with slightly more experience are rapidly acquiring these skills, the report states that many teachers have only recently begun to use computers with their students. The study also found that most students have basic computer skills equivalent to those of their teachers. Thus, it was concluded that a considerable proportion of teachers lack the skills to use or teach a range of computer applications (Department of Education, Employment, Training and Youth Affairs, 1999). In contrast, based on self-report data, few nominated proficient internet-using teachers in Phase One fall into this category.

The Australian study, nevertheless, adds further support to Becker's (1999) claim that younger teachers are more likely to use new computer technology, which is corroborated by the results of a December 1998 survey showing that New Zealand Internet users were generally younger, in higher income brackets and in paid employment (Doczi, 2000). Put another way, aside from being an important part of youth culture, the Internet is used by those who can afford it, and often in a work context. What this research suggests is that youth *per se* is not an independent variable, so we need to be careful when generalizing the findings of such crude snap-shot surveys when previous research has found quite the opposite.

At the time of Sherwood's (1993) Australia-wide survey, for example, only 21% of teachers under the age of 30 were identified as effective users of new computer technology in the classroom. Sherwood speculated on the reasons for this and, in part, attributed the finding to inadequate pre-service teacher education. Perhaps the emergence of more skilled younger Australian teachers is an indication of improvements in teacher preparation. Then again, the profile of the sample from Phase One does not support this theory, as there were only eight people in the 20-30 age cohort—that is, less than 15% of the teachers. As an aside, this group consisted of an equal number of young men and women. Obviously, discounting the teacher preparation hypothesis assumes that there is not a marked difference between Australia and New Zealand in the quality of pre-service training.

The claim that younger teachers are more likely to possess advanced Internet skills has yet to be borne out. It is not evident in the demographic profile of Harris and Grandgenett's (1999) study of K12 teachers who personally use the Internet. In this study, the mean age of the

participants was over 43 years and their teaching experience, measured by years in education, was over 15 years. In this regard, the profile was remarkably similar to the sample of nominated proficient internet-using teachers from Phase One. It was also similar to the previous New Zealand study by Brown (1995b), and to Sheingold and Hadley's (1990) sample of accomplished computer-using teachers where more than half of the participants were between 40 and 49 years old, and three-quarters had been teachers for at least 13 years.

At the same time, age is not correlated directly by Harris and Grandgenett (1999) with the teachers level of Internet experience leading them to suggest that telecomputing is probably still a rather new activity in school settings. This observation certainly matches the sample profile, as most teachers had less than three years experience using the Internet to support learning and teaching.

Thus far, the key lesson to emerge from the study of early Internet adopters is that possession of computer skills is not the same thing as using email and the Web for sound pedagogical outcomes in the classroom. Hence, many of the assumptions about the growth of personal computer skills and greater classroom use of the Internet are problematic. Although younger teachers in some contexts might be more technically skillful, this is not a trustworthy indicator of good teaching with or without the Internet. There is danger of over estimating the significance of a new generation of teachers with new Internet skills, especially in light of what is known about the role of experience in the mix of what makes a good teacher. Once again, the emerging research in this area has failed to address the wider ethical, moral and political dimensions of good pedagogy, as discussed in the Literature Review from a critical perspective.

In sum, since the conception of Phase One a number of major studies have been published on teachers' Internet skills but their findings remain infused by, and shackled within, a discourse that defines teaching as a practical craft—that is, a technical rationality view of pedagogy. There is an implicit assumption in the recently published literature that better computer skills are an essential ingredient of good teachers. What constitutes good teaching with or without the computer is taken-for-granted. The paradox, of course, is that good teachers need technical skills to make better pedagogical use of computers, but learning more skills does not automatically lead to good teachers or greater pedagogical use of educational technology. This paradox lies at the heart of some deep issues concerning the use of the Internet by teachers and it requires further investigation. In the meantime, there is every indication to suggest that the sample selection technique was successful in identifying a reasonable proportion of technically and pedagogically accomplished internet-using teachers for further investigation in Phase Two.

Training and Professional Support

The degree of personal training and the level of professional support for using the Internet in the classroom were shown in the Literature Review to be important considerations. According to Sheingold and Hadley (1990), support and collegiality for the integration of computers was a strong indicator of accomplished teaching practice. Similarly, Becker (1994) reported that collegiality amongst teachers using computers was one of the strongest predictors of exemplary practice. With this in mind, putting aside methodological shortcomings of prior research, this section reflects on the nominated proficient internet-using teachers' level of training and professional support.

It was noteworthy that over half the teachers perceive they were well supported by the principal and Board of Trustees. This suggests a reasonable level of institutional support for the use of the Internet. On the other hand, few teachers reported high levels of support from their colleagues, with gender once more a factor in this response. It must be borne in mind that, in September 1998, only 20% of primary schools reported 25% or more teachers using email and slightly fewer the Web in a typical week (Information Technology Advisory Group, 1998b). Hence, a small proportion only of the teaching profession uses the Internet. The lack of perceived support is explained perhaps by most of the participants having leadership roles with responsibility for establishing the school network, which might be a thankless and time-consuming task. Phase Two offers an opportunity to explore such tentative hypotheses.

It was notable that the majority of teachers devote time at least most weeks to informal discussion with colleagues about the Internet. The role of informal support and conversational networks has been overlooked in the past and this finding is worthy of further investigation. After all, Becker (1999) found that '...the higher the frequency of informal contacts, the greater the use of the Internet and the more essential its presence was regarded' (p.18). However, in the absence of qualitative data the perceived lack of collegial support may indicate that interest in the Internet is not driven from demand by staff, but rather from senior management through central government initiatives. It might also indicate that the level of curriculum integration and school-wide penetration of the Internet beyond the nominated sample of teachers is still minimal.

The fact that most teachers report the home was the most common setting in which they learned to use the Internet is not unexpected given what is known from previous research. In a recent New Zealand survey, Doczi (2000) reports, for example, that the home was the most common place for accessing the Internet. This survey also estimated that at the end of 1998 around 55% of New Zealanders had personal access to the Internet, which is almost 15%

lower than in the sample of nominated proficient internet-using teachers—another indication that the sample was atypical of the wider population. Despite the six-month time lag between the two surveys, the teachers in the present study appear to have better and more frequent access to the Internet, as 30% only of the general population reported having used the Internet in the preceding month (Doczi, 2000). This gap underscores the point that access, usage, and frequency of the Internet are not the same, and more needs to be learnt about the way teachers use email and the Web in their personal and professional lives.

The high level of personal Internet access is consistent with data on teachers' ownership of computers. In a previous New Zealand study, Brown (1995b) found that 77% of teachers had access to a home computer. This level of ownership is corroborated by the findings of Hadley and Sheingold (1993) who report that nearly 80% of accomplished computer-using teachers have access to a home computer and most were to some degree self-taught. In like manner, Sherwood (1993) claims that eight out of ten teachers acquired their computer skill and knowledge in a self-taught context. More recently, Berg, et al. (1998) testify that 95% of teachers had learned technology skills on their own. They concluded that:

> *Technology skills seem to be skills that many exemplary computer-using teachers gain informally through personal searches rather than formally through "guided" learning processes (Berg et al., 1998, p.117).*

The role of non formal learning is confirmed in the Real Time survey of Australian teachers where most computer skills were self-taught (Department of Education, Employment, Training and Youth Affairs, 1999). While the research also found that many teachers make extensive use of personal computers at home, in contrast to other studies basic computer skills were learned usually first at work, whereas the opposite was true of students. This suggests that computer skills are becoming an increasingly valued aspect of teachers' work culture. The opposite was found in Phase One, however, where few teachers (17%) indicate that they learned to use the Internet at school and even less reported learning through in-service or pre-service teacher education. Of course, pre-service training for most teachers within the sample pre-dated the advent of the Internet.

The use of the Internet by teachers for their own education and professional development was a distinctive feature of the sample. Notably, women at all levels were accessing online professional development resources more than men and a high proportion of teachers were using the Internet to support their formal study. Clearly, the growth of the Internet has impacted on the type of information teachers access for professional development. In the US Becker (1999) found, for example, that 68% of teachers used the Internet to find information and resources for use in their lessons. Furthermore, 25% of all teachers reported doing this

on a weekly basis or more often, and their use of the Internet correlates strongly with home access. In comparison, there were very few elementary teachers using the Internet professionally when Berg et al. (1998) conducted their study of exemplary use. Therefore, Becker's (1999) data must be kept in perspective as 'even among teachers with both home and classroom Internet access, more teachers report only "occasional" use of the Internet for lesson preparation than report use on at least a weekly basis' (p.4).

It was revealing to learn from Becker (1999) that 16% of teachers communicated by email with colleagues from other schools more than five times during the school year. In this regard, teachers with both home and classroom Internet access were three times more likely to use email for professional purposes. This suggests that dual access may be important if the Internet is to be used to build relationships that foster a greater sense of professional community. In terms of Web publishing—that is, the use of the Internet for "construction"—relatively few participants had posted information on an Internet homepage with less than 20% of teachers doing this in the last year (Becker, 1999). Once again, researchers need to be wary of these data as access, usage, frequency, and type of Internet use should not be confused as they are each distinct and tell only part of the story.

The sample of nominated proficient internet-using teachers was well qualified with a high proportion of participants (80%) having completed or were currently undertaking a specialist educational computing course or tertiary qualification. This compares favourably with Brown's (1995b) previous New Zealand study where just over half of all women reported completion of a formal course or qualification. In addition, proportionately more women had attended internet-related professional development with the overall level of attendance encouraging in comparison to the recent ITAG survey (Sillivan & Anso, 2000). There is evidence to suggest that women, in particular, have become more qualified and potentially better informed about the use of new educational technologies for pedagogical purposes. This is a positive finding given Becker's (1999) claim that advanced degrees and additional coursework contribute the most of any measure for predicting the teachers perceived value of the Internet for classroom teaching, thereby underscoring the importance of extensive and ongoing professional experience.

The high level of commitment to further study and ongoing professional development in a specialist area demonstrates that the research sample was unique in the wider population of teachers. In the past, Becker (1994) has speculated that these teachers may have a stronger commitment to teaching (and perhaps innovation *per se*), which contributes to their desire for further education. However, Trewen (1996) is more circumspect in her analysis of the reasons why New Zealand teachers pursue professional development. In the current economic and political climate, there is considerable external pressure on teachers to update

their skill and knowledge in this area. The reason so many teachers are pursuing qualifications in ICT and participating in related professional development may become more apparent in Phase Two.

A feature of the sample was the high level of knowledge of recent developments relating to ICT in New Zealand education. This suggests the sample represented a group of well-informed teachers. Indeed, a number of teachers were conversant with developments in educational technology within other parts of the world through their membership of professional associations and knowledge acquired from the Web. The Internet itself was, therefore, an important source of information for teachers' learning, which had contributed to some participants having a more international outlook toward the use of educational technologies and the teaching profession generally.

In sum, the teachers reported a mixed level of institutional and collegial support for the use of the Internet within their teaching. By and large, the sample does not reflect a group of well-supported teachers. To their credit, most people have acquired Internet know-how from personal access and through non-formal learning in their own time. Despite this, the teachers are well qualified and they demonstrate a genuine commitment to their own learning through the pursuit of specialist qualifications and professional development. This is evident from their knowledge of recent ICT developments in New Zealand. Overall, the sample selection technique was successful in identifying an atypical group of teachers given the embryonic nature of Internet use in schools.

6.2 USE OF THE INTERNET FOR LEARNING AND TEACHING

This section interprets the results that relate to the research question: How do teachers use the Internet for learning and teaching? It considers three key aspects of Internet use in schools, namely: (a) the level of use, (b) the method of use, and (c) the type of use by students and teachers.

Level of Use

At the cusp of the millennium, nearly all New Zealand primary schools (96%) had some level of access to the Internet (Sullivan & Anso, 2000). The level of access was similar to that available to teachers in the United States (Anderson & Ronnkvist, 1999). Of course, simply having Internet access does not indicate how widespread access and usage is throughout the school system. With this in mind, a stand out feature of Phase One was the limited access and use of the Internet in the lower primary school. The results show that Internet access in the lower and middle school is far from commonplace with potential use largely restricted to the library and/or specialized computer suites. Thus, one could easily surmise from initial

data that the Internet is an innovation for teachers working with older students at the senior level often in dedicated technology-rich settings.

Becker, Ravitz and Wong (1999) support this conclusion finding less use of and lower perceived value toward the Internet by elementary teachers. However, the differences in this study were minor, and the limited availability of the Internet in the lower and middle school must be seen in the context of two thirds of senior students not having classroom connectivity. Overall, this meant that during Phase One relatively few teachers were using the Internet with students in the regular context of their classroom, which no doubt limits the potential for curriculum integration. This gives some weight to Selwyn's (1999) observation that the computer is a technical innovation that does not easily mesh with the everyday mechanics of learning and teaching.

The limited access to the Internet in traditional classroom settings may also explain the low frequency of use by students. Remember, usage alone is not a good indicator of the frequency with which students are using the Internet. In this regard, it is salient to note that half the teachers were not using the Internet with students even when access was available in non-traditional settings. Moreover, less than 10% of teachers were using the Internet with students at least once every week. These data are consistent with a recent New Zealand study of schools participating in NetDay that found only three percent of teachers had used the Internet in lessons with students on more than 10 occasions (Drain, 1999). Indeed, 78% of teachers within the NetDay schools had not used the Internet with students. This will no doubt change as the benefits of the Internet become more apparent but even in the US 30% only of teachers have students who use the Web (Becker, Ravitz & Wong, 1999).

In Phase One, if the estimate is roughly accurate that on average each student uses the Internet for three minutes per week, this is a matter of concern especially given the hype and huge investment of wiring New Zealand schools. It may be early days, but thus far the growth of the Internet in schools, as measured by the frequency of student use, is somewhat disappointing. In September 1998, for example, a survey by ITAG (1998b) found less than 15% of primary schools reported 25% or more of students using email during a typical week. Similarly, ITAG (1998b) claims that in a typical week 21% of schools had 25% or more students using the Web. By the beginning of 2000, this figure had increased to 27% of schools with 25% or more students using the Web during a typical week (Sullivan & Anso, 2000). Usage of email followed a similar frequency pattern. In a typical week, ITAG found that 21% of schools had 25% or more students using email. At the time, this snapshot of ICT in schools led ITAG to conclude that '...usage of email and the World Wide Web is generally low among students' (Sullivan & Anso, 2000, p.6).

The mismatch between the rhetoric and reality of Internet usage in schools is amplified when the percentage of time devoted to internet-related applications in a typical week is compared to other software uses. In Phase One, the results show that use of the Internet constitutes less than 15% of total available computer time, which is hardly surprising given limited connectivity in the classroom. Becker (1999) reports that even in the US the Internet is still a long way behind traditional software applications such as word processing, educational games, CD-ROM references, etc. Another salient lesson can be taken from the finding that only 43% of elementary teachers gave students frequent opportunity to use computers during class time—that is, on more than 20 class days during the 1998 school year (Becker, Ravitz & Wong, 1999). The evidence from the United Kingdom (UK) paints a similar picture where less than 60% of students make frequent use of a computer during a typical week (Department for Education and Employment, 1997). Clearly, there is a need to extrapolate these data and conduct more phenomenographic research to better understand the "true" extent of the student experience.

Sullivan and Anso (2000) present a slightly more positive outlook of the New Zealand situation in terms of the frequency of Internet use by teachers. In ITAG's national random survey of 181 principals at the beginning of 2000, nearly half of primary schools reported 25% or more of their teachers using the Internet in a typical week (Sullivan & Anso, 2000). This represents more than a twofold increase in Internet use by teachers since September 1998. Of course, these data must be viewed with caution as the responses are likely to be skewed toward those schools more active in ICT, and the results reflect principals perceptions only, which have a strong male bias—70% of responses came from men. Although these national surveys provide useful baseline data, they tell a distorted story by ignoring the student experience and the individual teacher's voice.

It can be concluded from Phase One that the Internet does not appear to be dominating the classroom use of computers. While the Internet is most prevalent at the senior level, comparatively few students use email or the Web at school on a frequent basis. There is no doubt that teachers are making greater usage of the Internet but the question remains whether there will be an expediential increase in the frequency of classroom use when access becomes more widespread within and across the school system. As the story unfolds, Phase One will have provided valuable baseline data on the evolution of Internet use in schools.

Method of Use

The way teachers use the Internet for learning and teaching is correlated with the method of access available to students. In Phase One, not surprisingly, the level of classroom access correlates with the frequency of student Internet use. This correlation was statistically

significant at the senior levels where more students have direct access to the Internet in their own classroom. A similar pattern is evident in the US, where the effects of having classroom-based Internet connectivity were large, at least in terms of baseline levels of use (Becker, Ravitz & Wong, 1999). While access alone is unlikely to result in better pedagogy, on the surface there are obvious implications here for those advocating greater use of the Internet in schools.

Despite the widespread availability of the Internet in most primary schools, the level of access drops when data from classrooms and administration are separated. A closer analysis of recent survey data reveals that in September 1998, access was available in 83% of all primary schools but only 55% reported the Internet in at least one classroom (ITAG, 1998b). Nevertheless, 16% of primary schools report all of their classrooms as networked although 63% of schools had no networking in place. At the time, 27% of schools claimed to have a central server. ITAG (1998b) estimated from these data that roughly 23% of all primary classrooms had access to the Internet. This figure is slightly higher than Drain (1999) found in his study of NetDay schools where less than 15% of students had classroom Internet access.

In a follow up survey at the end of 1999, ITAG found that Internet access was available in at least one classroom for 70% of primary schools (Sullivan & Anso, 2000). Moreover, 33% of primary schools, or at least those responding to the survey, had 80% or more of their classrooms connected to the Internet. For some reason, this figure is slightly higher than the 25% of all schools fully networked—that is, 80% or more of the classrooms linked by cabling to other rooms. These data are, however, generally consistent with the 30% of schools with a central server. In total, Sullivan and Anso (2000) extrapolate from their results that approximately 36% of all classrooms in New Zealand primary schools have Internet access.

This level is slightly higher than found in Phase One where 27% of the teachers reported classroom access to the Internet. Of course, the difference might be an outcome of the three to four month gap between the two surveys, especially in light of the eight million dollar incentive at this time for cabling projects under the *Financial Assistance Scheme* (Sullivan & Anso, 2000). There are also potential flaws in Sullivan and Anso's methodology. The survey takes no account, for example, of Internet access in the library and/or computer suite, which might better explain the difference between general availability as opposed to individual connectivity in the classroom. In many ways, such points of debate are redundant given that less than 15% of schools had 80% or more of their total computer inventory connected to the Internet (Sullivan & Anso, 2000). Thus, Internet access is not common at this stage on the thousands of computers throughout New Zealand primary schools.

In Phase One, the reality was that Internet access for most students is through the school library and/or computer suite. This finding is consistent with Drain (1999) who reported from his NetDay study that the library was the most common location for Internet access followed by the computer room. In the national TLC survey, Anderson and Ronnkvist (1999) showed the use of computer labs is also common in elementary schools in North America. Of course, the advent of these new computer suites may not be entirely positive as illustrated by Salomon's (1990b) famous pencil analogy where he belittles the technocentric nature of the curriculum of "pencilology". The lab may help to centralise the latest hardware where larger groups can access the Internet at the same time, but it also gives an excuse for teachers not to integrate the computer in the classroom, especially if they think ICT will be taught elsewhere. Therefore, in a physical and philosophical sense, this development has the potential to separate the integration of new computer technology from the regular curriculum.

There is evidence from the US to support this hypothesis as Becker, Ravitz and Wong (1999) claim that the classroom has a clear advantage over the computer lab. They asked the question: which promotes more frequent use, high computer density in labs or convenience of classroom location? The answer taken from the national TLC survey data was that a higher proportion of teachers with five or more computers in their classroom gave more frequent computer assignments than those whose students use labs with 15 or more computers in them. Although the difference was most apparent at the secondary level, they conclude '...that the computer's value may not be for concentrated whole-class use on a scheduled basis, but as a resource for particular groups of students *when needed* to find, analyze, or communicate information' (Becker, Ravitz & Wong, 1999, p.11). This point highlights the danger of bipolar lab vs. classroom debates, as the best location will depend on how teachers intend to use the available computers and the nature of Internet access in the first place.

Lastly, regardless of the method of access, few students could use the Internet without restriction. This adds another layer to the picture of limited student access suggesting that even with greater access, and choices of location within schools, the Internet is likely to be used under tightly restricted conditions. Thus, it can be concluded from Phase One that most teachers who use the Internet do so with their students in a location outside of the regular classroom, in pair or small group instructional contexts, where there is a reasonable number of computers. This scenario contrasts with the international evidence that suggests teachers who are using the library and computer suite would use the Internet more often if they had direct access in their classroom. Having said that, if teachers do not have enough computers in any location, then they will not make extensive use of them with students.

Type of Use

A preoccupation with access and infrastructure has the potential to distract from the type of use that teachers make of the Internet. Remember, an important distinction exists between access, usage, frequency and the type of Internet use. Arguably, the last is a more fruitful area of inquiry especially if the Internet is to transform learning and teaching as predicted by the Boosters and Deschoolers. In the past, national surveys of computer use have provided little more than a basic inventory of hardware and software. As pointed out in the Literature Review, beyond baseline data the literature has failed to uncover how different teachers use different computer applications in different contexts for different purposes. The results from Phase One provide the basis for a finer grain analysis of how teachers (and students) are using different types of computer applications.

At a basic applications level, for example, it is known that the type of student use is limited mainly to email and web page browsing including to some extent the usage of Internet search engines. There is very little evidence that students use applications such as chat, email lists, discussion groups and web page construction. The pattern of Internet use by students is similar to that revealed by Drain (1999) where email was less common than web page browsing in schools. A similar pattern is repeated in Becker's (1999) study, which found that use of the Web by students was almost four times more common than email in elementary schools.

As a computer application, the Internet competes with other types of software uses. It would appear the Internet has not displaced word processing as the most common type of computer use in schools. This finding is confirmed by Becker (1999) who reports at the elementary level that 65% of students use the word processor during class, compared with 63% games/drills, 54% CD-Rom references, 33% simulations, 26% the Web, 26% graphics, 14% multimedia authoring, 10% spreadsheet/databases and 7% email (Becker, 1999). Berg et al. (1998) found a similar pattern in their cultural constructivist study of exemplary practice where the use of computers and desktop publishing software in the writing process was the most frequent application followed by CD-ROMs for research.

In the UK, word processing remains the most commonly used computer application with Internet access restricted mainly to library and museum sites (Department for Education and Employment, 1998). It must be borne in mind that the Stevenson (1997) Report found the state of ICT in schools was primitive and extremely variable. This conclusion is supported by The Office for Standards in Education (OFSTED) (1999) which reports that there is great variety of attainment within schools across the UK and that IT is the weakest area of the primary curriculum. Despite this criticism and the problematic nature of international

comparisons because of different typologies, there is little doubt that word-processing remains as the quintessential heart of educational computing.

The same thing, however, cannot be said about the use of interactive fiction, which according to the teachers in Phase One has declined in use along with databases and spreadsheets—displaced possibly by the advent of multimedia and the Internet. It is interesting to note that just a few years earlier, Brown (1995b) found 75% of New Zealand teachers used interactive fiction and approximately 25% databases and spreadsheets in the classroom. In Phase One, no overall comparison of all of the different types of applications was undertaken, but the decline in these two areas suggests there may be a displacement cost associated with the introduction of the Internet in schools. This is a potential concern as both application types still have considerable value in the classroom and this hypothesis warrants further investigation.

In many ways, research that merely lists the different type of applications—albeit by ranked frequency of use—is a crude measure of the software that teachers use with students. Becker, Ravitz and Wong (1999) demonstrate through a sophisticated cluster analysis procedure that patterns of software use are far more complicated. They found that 16% of elementary teachers do not use computers at all and another 30% make nothing more than occasional use. Of the remaining teachers, 15% belong in a cluster where students use word processing frequently but they rarely use any other type of software. Another 10% make only frequent use of word processing and CD-ROM references. In other words, 71% of teachers use none or no more than one or two software applications in the classroom.

This leaves a number of sub groups including 10% of teachers whose students make frequent use of three types of software besides word processing. Another three percent have students who use software mostly—even more than word processing—to assemble and produce their own multimedia. This group does not use computers more or less than the aforementioned frequent users, it just uses them differently—albeit often with higher ability students. In total, less than two percent of teachers use anything like a full range of software (Becker, Ravitz & Wong, 1999). The lesson from this cluster analysis is that merely listing the different computer applications used by students gives limited insight into how different teachers use different types of software in different contexts for different purposes.

At a pedagogical level, there is a variety of types of use for the Internet in schools. In Phase One, just as locating information was a common type of Internet use by teachers, students used the Web for research and information gathering more than any other purpose. Indeed, more days were devoted to information searches than any other internet-related activity, which is consistent with Becker (1999). The main type of pedagogical application is

amplified by grouping the different learning experiences in terms of the four main "Cs" of Internet use. Figure 6.1 shows the mean percentage of one or more days that teachers devoted to using different types of pedagogical applications of the Internet over the last 12 months collapsed by category. Clearly, the most common type of pedagogical application used by teachers falls within the "content" metaphor (46%), followed by the use of the Internet for "connectivity" (24%). Use for "community" (12%) and "construction" (12%) activities is rare.

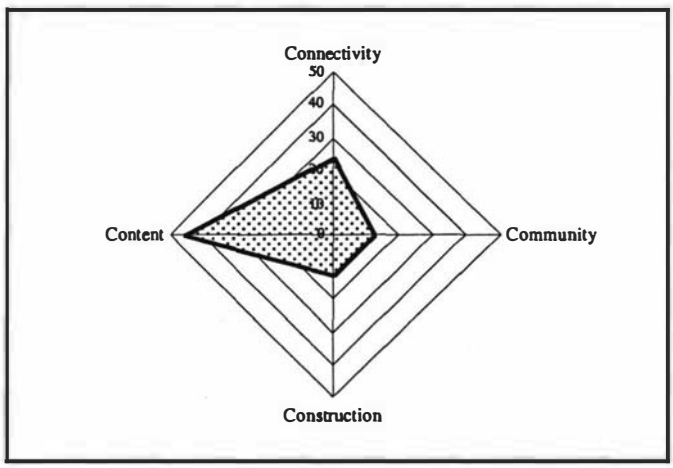

Figure 6.1 Mean percentage of one or more days devoted to using the Internet by category

So, beyond using the Internet to look up information as a source of content for writing reports and researching projects, there is limited evidence that students have participated in a wider range of activity structures as defined by Harris (1998b). Amongst other things, this includes using the Internet to contact experts on a topic, to collaborate with classes in other schools in joint projects, and even to publish their findings on the Web. As Becker (1999) observes, as of 1997-1998, few teachers have had students involved in those activities. He found, for example, 6% of students in elementary and middle schools had participated in a beyond the classroom Internet project, which is corroborated by the finding that less than 8% of teachers had created opportunities for the using email at least three times during the school year (Becker, 1999). Berg et al. (1998) reported a similar trend where on average exemplary computer-using teachers have students use email to communicate with other people fewer than five times per year. Thus, at this stage, the vast majority of teachers in the US do not exploit the connectivity of the Internet on a regular basis.

Use of the Internet for construction activities was even more rare, with 2% of students in elementary schools and 4% in middle schools having published material on the Web itself (Becker, 1999). In a similar vein, Berg et al. (1998) found that on average few students design and create Web pages, as this activity is on a par with the use of data probes and Lego Dacta. This led Becker and Ravitz (1999) to conclude from their related study of the National Schools Network that most teachers regard:

> *The Internet primarily as a resource for expanding the information environment for students rather than as a means of publishing student work for an audience or broadening their real-world contact with other adults and age peers (p.372).*

The above situation appears to be similar in the UK. In its Annual Report, OFSTED (1998) noted that while some teachers are beginning to use the Internet to support topic work, the quality of much of this is superficial and there is little purposeful electronic publishing. Similarly, the Real Time report based on a survey of IT skills in Australian schools stated that:

> *...even students with advanced technical skills may be treating the computers as little more than a source of information that is easily pasted, undigested, into projects and assignments, so that their main relationship to resources such as the Web is to try 'to access and view as much of it as possible' (Department of Education, Employment, Training and Youth Affairs, 1999, p.343).*

The limited use of Web construction in Phase One, however, needs to be seen in the context that based on the Web66 Registry less than 50 New Zealand primary schools had their own websites at this time (Darling, Peterson & Smith, 1998). This figure compares with 17% of primary schools according to ITAG's survey conducted by Sullivan and Anso (2000). If either figure is accurate, then the sample profile compares favourably with international comparisons, as more than half the teachers work at schools with their own websites. Yet again, this provides evidence that a core group of teachers is making innovative use of the Internet for learning and teaching unique from those in the wider teaching population.

While most internet-using teachers are atypical from colleagues, a surprising finding by Becker (1999) was that there was no significant difference between the duration these teachers had been using computers in their teaching and their use of email and the Web with students. In other words, prior teaching experience with computers *per se* made almost no difference in teacher use of the Internet for student research or for more sophisticated online projects and electronic publications. This finding challenges the assumption that the Internet is a domain for already experienced computer-using teachers. Again, it provides evidence that a younger generation of less experienced teachers may be having an important role in shaping the adoption of the Internet in schools.

Of course, data on access, usage, frequency and type of use by age or generation can be deceptive. As Becker, Ravitz and Wong (1999) point out, classifying Internet use by gross type does not provide sufficient information about the way its use is shaped by a specific pedagogical orientation. These data are insensitive to the context in which particular internet-related activities and applications are used in the classroom. Thus, a deeper level of pedagogical analysis is required, which takes into account teachers' pre-existing methods of teaching and investigates instructional changes arising from Internet use, such as completion of longer projects, increased focus on real world problems, more use of interdisciplinary content, and greater opportunities for collaborative learning (Becker & Ravitz, 1999). The lesson is that how teachers adapt and assimilate the technology according to their pedagogical orientation has the potential to reveal yet another layer of the Internet as a social, economic and educational phenomenon.

6.3 BELIEFS ABOUT THE LEARNING AND TEACHING PROCESS

This section interprets the results that relate to the research question: What beliefs do internet-using teachers have about the learning and teaching process? It reflects on: (a) the nature of the teacher's role and (b) the participants' pedagogical orientation toward the learning and teaching process with specific reference to constructivism.

Teacher's Role

The description of the teacher's role was both enlightening and problematic. It was enlightening because most teachers articulated a clear philosophy based on a conscious decision to adopt a particular teaching style. This is evident from the high level of self-reported knowledge of teaching and the detailed response to the question requesting information on their teaching philosophy. Herein lies the problem. Their philosophy was often eclectic, which meant the teachers drew on a combination of teacher-centred and learner-centred methods of instruction when describing their teaching approach. For instance, the majority of teachers claim to place equal emphasis on learning as both a product and process by promoting active learning experiences alongside the acquisition of facts and correct answers. In other words, there was a tendency toward the adoption of the middle ground, which could indicate over-reporting of teaching methods that are perceived to be socially acceptable—a common finding in survey research (Becker & Ravitz, 1999).

Whatever the reason, the selection of a single metaphor of the teacher's role along the traditional continuum from manager of instruction to facilitator of learning was problematic. Although this dichotomy was effective in trying to classify different pedagogical and philosophical approaches, as the Literature Review argued it conveys a one-dimensional impression of the teacher's role.

The questionnaire responses offer little or no insight into how individual participants interpreted the various terms, especially given that some of the philosophy statements contradicted the selected metaphor, which is not apparent in the presentation of the results. This observation shows that different terms mean different things to different people. Hence, we need to question the validity of using this technique to gather trustworthy data on a person's orientation to the teacher's role. Frankly, the results exposed the limitations of a questionnaire in eliciting data on teachers' beliefs, given the dynamic and idiosyncratic nature of the teaching process.

Pedagogical Orientation

At the same time, the teachers did not all hold the same belief. Indeed, there is sufficient evidence of major pedagogical and philosophical differences between some of the teachers, as reflected in the contrasting descriptions of teaching philosophy. It is apparent from the written responses that some participants unashamedly adopt traditional "old school" methods whereas other teachers perceived themselves to be "constructivist" in their pedagogical orientation. Several teachers, for example, made explicit mention of constructivism and their use of the phrase "guide on the side" is common within the constructivist literature. An emphasis on individual learning styles was another common theme to emerge throughout the philosophy statements, a theory often loosely associated with constructivism.

The adoption of a constructivist perspective has taken on new significance since the publication of Becker (1999), Becker and Ravitz (1999), and Dexter, Anderson and Becker's (1999) work on the role of constructivist teaching methodologies as a predictor and outcome of teachers' Internet use and perceived value. In this context, the term constructivism is defined as an '... approach to teaching that involves having students work on complex projects, often in groups, and often with different groups working on different projects' (Becker, 1999, p.20). These projects were deemed to follow constructivist theory when learning and Internet use are embedded in context-rich activities where subject-matter becomes meaningful and, therefore, understandable for students. This contrasts with a more traditional "transmission model" of teaching where students master a sequential set of facts, skills and concepts through listening, reading and note-taking in teacher-centred whole class instructional contexts (Becker, 1999).

Although there are subtle variations of interpretation, this dichotomy underpins each of the aforementioned surveys in which Becker was involved. In the national TLC survey, for example, Becker (1999) asked teachers to respond to a number of questions about their beliefs of what constitutes good teaching and about how they teach in the classroom. In one question, teachers were asked to compare two teachers' approaches to classroom discussion,

one approach representing traditional teacher-directed questioning whereas the other represented teacher-led discussion that provoked questions from the students themselves. The responses were then analyzed according to five "factors" related to constructivist pedagogy. However, Becker and Ravitz (1999) went further in their related study of the National School Network by conceptualizing these factors under four categories of teacher beliefs and practices that have contrasting constructivist and traditional poles. These categories were: (a) the tasks given to students, (b) the structure of the curriculum, (c) general teaching style, and (d) related perceptions (Becker & Ravitz, 1999). The two linked surveys both measured constructivist pedagogy under a number of sub variables including the value of a quiet classroom, use of multiple simultaneous classroom activities, doing "hands-on" collaborative projects, solving problems with no obvious solutions, and undertaking tasks where there is no correct answer. Identification of such variables in the context of the Internet provided the potential for a much deeper level of pedagogical analysis than previously undertaken. This is why some of the measures of pedagogical orientation employed by Becker were adapted for use in the Phase One questionnaire.

As stated, the questionnaire results painted a rather blurred picture of the teachers' pedagogical orientation. However, the picture was far more visible in Becker's research where the findings were almost black and white. In terms of computer and Internet use Becker (1999) found that:

> *Teachers who regard education as primarily the distribution of facts and skills to students according to a fixed curriculum sequence are much less likely to exploit the Internet than more "constructivist" teachers (Becker, 1999, p.28).*

In other words, the more constructivist the teacher the greater their use of and the more positively they perceived the Internet. Evidence of such a significant difference between traditional and so-called constructivist teachers was based on factor and multivariate analysis showing that:

> *In particular, frequent computer and Internet use seem to be related to (a) teachers being more willing to discuss a subject about which they lack expertise and allowing themselves to be taught by students, (b) orchestrating multiple simultaneous activities occurring during class time, (c) assigning long and complex projects for students to undertake, and (d) giving students greater choice in their tasks and the materials and resources they can use to complete them (Becker & Ravitz, 1999, p.381).*

On average, elementary teachers reported more of these types of pedagogical changes to their teaching practice over the past few years than their middle or high school colleagues. However, a point easily overlooked in this analysis is that computer use at the elementary level was strongly correlated with only one type of change—that is, more frequently having students revise their work. No doubt, this reflects growth in the use of word processing within the writing and language programme. The lack of positive correlation on other measures suggests that these changes have been influenced by factors other than computer use, which is an important point that Becker and Ravitz (1999) fail to highlight. The key point is that we are no closer to understanding the sources of these changes from Becker's work.

In terms of the Internet, the correlation with pedagogical change is far stronger—at least statistically. The strongest changes were associated with increased use of long-term projects, increased use of assignments linked to real world contexts, and observing more advice exchanged among students. Despite this, the relationship between Internet use and pedagogical change is weakest at the elementary level. The most significant changes correlated with Internet use appeared at the secondary level, particularly in the areas of science, social studies and non-core subjects. Of course, changes toward more constructivist methods have to be seen in the context of Harris and Grandgenett's (1999) finding that teachers who had used computers longer had more teacher-centred beliefs than their colleagues. Thus, the literature is not as clear-cut as Becker would have people believe.

Whether or not instructional changes are associated with the advent of new computer technology, Becker and colleagues place constructivism at the heart of Internet use in schools. In many ways the centrality of constructivism is consistent with the high profile of this perspective within the professional discourse, as evidenced by the recent work of Jonassen, Peck and Wilson (1999). In the backdrop of the constructivist movement, the key finding to emerge from Becker and Ravitz (1999) is that those teachers who report having changed their teaching practice in a learner-centred direction are the same teachers who have taken advantage of the opportunities of incorporating the Internet into their instructional repertoire. In other words, a preference toward constructivism is claimed to be common to all teachers who are early adopters of the Internet. Methodological weakness of the sample selection technique aside, Falloon (1999) also comes to the conclusion that a constructivist philosophical alignment is central to exemplary computer use in his New Zealand study of six hand selected primary teachers.

Despite this claim, there is a serious problem in the marriage between computers and constructivism. Becker and colleagues treat constructivism as unproblematic but in the educational psychology and philosophy of education literature there is considerable debate over the different faces of constructivist theory (Matthews, 1995; Phillips, 1995).

Constructivism is not a well-defined set of agreed teaching strategies as implied by Becker. That particular version of constructivism is rather narrow as it takes little or no account of alternative learning theories and/or competing philosophical perspectives. Suffice to say the definition adopted by Becker—which is similar to that articulated by Jonassen and colleagues—ignores some of the deeper ontological and epistemological issues surrounding different interpretations of constructivist theory. Beyond this, there is no attempt to take into account the moral, ethical and political beliefs that inform and underpin teachers' work. These basic failings highlight the instrumentalist assumptions that still dominate research on the teacher's role in the use of new educational technologies.

To their credit, Becker and Ravitz (1999) point out three possible interpretations of the potential changes in teacher beliefs. The first is whether the causal impact is that the teachers had a predisposition toward constructivism in the first place, and they simply needed the appropriate tools and contexts to translate constructivist theory into practice. Second, they hypothesize that it may be that the experience of using computers and the Internet has led in a substantial way to otherwise "non-constructivist" teachers rethinking their pedagogical orientation and teaching philosophy. Either way, Becker and Ravitz (1999) reject the third option of a theory of spurious correlation. Indeed, they conclude the relationship between Internet use and pedagogical change is truly causal. In their view, the remarkably consistent pattern across the board is not simply a spurious outcome of already innovative teachers who happen to use technology and thereby develop constructivist pedagogy.

In sum, there is no doubt that teachers' pedagogical beliefs lie at the heart of their use of the Internet for learning and teaching. Whether Internet use is strongly correlated with a truly constructivist pedagogical orientation is open to debate. After all, retrospective recall through a questionnaire taking over an hour to complete is not an entirely trustworthy research technique for eliciting data on teachers' deeply held beliefs. Aside from this obvious methodological limitation, there is still much to learn from the study of internet-using teachers. Still little is known about teachers' ethical, moral and political beliefs, which means there is need to be wary of superficial investigations of dichotomous teaching approaches with the Internet. In short, this type of research belittles the complex and deeply rooted nature of teachers' pedagogical beliefs.

6.4 CHANGES TO TEACHING PRACTICE AND WORK CULTURE

This section interprets the results that relate to the research question: What changes to their practice and work culture do teachers report from using the Internet for learning and teaching? It reflects specifically on: (a) the lack of change, (b) the stages of Internet adoption and (c) the relationship between teacher change and school culture.

Lack of Change

Teachers' work is not static. Consequently, one would expect teachers' pedagogical beliefs to change as the nature of their work changes. With this in mind, it was interesting that few teachers report a change in their teaching philosophy due to the advent of the Internet. On the one hand, this might indicate the Internet is still too new to have had a major influence on their philosophy. Then again, it might suggest these teachers already have well-developed philosophies that harmonize with the educational potential of the Internet. Hence, this explains no or very little reported change. This hypothesis is akin to the explanation provided by Becker and Ravitz (1999) of a direct association between computers and constructivism. Of course, the teachers in Phase One were asked whether the Internet had changed their teaching philosophy—not whether their philosophy had changed *per se.*

An alternative explanation is that many teachers have entrenched philosophies impervious to developments in new educational technologies. While the purposive nature of the sample would suggest otherwise, there is potential support for this hypothesis from the analysis of responses by generation. A breakdown of data by age shows the Internet is having a greater impact on the philosophy of younger teachers, which is consistent with international research (Becker, 1999; Department of Education, Employment, Training and Youth Affairs, 1999). Yet again, this highlights an interesting split between older and younger teachers at least in terms of self-reported perceptions.

If age is an important factor—notwithstanding the potential covariates other than age—then this is not necessarily positive. It could be the Internet is steering younger teachers with less professional experience toward a more technical orientation—that is, a practical craft view of teaching. Alternatively, their enthusiasm for the Internet might be shaping a radical constructivist perspective where teachers believe learning occurs by osmosis in hi-tech information rich landscapes. Currently, there is insufficient evidence to refute or support this type of speculative observation.

In the meantime, the unexplained paradox is that despite high levels of confidence and enthusiasm shown toward the Internet in Phase One, few teachers believe it has positively affected their teaching. On the surface, this is surprising. It may be that teachers with high levels of self-efficacy toward the use of educational technologies, but who report no change of philosophy or positive impact on teaching, have framed the Internet within the wealth of their experience, which mediates against major changes of a pedagogical nature. In other words, teachers do not change their philosophy and teaching practice without judicious reflection drawing on years of pedagogical wisdom. The incubation process for change may

take far longer for experienced teachers based on what is known about the differences between novices and experts, as synthesized in the Literature Review. Although highly speculative, this "lack of change" theory provides further justification for the study of internet-using teachers with a wealth of teaching experience.

Another explanation for the lack of change appears in the validation study of self-report measures undertaken by Dexter, Anderson and Becker (1999). This research was conducted before Becker's other surveys as a way of piloting and gathering baseline data on teacher beliefs and practices. Arguably, this preliminary research is more trustworthy than the other two studies combined, as it goes beyond questionnaire responses and eloquent statistical analysis. Instead, it involved interview data, pilot questionnaires and detailed classroom observations of 72 teachers in 24 schools renowned for their use of computers. Of the trilogy, this study provides the most insight on the influence of constructivist pedagogy in shaping teachers practice and views of computers as catalysts for changes to their teaching philosophy. The interview asked teachers to describe their best and worst experience with computers and the software they found most essential to their teaching. In addition, teachers recalled critical experiences that caused them to rethink their teaching and commented '...on whether computers changed what they wanted to accomplish or helped make changes they already wanted to make' (Dexter, Anderson & Becker, 1999, p.225). From this grounded approach, a number of categories were developed to depict the different instructional styles—namely, non-constructivist, weak constructivist and substantially constructivist.

The majority of teachers were categorized as constructivist but regardless of the category, all participants had changed their teaching practice and they did not think that computers were the catalyst of this change. Across the board, they made it clear that new educational technologies did not automatically cause more constructivist practices (Dexter, Anderson & Becker, 1999). Instead, a variety of reasons were provided for pedagogical changes including experiences in the classroom, reflection on those experiences, formal learning opportunities and the professional culture of the school. Interestingly, teacher reflection—the most often mentioned influence—was not exclusive to the constructivists as a source of change. This finding suggests that critical reflection can influence teachers to change their practice in a variety of directions, which might explain why nearly all teachers in Phase One claim to be deeply committed to reflecting on the quality of their teaching. The above explanation may also account for why few teachers in Phase One perceived the Internet itself had changed their teaching philosophy.

The stand out feature of this validation study was that individual pedagogical changes, with or without computers, were the result of thoughtful reasoning based on professional knowledge constructed within a wider socio-political climate. As Miller and Olson (1994)

contend, 'Teachers do things for good reasons' (p.123). This astute observation contradicts many of the over simplified rational assumptions presented by Becker and colleagues in their larger follow up research on Internet use and associated teacher beliefs. Thus, in a prophetic sense, Becker and Ravitz (1999) were right when they stated '...we are still at an early stage of understanding the dimensions of how various experiences with computer technology help to change how teachers go about their work' (p.380). The lesson is that researchers and policy-makers need to move beyond simplistic views of the Internet as a catalyst for pedagogical change, as this disregards the wealth of literature on the complex, dynamic and subjective nature of the change process.

Stages of Internet Adoption

In the past, teachers' adoption and implementation of educational technology has been described as developmental (Sheingold & Hadley, 1990). There is consensus in the literature that teachers use of computers evolves as they gain experience (Ertmer et al., 1999). Whereas teachers initial use tends to support existing teaching methods, over time these approaches appear to change (Dwyer, Ringstaff & Sandholtz, 1991). As teachers gain more experience, they become more comfortable and expert at integrating the computer into the classroom (Hadley & Sheingold, 1993). Thus, the pedagogical use of computers is assumed to progress through a series of stages from novice to expert. As teachers advance through these stages, their computer use 'becomes more frequent, more sophisticated, and more creative—that is, they use more types of applications more often and more flexibly' (Ertmer et al., 1999, p.55). Indeed, Hadley and Sheingold (1993) claim that with experience teachers gradually manage more expansive uses of the computer that in due course engender new approaches to the curriculum itself.

In recent years, this theory has given rise to a number of stage models of teacher development (e.g., Ager, 1998; CEO Forum, 1999; Haymore-Sandholtz & Ringstaff, 1996; Heppell, 1993; Marcinkiewicz, 1994; Ministry of Education, 1998c; Moersch, 1995). Essentially these models are variations of the Concerns-based Adoption Model (CBAM) first proposed by Hall and Loucks (1977) as a way of evaluating an innovation or change in teaching practice. Notably, the CBAM was developed at the time of Havelock's (1973) "linkage model" of educational change where the focus was on *adoption* rather than implementation of an innovation (Ely, 1999). Even in terms of implementation, the CBAM is conceptually flawed as it assumes a rational view of school improvement (Hopkins, Ainscow & West, 1994). Since the model was first proposed, there have been a number of important developments in the study of educational change. The key point is that many assumptions about computer adoption, teacher development and educational change are out of step with the contemporary literature.

This point is illustrated by the teachers' response to the different genres or categories of adoption taken from Hadley and Sheingold's (1993) study of accomplished computer-using teachers. Although the self-reported responses to this taxonomy confirm that at least some of the sample is unique in the wider population of teachers (e.g., the number of "Committed Innovators"), this question lacks content validity. In this sense, content validity refers to the categories representing the type of genre they are supposed to represent. We have already seen how the response to a single word or brief phrase can be ambiguous and potentially misleading. This is evident from some of the most experienced internet-using teachers identifying with the "Enthusiastic Beginner" category. If the intention is to use these genres for the purpose of comparison, then further descriptions of each category are required to reduce the potential ambiguity.

Then again, the inconsistent responses may highlight what Fullan and Stiegelbauer (1991) describe as the "subjective realities" of educational change. That is, the deeply rooted personal nature of change where people mediate the same change differently. From this grounded perspective, the response to change is not predictable and generalizable, which partly explains the teachers' different interpretations of the different genres in Phase One. As Fullan (1993a) points out, those who understand the nature of educational change appreciate its volatile character. For the individual, change involves loss, anxiety, and struggle where people pass through zones of uncertainty (Fullan, 1993b). Therefore, policy-makers should not expect a uniform response from teachers when attempting to implement an innovation. Thus, researchers need to 'understand what change means for the individual teacher and to develop strategies which take these differential meanings into account' (Fullan & Hargreaves, 1992, p.49). In the future, rather than try to more precisely define the different genres it is better to understand why individual teachers responded in different ways, as this will provide deeper insight into their subjective realities.

A number of other stage models of teacher development are relevant to the adoption and implementation of the Internet. Probably the most well known model is derived from the Apple Classrooms of Tomorrow (ACOT) Project. ACOT involved a longitudinal research and development programme investigating teachers' classroom computer use over a 10 year period. From this national "test-bed" of computers in classrooms—albeit Apple products only—the researchers identified five stages of instructional evolution. They labelled these stages: (a) entry, (b) adoption, (c) adaptation, (d) appropriation, and (e) invention. (Haymore-Sandholtz & Ringstaff, 1996).

At the "entry stage", teachers had little or no experience with computers and they demonstrated little inclination to significantly change their instruction. While teachers began

to use computers, they simply replicated traditional instructional methods and learning activities. Then teachers moved into the "adoption stage", where their 'concerns shifted from connecting the computers to using them' (Haymore-Sandholtz & Ringstaff, 1996, p.286). However, they merely adopted the technology to support their established methods of instruction. The "adaptation stage" brought changes in the efficiency of the teaching process. Teachers increasingly incorporated the computers into their teaching, and focused on ways in which students could use a number of productivity tools. In time, teachers reached the "appropriation stage" where their roles began to shift noticeably as they began to reflect on teaching and new instructional patterns emerged (Sandholtz, Ringstaff & Dwyer, 1997). For example, team teaching, inter-disciplinary project-based learning, and individually paced instruction became more common. A critically important shift occurred during this phase as teachers better understood computers and used them effortlessly as a tool to undertake authentic work. The "invention stage" marked a time when teachers began to implement a truly integrated curriculum that made creative and strategic use of the technology within a balanced learning environment.

This final level is similar to the model proposed by Somekh (1998) where teachers begin at an "orientation stage" and pass through a number of other stages—"preparation", "routine", "refinement", and "integration"—before eventually achieving "creative integration". In like manner, this model fits well with one recently proposed by Knezek and Christensen (1999) that culminates in teachers making "creative application of technology to new contexts". At this stage, teachers can apply what they know about ICT in the classroom and they can use it as an instructional tool and integrate it into the curriculum (Knezek & Christensen, 1999). The other five stages of technology adoption begin with "awareness" where teachers have not used ICT and/or avoid it wherever possible. The next stage involves "learning the process" in which teachers have basic skills but they lack confidence and are often frustrated when using computers. After this, teachers acquire a better "understanding and application of the process" as they can now think of specific tasks in which computers might be useful. The "familiarity and confidence stage" is where teachers become more self-confident about using computers for specific purposes. In the "adaptation to other contexts stage", teachers think of the computer as a tool and are no longer concerned about it as an unrelated technology. They can use it in many applications for a number of instructional purposes but have not yet fully integrated the computer, which is the final stage.

This model has particular relevance because Sullivan and Anso (2000) used an adapted version of it to access the extent to which ICT was integrated into the learning and teaching process in New Zealand schools. In this ITAG survey, principals were asked to indicate at which stage they perceived most teachers in their school were, in their adoption of ICT. Interestingly, most primary teachers were in the middle stages of adoption—at least

principals think so—with the largest group (40%) in the "familiarity and confidence stage"—that is, stage four (Sullivan & Anso, 2000). It is salient to note that only six percent of teachers were described as having reached the final creative application stage. Thus, in terms of Hadley and Sheingold's (1993) genres the ITAG survey uncovered few "accomplished achievers", consistent with the results of Phase One.

In contrast to many of the models, Ertmer et al. (1999) advance a stage theory that reframes computer use in relation to the curriculum. This model has a number of subtle but important conceptual accommodations, which make it more robust than some of the aforementioned stage theories. It makes a threefold distinction between the computer being used to: (a) supplement the existing curriculum, (b) support the existing curriculum, and (c) facilitate an emerging curriculum. That is, teachers might begin by using computers in ways that are supplementary to the curriculum but progress towards uses that reinforce or enrich their current topics and teaching methods. Eventually, teachers will capitalize, hopefully, on the potential of the computer to take students beyond the existing curriculum. The assumption is that:

> *The "best" fit is not one in which there is some overlap between technology and the curriculum (concentric circles), but one in which technology facilitates learning beyond what is currently possible (spiraling circles) (Ertmer et al., 1999, p.56).*

This last statement implies that curriculum integration is not the ultimate goal. Although Ertmer, et al. (1999) fail to make this point explicit, the final level can be read as those teachers who reconceptualize the curriculum itself. Having said that, Ertmer, et al. (1999) found no one at this level in their purposive qualitative study of computer-using teachers, further evidence of the lack of "accomplished achievers".

Although the model suggests that progression to the most advanced level is sequential, teachers are thought to use computers at more than one level simultaneously (Ertmer et al., 1999). This is an important concession that highlights a major conceptual flaw in previous developmental models. After all, the computer is not a fixed variable. In fact, the computer industry is highly dynamic and teachers are always going to be required to develop awareness of new developments. Hence, the process is iterative, not linear, with a high level of reciprocity between different phases of adoption, implementation and curriculum integration.

Ertmer, et al. (1999) help to expose another flaw by acknowledging that computer use may continue at one level indefinitely because of the relative stability of teacher beliefs. Thus, it is

wrong to assume a linear progression or trajectory through the various stages as teachers acquire more computer and pedagogical experience. As Ringstaff, Sandholtz and Dwyer (1991) observe from the ACOT Project:

> *Increasing attention is being paid to the idea that lasting change in the classroom must be accompanied by changes in teachers' beliefs about the purpose and nature of instruction, and that these belief systems are remarkably resistant to change (p.7).*

This observation shows that greater cognizance needs to be taken of the contemporary educational change literature. Trajectory adoption models are at odds with dynamic theories of educational change taking into account the complex and deeply subjective nature of the change process (Fullan & Stiegelbauer, 1991). At an individual level, the subjective process of adoption and implementation is likely to be far more fragile and context specific than currently acknowledged in the literature. Indeed, from a cognitive perspective there is a possibility that some teachers may even regress to an earlier stage (if these exist) depending on how they mediate a specific computer experience.

It must be borne in mind that examples of teachers moving through different stages typically come from a small number of early adopters in lighthouse schools where there is access to sufficient resources (Ertmer et al., 1999). Missing from the literature is a description of what the developmental process is like for regular teachers who have limited resources—that is, those working under naturalistic conditions. Even in atypical settings, Becker and Ravitz (1999) show that teachers with more computer and pedagogical experience do not always use more types of applications more often and more flexibly, as most stage models assume at the advanced levels. Their research suggests that in some cases experienced teachers make intensive use of only a handful of software applications—for instance, multimedia construction (Becker & Ravitz, 1999).

In sum, stage models of teacher development fail to acknowledge how individual teachers mediate the change process in neither logical nor predictable directions. On closer analysis there is an implicit behaviorist perspective embedded within this type of stage theory. Arguably, the various stages of adoption are nothing more than a dressed up chain of learning in response to external forces. Moreover, the notion of a pinnacle of instruction reflects a technical rationality model of teaching as it fails to recognize the complex and intellectual nature of teachers' work, and the multiple trajectories of professional growth. Across the board, the different stage models treat the definition of good teaching as unproblematic because they ignore the ethical, moral and political dimensions of critical pedagogy.

Teacher Change and School Culture

The study of change is quite new (Lieberman, 1998). According to Hopkins, Ainscow and West (1994) there have been three major perspectives of educational change: (a) the technological, (b) the political, and (c) the cultural.

The technological perspective is the most dominant and least successful form of change. It is characterized by centralised approaches to curriculum innovation at the local and/or national level. This perspective assumes that change evokes an orderly and rational response from teachers when the innovation is based on systematic policy and planning.

The political perspective recognizes that educational change inevitably involves conflict. Change by its very nature involves teachers and groups doing new things that inevitably disturb the status quo (Hopkins, Ainscow & West, 1994). This perspective recognizes the micro-political aspects of educational change in that some teachers will perceive an innovation to be an improvement whereas others will consider it irrelevant and even a waste of time.

The cultural perspective is concerned with the social setting in which the innovation or change takes place. It considers the cultural norms and social practices that are disrupted when innovation threatens. The problem of change is treated as essentially a cultural one (Hopkins, Ainscow & West, 1994). This perspective considers the complexities of school life and the ways in which the culture of an organization constrains and encourages teachers' work. From this perspective, Becker and Riel (1999) claim that school culture is one of the most powerful variables affecting the use of educational technology for learning and teaching. Schools, like all social organizations, have cultures that reward, foster, discourage, or constrain the actions of teachers.

While the study of school culture is largely beyond the scope of this research, it deserves brief mention for at least two reasons. First, Internet use by teachers is situated within the norms, values, and beliefs of how things are done within a school. No teacher works in isolation and the results must be interpreted with this in mind. The second reason is that Becker and Riel (1999) analyze the results of the national TLC survey in terms of school culture and the emergence of constructivist-compatible pedagogies. Their assumption is that studying teachers' orientation towards teaching and the collective orientation of a school's teaching staff is important because such variables are likely to be key levers for changing teachers' beliefs and classroom practices (Becker & Riel, 1999). The role of school culture from their perspective is expressed in the following statement:

How teachers organize their classes to a large extent reflects their beliefs about good teaching. Nevertheless, their practices, and to a lesser extent even their philosophies themselves, are subject to influence based on their continual experiences in teaching, the values and opinions expressed by their peers around them, and by the expectations of influential others which are transmitted to them through formal rules and procedures and informal norms (Becker & Riel, 1999, p.10).

Using data from the national TLC survey, Becker and Riel (1999) examine teachers' personal orientation to the work of teaching and compare this with the social or interpersonal dimension of their school culture. The relationship between these two dimensions of teacher professionalism is, then, analyzed in terms of some of the aforementioned findings related to teacher beliefs and teaching practices. Using four constructs spread across a continuum, on one axis Becker and Riel (1999) make a binary distinction between teachers with a "classroom orientation", as opposed to those with a "professional orientation". This distinction attempts to identify those teachers whose focus is on the classroom implementation of the curriculum, with little or no critique, in contrast to others who have an orientation towards professional engagement and leadership. Teachers at this end of the continuum 'see their responsibility in terms of their relationship to their students and to the larger educational community' (Becker & Riel, 1999, p.4).

The contrast between a classroom orientation and a professional orientation was measured by three multi-part questions that examined: (a) within school teacher interactions, (b) beyond school teacher contact, and (c) professional leadership. On this basis, teachers were classified into four groups with three percent only meeting the strict criteria as "teacher leaders". Another 12% were described a professionally active. The remaining teachers were classified as either collaborative classroom teachers (30%) and classroom focused teachers (55%). The findings are claimed to show a significant difference in teaching practice between '... teachers who focus almost solely on their own classroom responsibilities and those who take leadership roles and are in frequent professional contact with other teachers'. (Becker & Riel, 1999, p.21). The latter group is the same teachers who believe that students should take active leadership roles in creating their own knowledge. In other words, these teachers were more likely to adopt constructivist approaches in the classroom.

On the school culture axis, a dichotomy was drawn between "private practice" teachers, as opposed to those with an orientation toward "professional collaboration". The assumption was that some school cultures can be characterized as situations where teachers' work is essentially private. In these schools, interaction among teachers is rare and organizational goals are not articulated or quite diverse. Thus, the schools are characterized as supporting

private practice among teachers. In contrast, there are schools where teachers frequently interact with one another. These schools encourage collaborative work in which teachers participate in shared learning experiences. Becker and Riel (1999) refer to this type of school as a professional collaborative work culture.

They adopted four main aspects of school culture as a framework to measure the extent to which this variable affected teachers' work. They included: (a) consensus and salience of school-wide goals, (b) organization of teacher learning opportunities, (c) presence or absence of a collegial learning community, and (d) teacher recognition and evaluation practices. In addition, the impact of school culture was measured in terms of the external pressures teachers felt under to teach in certain ways despite their better judgment. Although not made explicit, to their credit this question potentially addressed the political dimensions of teaching with educational technology.

The overwhelming majority of teachers with a professional orientation reported shared school-wide goals and the existence of a learning community supporting professional growth where colleagues help one another to become more successful at their work (Becker & Riel, 1999). Again, there was a positive correlation between some factors of school culture and classroom practice. For example, if the school culture was one in which teachers were continually learning and there is strong support for experimentation, this was correlated with a similar description of the characteristics of the learning environment for students. In terms of external pressures, teachers felt more pressured around the issue of assessment than around any other issue. Notably, relatively few teachers (15%) felt pressured to incorporate the Internet into their teaching against their better judgment. Of course, the national TLC survey did not actively seek participants who were not using computers in their teaching and these teachers may well have a different opinion.

Overall, both dimensions—school culture and orientation to teaching role—were found to be related to teachers' pedagogy. The more teachers engaged in professional collaboration within and beyond their schools, the more likely they were to self-report an orientation toward constructivist teaching methods. Conversely, teachers who did not participate in any professional leadership activities in the educational community were found to be the teachers who adopted traditional methods of instruction. Based on this finding, it would appear that Becker and colleagues have initiated an important line of inquiry in their focus on school culture. However, this research needs to be treated with extreme caution. In addition to the aforementioned methodological limitations, there is a serious flaw with the definition and stated measures of school culture. The term "school culture" remains enigmatic and much abused in the educational discourse. As Prosser (1999) writes:

> *There is no agreement on the definition or meaning of the terms school culture, climate, ethos, atmosphere, character and tone, used to evoke what is too often assumed to be a common phenomenon that needs little explanation (p.5).*

A typical definition of school culture from an anthropological and sociological tradition describes this concept as the historically transmitted patterns of meaning that include the norms, values, beliefs, ceremonies, rituals, symbols, stories and myths that are understood by members of the school community (Hargreaves, 1995; Schein, 1997). Despite subtle variations in the literature, there are two main interpretations of this type of definition (Prosser, 1999). The traditional interpretation is that school culture is a holistic entity that pervades and influences everyone within a school. According to Prosser (1999), managerialists who assume that organizational culture pervades the fabric of school life affecting all participants similarly favour this view. It would appear that Becker, Riel and Irvin (1999) subscribe to this tradition in their analysis of school culture.

An alternative view is that school culture is the result of multiple interactions between individuals and groups who form sub-cultures, which co-exist and compete with each other (Prosser, 1999). Increasingly, there is a belief that schools unique culture is the aggregation and amalgamation of its sub cultures. There has been a move away from research investigating holistic notions of school cultures and a growing interest in understanding sub cultures and their dynamic inter-relationships. In this regard, Becker's analysis offers little or no insight into the dynamic inter-plays between individuals and sub groups within most schools. Indeed, the response to a postal questionnaire, even after impressive statistical analysis, is unlikely to reveal insight into the level of sub-cultural fragmentation within the overall school milieu. In the future, the challenge is to link the research on new educational technologies to the contemporary literature on school culture and the idiosyncratic nature of teachers' work.

6.5 HOW THE INTERNET SUPPORTS LEARNING AND TEACHING

This section interprets the results that relate to the research question: What perceptions do teachers have of how the Internet supports the learning and teaching process? It reflects on: (a) the perceived value of specific computer activities and applications, and (b) the teachers' perceptions of the Internet in terms of instructional benefits and its wider educational significance.

Activities and Applications

So far, this chapter has considered teachers' access, usage, frequency and type of Internet use. It now shifts attention to the value teachers place on different internet-related activities and applications for learning and teaching. This recognizes a crucial difference between what teachers use and what teachers value. Berg et al. (1998) found, for example, when they asked exemplary computer-using teachers what software they judged most important, that the Web was highly valued despite its infrequent use in the classroom. Indeed, the Internet in all of its manifestations rated in importance just below the use of computers in the writing process and CD-ROMs for research, which were the most frequent and highly valued applications. According to Berg et al. (1998), the infrequency of Internet use, despite strong belief in its importance by teachers, is easily explained by lack of access. However, access alone does not explain the high value assigned to multimedia authoring when its use was also infrequent. Moreover, it fails to account for the infrequent use of databases and spreadsheets relative to their perceived educational importance. Across the board, teachers valued the importance of different software applications at higher levels than the frequency of their use. This pattern suggests that beyond limited access, other factors have an important bearing on teachers' actual classroom use of computers.

The results of Phase One reveal a similar paradox in that the perceived value of the Web outstripped the level of access, usage and frequency of use by teachers. Whereas the time teachers devoted to the Web in the classroom was less than to educational games, it ranked second to word processing in terms of perceived educational value. Notably, the Web displaces interactive fiction from the list of most valued software previously reported by Brown (1995b). It must be borne in mind that the abbreviated list of software was not inclusive of all options making direct comparisons problematic. Unfortunately, the use of CD-ROMs and multimedia authoring was not included in the original question, as the list of applications was intended to focus on the Internet. Nevertheless, Berg et al. (1998) and Becker, Ravitz and Wong (1999) demonstrate that software such as HyperStudio™ is now highly valued by elementary teachers. Sullivan and Anso (2000) confirm this claim based on its availability in New Zealand schools although interestingly more teachers have access to KidPix than HyperStudio™. Finally, the list of options does not include the use of computers in school administration, as this type of application was beyond the scope of the research. In light of the above omissions, the value assigned to the Web relative to other software applications must be treated with caution.

Notably, the use of email was not valued highly by teachers, which is in stark contrast to the research by Berg et al. (1998) where it was only slightly less important than the Web.

Broadly speaking, there was general agreement in terms of which internet-related learning activity was perceived as having the most educational value—that is, accessing up-to-date information on a current topic through the Web. The use of key pal exchanges between students and other such experiences involving email did not rank as highly in comparison to web-based activities involving investigations and research. Not surprisingly, the perceived value of different internet-related learning activities appeared to closely match the pattern of self-reported usage. In the case of the Internet, the teachers appeared to value the activities that they were most familiar with based on their own first hand experience.

Overall, the remaining software applications followed a similar pattern of perceived value to that shown by Berg et al. (1998) in which the use of Logo was the least valuable in both studies. Thus, it would appear that Logo is no longer fashionable to teachers in either the US or New Zealand. In contrast, there is strong evidence to suggest that the Web has rapidly become highly valued by teachers at least in terms of perception—if not in classroom practice. Although speculative, it follows that over the next few years the Web and to a lesser extent email might replace some of the traditional computer applications in terms of usage and frequency of use. Of course, the demise of Logo teaches us that the rise and fall of some applications is not always an accurate measure of their potential educational value. The lesson is that teacher perceptions do not always match the value of the different software applications expressed within the academic literature.

Instructional Benefits

Since teachers highly valued the Internet, it was not surprising that they were able to identify a number of potential instructional benefits. A striking feature, however, of the perceived benefits was the close fit with the rather binary distinction between learning to use the Internet and using the Internet to learn. Remarkably, few responses to the open-ended question that invited teachers to state the main benefits bridged this somewhat artificial dichotomy. In other words, the teachers tended to identity the value of Internet skills for employment and life in the future or report the potential affective, cognitive, instructional and motivational benefits—but not both.

The potential of the Internet to enhance student motivation was a recurring theme, which Berg et al. (1998) found as the most important reason given by teachers for using educational technology with students. This aside, the main benefits of new technology were perceived as a combination of using the Internet: (a) for its own sake (a variation of the Everest Syndrome) based on a pragmatic rationale, (b) to future-proof job prospects in keeping with a vocational rationale, (c) as a learning tool framed by a pedagogical rationale, and (d) to prepare students for a very different kind of future underpinned by social, economic and transformational rationales. The way teachers used different rationale, and the relative weight

they placed on them, suggests that the participants drew on a range of worldviews when conceptualizing the Internet's perceived benefits.

On the surface, this hypothesis is supported by the bipolar response to the statement about what teachers valued as having the most educational significance for using the Internet in New Zealand schools. The dichotomy between "basic skills and computer literacy" on the one hand, and "developing students' thinking and problem solving skills" on the other, helped to reveal those teachers who placed greater emphasis on the pedagogical as opposed to vocational rationale. Support for the latter rationale was established further in the statement "developing skills for future employment and meeting parental expectations", which typically ranked as the second choice by those who first selected "basic skills and computer literacy". When combined, the level of support for these two statements provided evidence that a sizeable proportion of the sample endorsed the vocational rationale.

However, the tendency of men to support the vocational rationale more than women was not evident in the open-ended question regarding the main curriculum benefits. It was noticeable that many of the responses previously coded under the "learning to use the Internet" category selected either "thinking and problem solving skills" or "the development of social skills for collaboration and working with others" in the follow up question. Hence, the responses were not as binary or clear-cut as perhaps indicated by the presentation of the results. Instead, it appeared that teachers were drawing on competing rationale simultaneously as they grapple to come to terms with the educational potential of the Internet. The fluid nature of the responses once again highlights the limitations of a questionnaire and the fragile nature of teachers' opinions and perceptions. The key point is that Phase One does not provide any basis for sweeping generalizations within or beyond the sample about the use of the Internet for learning and teaching.

In sum, regardless of the perceived benefits, whatever the underpinning rationale, it was salient to note the lack of success at integrating the Internet within the curriculum. Indeed, over half the participants reported a poor level of curriculum integration. Only one teacher claims to have made very good progress. The lack of such progress is corroborated by data on the poor level of access, limited usage, low frequency of use, and narrow type of internet-related activities and applications used by teachers. It is fair to conclude that many teachers are still struggling to incorporate the Internet within their day-to-day work. However, this conclusion needs to be interpreted in the context that at about the same time only 48% of New Zealand principals reported that ICT has had a positive impact on the quality of curriculum delivery (Sullivan & Anso, 2000). The lack of integration is not a problem unique to the Internet and there are many barriers and obstacles to overcome before ICT makes a major contribution to the curriculum.

6.6 FACTORS THAT INHIBIT / ENABLE INTERNET USE

This section interprets the results that relate to the research question: What factors do teachers believe inhibit and/or enable the use of the Internet for learning and teaching? It places greater emphasis on the obstacles rather than enablers of technology adoption by considering a number of: (a) first order external barriers, (b) second order internal barriers, and (c) third order meta-barriers to the pedagogical use of the Internet as a social, economic and educational phenomenon.

First Order Barriers

First order barriers are defined as constraints and limitations that are external to teachers (Ertmer et al., 1999). This definition builds on the work of Cuban (1993a) and Brickner (1995; cited in Ertmer, et al, 1999) who classify first order barriers as being extrinsic factors that prevent attempts to adjust or tinker with the current system to make it more effective or efficient. Typically, such barriers include lack of access, lack of money, lack of leadership, lack of planning, lack of resources, lack of training, insufficient time, and inadequate infrastructure support (Ertmer et al., 1999; Fabry & Higgs, 1997; Zammit, 1992).

In recent years, increasing attention has been placed on these types of barriers. The importance of infrastructure is evident from the issues raised by Bulter and Zwimpfer (1997) and from the impediments to successful IT use identified by the Education Review Office (ERO) (1997). The lack of infrastructure is highlighted also by Capper (1999) and Web Research (2000) in their extensive but unpublished report to the Ministry of Education on the management of ICT in New Zealand schools. When ITAG (1998b) sought principals' perceptions of the major factors that reduce the potential of schools from getting *value* from IT, the list of options was almost exclusively first order barriers. Thus, it is hardly surprising that principals identified cost of equipment and lack of teacher knowledge as the main barriers. Although the questionnaire in Phase One attempted to extend the range of options, teachers were still mostly concerned about first order barriers—namely, cost and availability of equipment. On the face of it, the results appear to confirm the findings of previous research and endorse attempts to overcome such barriers through the ICT Strategy (Ministry of Education, 1998a).

However, this reflects a superficial level of analysis as these barriers can be "read" in different ways. As Fabry and Higgs (1997) argue, 'Access is more than simply the availability of technology in a school' (p.390). In this sense, access involves locating sufficient equipment and the right type of hardware and software where teachers can effectively use it. In Phase One, what barriers do teachers actually perceive when they report lack of equipment if Internet access is available only in the Computer Suite at certain times of

the week? The answer to this question is likely to be very different from how a principal has defined the problem of access. Thus, knowing that nearly all New Zealand schools have Internet access tells very little about the real barriers that teachers face in their work.

The key point is that barriers to Internet use have a different meaning from an insiders' point of view. Ertmer et al. (1999) show that teachers have different reasons for wanting access to more equipment depending on their intended use. In one case, teachers required more equipment because they wanted enough workstations for students to be all doing the same thing. A single computer was an intrusion because it did not fit the way they structured their class. In contrast, another teacher wanted more equipment so that her students could spend greater time creating innovative things in HyperStudio™ as this was valued as an intelligent activity. This distinction shows there is a deeper layer to interpreting what teachers report when they identity an obvious barrier such as lack of equipment. The barriers have different meanings for different teachers and they affect their teaching practice and use of computers in different ways (Ertmer et al., 1999). Therefore, it is naive to assume that these barriers can be eliminated by the *modus operandi* becoming more strategic (Ministry of Commerce, 1999a). That is, by providing additional resources more training, technical support, and so forth. The conceptualization of the obstacles to Internet use by teachers needs to be widened beyond first order barriers.

Second Order Barriers

Second order barriers are defined as conflicts and tensions that are internal to teachers and the places they work (Ertmer et al., 1999). This definition is adapted from that described by Ertmer et al. (1999) who categorize second order barriers as being intrinsic factors that prevent the adoption of new teaching methods and technologies in ways that might reformulate basic conceptions of school and the nature of teachers' work. Typically, such barriers refer to teachers' beliefs about teaching, beliefs about technology, established classroom practices, institutionalized routines, social and interpersonal relationships, and ability and willingness to change.

In Phase One, there was an effort to elicit data on teachers resistance to change brought about by recent developments in ICT. While the research was successful in providing better insight into a number of second order barriers—such as, the lack of collegial support—the internal disturbance evoked by the growth of the Internet is hard to disentangle from a postal questionnaire. Moreover, the teachers themselves are thought to be one of the most significant second order barriers to the integration of the Internet within the curriculum. As Becker and Ravitz (1998) point out, early adopters and pioneering internet-using teachers who emphasize:

> *...collaborative, interschoolastic project-based learning and worldwide publishing of student work (...) have precisely those characteristics that seem likely to produce increasing inequalities in opportunities for student accomplishment (p.4).*

They argue that teachers who teach successful students may be predisposed to experimentation and innovation. Whereas, those who are accustomed to working with lower ability students may, for whatever reason, be inclined to traditional teaching methods. Becker and Ravitz (1998) show from the study of different internet-using teachers in the same school that the strongest user—that is, those with the most knowledge and Internet experience who involve more students in internet-related activities employing innovative projects—teach students of higher ability in comparison to their colleagues. This suggests that the barriers to Internet use in the manner envisaged by contemporary theory are interlocked with the level of student achievement in a complex relationship that has yet to be understood.

In addition, teachers with specific responsibility for ICT are prone to "domain defending" (Page, 1999). This concept refers to a psychological barrier where teachers who possess technical expertise that brings them power and prestige defend, consciously or subconsciously, their elite status. In so doing, their actions may create or maintain barriers between individuals and/or fractions within a school, which are counter-productive towards creative and expansive Internet use.

The above two examples of second order barriers highlight the micro politics of educational technology in the context of schools and reminds that teachers' work is inherently political. It also demonstrates how people either avoid or are attracted to using new educational technologies because they fear a loss of status and perceive their knowledge is under threat (Marcinkiewicz, 1993). If this threat is associated with a change that is imposed from the outside then it is often bitterly resented. As Fabry and Higgs (1997) point out, 'an innate dislike for change (especially change mandated from above) is probably the most basic...' and common barrier to technology integration (p.388). In this regard, there is a need to ask who is promoting the Internet in schools in the first place. The lesson from history is that mandated change in education typically results in superficial adoption rather than implementation and integration with substance (Fabry & Higgs, 1997). It leads to half-hearted compliance where some teachers simply adopt the language of ICT-related school reform but with little or no conviction of real change in their teaching practice. This situation is encapsulated in the following observation:

> *No matter how many computers are available or how much training teachers have had, there are still substantial numbers who are "talking the talk" but not "walking the walk (SEIR-TEC, 1998; cited in Moran, Thompson & Arthur, 1999, p.24).*

Of course, the failure to convert the "talk into walk" highlights the fragile nature of teacher opinions and perceptions and sounds a warning in terms of placing too much emphasis on the questionnaire results. After all, some of the teachers may suffer from "false clarity" thinking that they have changed when they have only assimilated the superficial trappings of the innovation (Fullan, 1993b).

That said, it was predictable that teachers reported lack of time as another major barrier to the effective use of the Internet. In the past, even accomplished highly motivated computer-using teachers have reported lack of time as among the most problematic barriers to curriculum integration (Sheingold & Hadley, 1990). While time is generally regarded a first order barrier, like access, it has multiple layers that lead to trade offs in teachers' work, which are insufficiently understood. Given the raft of curriculum reforms in recent years, lack of time is perhaps the best illustration of an internal barrier in action. From this insider's perspective, it is almost evitable that teachers will have responded in different ways to the competing demands of the curriculum and the pressure of added workload, at least in the short term, associated with the introduction of the Internet.

Again, Ertmer et al. (1999) help to demonstrate how lack of time is interpreted in different ways depending on teachers' beliefs and existing classroom practices. In their study of elementary teachers, for example, some people only used the computer during scheduled instructional time—that is, at a specific time of the day or week usually in dedicated technology-rich locations. Consequently, these teachers did not perceive lack of time to be a significant barrier in the same way as those people who wanted to integrate the computer into their own classroom. To the former group, lack of time related to preparation time and the need to learn how to use new software. In contrast, it meant lack of time to fit the computer into the existing programme for the other teachers. Teachers who believed the computer was an "add on" to the curriculum ascribed yet another meaning to this barrier (Ertmer et al., 1999). In this case, the lack of time was in response to other curriculum areas which the teachers perceived to have greater value. The above example underscores how individual teacher's subjective realities strongly mediate their computer use and Internet adoption for pedagogical purposes.

The lesson is that Phase One provides little or no insight into what teachers meant by the lack of time. It must be borne in mind that many of the barriers identified in the past have come from the study of early adopters and schools with favourable conditions necessary for fostering pedagogical reform through new educational technologies (Ertmer et al., 1999). Moreover, if change is to be widespread, many teachers and the whole teaching profession—not just the enthusiasts—must be engaged in the decision making process (Kuehn & Glickman, 1999). The point is that there is still a need to understand the internal conflicts and tensions that occur within and between teachers in naturalistic conditions that are typical of the majority of New Zealand schools. We know from the case studies undertaken by Boyd (1998) that time, instructional methods, different approaches to classroom management and unresolved debates over the educational value of certain software are all notable barriers. How teachers deal with the internal barriers that the growth of the Internet may engender is an issue for further exploration.

Third Order Barriers

There is a third possible type of barrier frequently overlooked when considering the obstacles to ICT-related school reform. These are meta-barriers which permeate the walls of the classroom and go beyond the school gate at a much deeper cultural, historical and political level. As Cuban (1999) states, presenting the failure of educational technology to penetrate the classroom as merely a lack of access, time, planning or training is eminently sensible but terribly short-sighted. It ignores the wider social practice that affects what teachers do in schools and the reasons why certain teachers teach in particular types of schools in the first place. In this regard, Becker and Ravitz (1998) remind that innovative teachers may be recruited disproportionately to teach in certain communities based on factors such as perceived socioeconomic status. At a meta level, there is a need to consider:

> *...the social and epistemological determinations that already serve to structure the institutions from which the new technology emerges and into which it is placed (Bromley, 1998, p.23).*

It is important to recognise that schools are not islands sheltered from the changes that have taken place to New Zealand society. This point widens the focus and implies that the greatest single barrier for pedagogical innovation is the constraints of the education system itself. In this sense, there is a need to understand how schools and the Internet are enmeshed in more expansive social practices. That is, the powerful social, economic and ideological influences that are shaping society and the education system.

In a loose sense, the competing forces influencing ICT-related school reform and the rapid introduction of the Internet in education are reflected in the different schools of thought described by Bigum (1995). These categories help to explain the competing perspectives on the relationship between technology and society. Drawing on this framework, there is evidence from Phase One to suggest the sample includes a number of potential Boosters, Deschoolers and even Critics. There are no Doomsters, which is consistent with the purposive nature of the sample. Despite this, the majority of the nominated proficient internet-using teachers do not fit within any of the proposed categories. Rather, they appear to be a group of dedicated teachers endeavouring to adopt the Internet as another professional tool in the delivery of the *New Zealand Curriculum Framework* (Ministry of Education, 1993a). This suggests that ICT itself is not driving the curriculum as some people fear. Rather, the intention of most teachers is to assimilate and integrate the Internet in a manner that causes the least disturbance with existing curriculum goals.

In sum, the literature is full of descriptions of the external factors that preclude teachers from making better use of new educational technologies. However, second order barriers including resistance to the growth of the Internet in schools as outlined in Chapter One (e.g., Armstrong & Casement; Healy, 1998; Oppenheimer, 1997; Roszak, 1994; Stoll, 1999) has been largely ignored in the policy and professional discourse. Consequently, the literature is still immature in terms of understanding the real barriers to technology implementation. Few people have attempted to articulate the meta-barriers that conspire against the reconceptualist use of the Internet in schools. There is a danger that principals, politicians and policy-makers alike will continue to misunderstand the nature and complexity of the deeper obstacles to the adoption and sustainable implementation of the Internet as an educational innovation. The challenge is to uncover the multiple layers of the barriers that continue to inhibit the effective use of the Internet by teachers in ways deemed pedagogically sound.

6.7 SYNTHESIS OF EMERGENT THEMES

This section provides a synthesis of the emergent themes from the first phase of the research. It reports the key findings to emerge from an analysis and interpretation of data in accordance with the main research questions. Although many points and issues are worthy of further consideration, the major research findings are synthesized in the following emergent themes:

1. Male teachers make greater use of the Internet. Overall, men of European and/or Pakeha descent report more teaching experience, more years using the Internet, higher levels of personal Internet access, and greater technical and pedagogical expertise. Nonetheless, it is too early to judge whether the greater use of the Internet by men is an outcome of gender alone as there are a number of potential covariates.

2. The Internet is still relatively new to all teachers; however, the sample represents a group of informed, highly experienced and well-qualified teachers. The teachers have a long history of professional development in educational computing and they report high levels of self-efficacy in their personal and pedagogical ability to use computers. There is evidence that teachers are making increasing use of computers and the Internet especially in their professional work outside of the classroom.

3. The majority of teachers do not exploit the potential of the Internet with students on a regular basis. Few teachers have direct classroom access and the most common and frequent use of the Internet was at the senior school and intermediate level. This suggests the Internet is an innovation for teachers working with older students at senior levels often in specialized lab settings.

4. While the Internet was most prevalent at the senior level, comparatively few students use email or the Web at school on a frequent basis. Little or no use is made of other internet-based applications. Some teachers have attempted a variety of internet-related learning experiences but in comparison to the usage of word processing and presentation software, the Internet is not dominating the classroom use of computers.

5. The main usage of the Internet was as a resource and research tool to look up information relevant to topics of study—that is, the Web is used mainly in accordance with the content metaphor. While teachers make limited use of email with their students, there is evidence to suggest that the Web is displacing more traditional and perhaps less fashionable educational software (e.g., interactive fiction).

6. Teachers report a range of pedagogical beliefs and approaches to their use of computers and the Internet. These appear eclectic at times and bridge a pedagogical and philosophical continuum from manager of instruction to facilitator of learning. While teachers were committed to deeply reflecting on the quality of their teaching, it was difficult to judge whether the majority of teachers drew more heavily on a teacher-centred or learner-centred instructional approach.

7. Although teachers were generally confident and enthusiastic toward the Internet, it had not had a major impact on their teaching—nor had the Internet greatly changed their teaching philosophy with the exception of less experienced younger teachers. Most teachers claim to be knowledgeable about teaching, learning and the use of computers for educational purposes, but they are still at an early stage of Internet adoption. The adoption process, however, is likely to be far more complex, idiosyncratic and reflexive than currently envisaged in the professional literature.

8. Teachers' perceived a range of benefits eventually arising from the Internet in schools with the main value evenly divided between social/vocational and pedagogical rationales. Some teachers, for example, endorsed the value of Internet skills for employment prospects and for preparation for life in the future, whereas others identified the affective, instructional and motivational benefits of internet-related learning experiences. On the surface, this distinction suggests the existence of at least two competing worldviews.

9. Across the board, teachers valued the importance of the Internet at a higher level than the frequency of its use. In other words, the perceived value of the Web outstriped the level of access, usage and frequency of use by teachers. Thus, there is strong evidence to suggest that the Web as opposed to email has rapidly become highly valued by teachers. If this perception is translated eventually into classroom practice, it follows that the Internet is likely to replace more traditional types of software applications in terms of usage and frequency of classroom use.

10. Teachers' success at integrating the Internet within the curriculum is poor. Many teachers perceived a lack of support from their colleagues and traditional barriers of cost, availability of equipment and lack of time remain. Even in a purposive sample of early adopters, the Internet is not yet "adding value" to the curriculum. Those who predict the Internet will transform teaching should not underestimate the deeper barriers and subjective realities of teachers that prevent more widespread curriculum integration.

Finally, the interpretation of the results brought to light a number of methodological limitations that suggest the above synthesis of key themes should be treated with caution. There was every indication, nevertheless, that a reasonable proportion of technically and pedagogically accomplished internet-using teachers could be identified from Phase One for further investigation. Despite the large gap between rhetoric and classroom reality, considerable value exists in documenting the pedagogical wisdom embodied in our most talented internet-using teachers (Brown, Greeno, Lambert, Mehan & Resnick, 1999). Over the next few years, a lot can be learnt from super teachers who have begun to explore the Information Highway.

6.8 SUMMARY

This chapter has interpreted the results for Phase One. It considered the main findings as they relate to each of the research questions. First, it explored the background characteristics of the nominated proficient internet-using teachers. The chapter then discussed the use of the Internet for learning and teaching in relation to theoretical models and emerging research findings. After this, an interpretation of the teachers' beliefs about learning and teaching was presented. This section was followed by consideration of perceived changes to teaching practice and work culture since the introduction of the Internet. Teachers' perceptions of how the Internet supports better learning as a new educational innovation were then interpreted. The last section reflected on factors that inhibit and enable the pedagogical use of the Internet in schools. Finally, a brief synthesis of the emergent themes provided an overall summary of the key findings for Phase One.

The following chapter presents the results of the research for the second phase—that is, the questionnaire and interview.

CHAPTER SEVEN

Results: Phase Two

'Wide-scale innovation should avoid extreme demands on teachers' skills and talents' (Perkins, 1992, p.207).

7.0 INTRODUCTION

This chapter presents the results for Phase Two of the research. It describes the experiences, perceptions and practices of perceived accomplished internet-using teachers, gathered through a postal questionnaire and follow up informant interview. Findings from the two research techniques are integrated throughout the chapter with figures, tables and selected quotes presented in accordance with the main research themes. The results are divided into five sections. Section one presents background demographic information on the participants and their teaching experience. Teachers' personal computer and Internet experience is described in section two. This is followed by section three, which reports teachers' use of the Internet to support learning and teaching. Section four describes teachers' pedagogical and philosophical beliefs of how the Internet supports the learning and teaching process, and perceived changes to teaching practice and work culture since using new computer technology for educational purposes. The final two sections present data on teachers' perceptions of the Internet as a social, economic and educational phenomenon along with factors perceived to inhibit and/or enable its use in schools.

7.1 BACKGROUND TEACHING EXPERIENCE

This section presents demographic data on the participants' background teaching experience. The results relate to the research question: What are the background characteristics of internet-using teachers?

Table 7.1 reports the total number of perceived accomplished internet-using teachers participating in the research, by region. Of the original sample, 35 teachers agreed to complete the follow up questionnaire during Phase Two. There were 24 teachers from this sample who also participated in a follow up interview. Notably, the response rate from teachers to both the questionnaire and interview was comparatively similar across all three regions. For this reason, the results were not disaggregated from the sample by region. Data and statistical calculations are reported herewith only in terms of those teachers participating in the research.

Table 7.1
Sample of Perceived Accomplished Internet-using Teachers by Region

Research Population (n)	Accomplished Teachers	Questionnaire Participants	Response Rate	Interview Participants	Response Rate
Central Region East	19	15	78%	10	66%
Central Region South	11	9	81%	6	66%
Central Region West	13	11	84%	8	73%
Total	43	35	81%	24	68%

Table 7.2 presents the gender distribution of the participants involved in Phase Two of the study. Although the majority of perceived accomplished internet-using teachers who responded to the questionnaire were women (60%), there was a high percentage of male teachers (40%) in this phase of the study. The gender ratio was similar during the follow up interview and there was little variation across regions, which supported the decision to report aggregated data from the wider sample.

Table 7.2
Gender Distribution of Accomplished Internet-using Teachers by Survey Technique

Participating Teachers (n)	Male Teachers	Female Teachers	Total Sample
Questionnaire	14	21	35
Interview	10	14	24

The age distribution of the perceived accomplished internet-using teachers is shown in Table 7.3. While the teachers spanned a wide age range, the largest group fell within the 40-49 cohort. Indeed, this cohort included 71% of teachers participating in the interview. There were similar percentages of men (47%) and women (53%) within this age range. Notably, few teachers fell within the 30-39 cohort and the two teachers over 50 who participated in the interview were both women.

Table 7.3
Age Distribution of Accomplished Internet-using Teachers by Survey Technique

Participating Teachers (n)	Age 20-29	Age 30-39	Age 40-49	Age 50-59	Total Sample
Questionnaire	3	5	22	5	35
Interview	3	2	17	2	24

Table 7.4
Ethnic Profile of Accomplished Internet-using Teachers by Survey Technique

Participating Teachers (N)	European	Maori	Polynesian	Other	Total Sample
Questionnaire	34	1	0	0	35
Interview	23	1	0	0	24

The ethnicity profile of the perceived accomplished internet-using teachers is shown in Table 7.4. It was notable that one teacher only of Maori descent participated in both the questionnaire and follow up interview. All of the other teachers were of European and/or Pakeha descent.

Table 7.5 shows the teaching experience of the perceived accomplished internet-using teachers by research technique. The mean number of years teaching in all schools was over 17 years, which was approximately two years longer than the original sample. On average, the internet-using teachers had worked between six and seven years in their current school. This confirmed that these teachers were in relatively stable employment at the time of the study.

Table 7.5
Teaching Experience of Accomplished Internet-using Teachers by Survey Technique

	Years Teaching (M)			
Participating Teachers	All Schools	SD	Current School	SD
Questionnaire	17.68	5.80	7.11	3.40
Interview	17.04	5.18	6.66	3.05

Figure 7.1 displays the mean teaching experience by gender. Men had more teaching experience in all schools than women in both survey techniques. Indeed, male teachers who completed the questionnaire had a mean of over 20 years of teaching experience. The men also had a wider variance of teaching experience (SD=6.34) compared to their female colleagues (SD=4.63). It was likely, of course, that many women had less teaching experience due to broken service because of children and family responsibilities. This explains, in part, why there was a higher ratio of older women with less years of teaching experience in the age distribution of the sample. Lastly, there was minimal difference between men and women in teaching experience in their current school during both the questionnaire and interview.

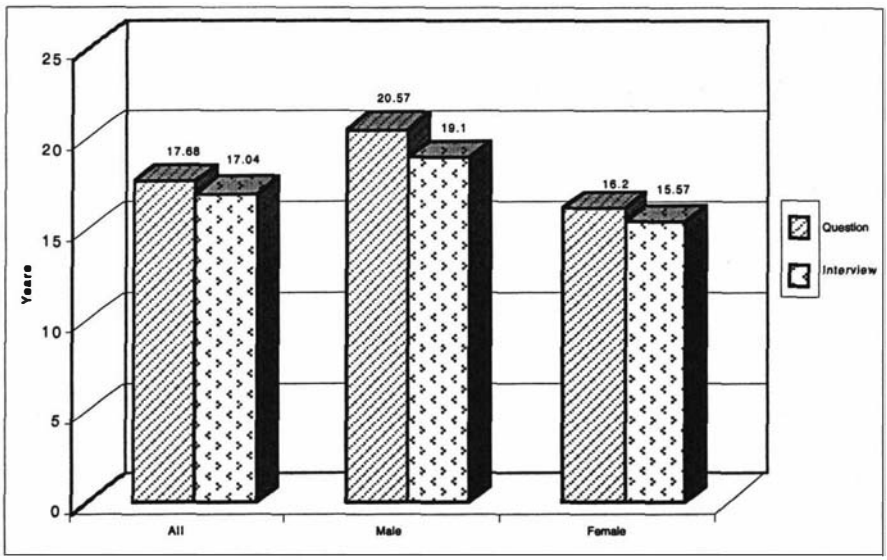

Figure 7.1 Mean prior teaching experience of accomplished internet-using teachers by gender

Table 7.6 presents the teaching positions of the participants within their current school. The sample included a wide cross section of teachers at different levels of professional status, but almost 60% of the participants were senior teachers. While there were a number of teachers (n=9) in senior management positions, notably none of the deputy principals, who were all men, participated in the follow up interview. With the exception of these teachers, there was an even distribution of men and women at each level of professional status. The sample contained few Scale A teachers (n=6).

Table 7.6
Teaching Position of Accomplished Internet-using Teachers by Survey Technique

Participating Teachers (n)	Scale A	Senior Teacher	Assistant Principal	Deputy Principal	Total Sample
Questionnaire	6	20	6	3	35
Interview	5	14	5	0	24

The teaching level of the perceived accomplished internet-using teachers is presented in Table 7.7. It is noteworthy that the majority of the teachers (57%) who completed the questionnaire taught in the senior school. There were an equal proportion of men and women at this level. Thus, less than 10% of participants worked at the lower school or intermediate level respectively. A similar distribution pattern was evident across school levels in the follow up interview. Teachers at the senior level represented 62% of the interview participants, followed by 21% who worked in the middle school. Significantly, all of the intermediate teachers were men. It was apparent, however, that some teachers with specific responsibility for ICT often worked across levels. Thus, these data were misleading as they only showed the home level of each teacher.

Table 7.7
Teaching Level of Accomplished Internet-using Teachers in Current School by Survey Technique

Participating Teachers (N)	Lower School	Middle School	Senior School	Intermediate School	Total Sample
Questionnaire	3	9	20	3	35
Interview	2	5	15	2	24

Table 7.8 reports the mean decile level of the schools in which the participating teachers were employed. As previously stated, the decile level is an outcome of a complex formula used by the Ministry of Education to calculate the socio-economic status of a school. In this phase, the mean decile was similar for both survey techniques. There was, nevertheless, a notable lack of teachers in lower decile schools. The majority of teachers who completed the questionnaire and participated in the interview worked in schools with a Ministry of Education decile level of five and above.

Table 7.8
Mean School Decile of Accomplished Internet-using Teachers by Survey Technique

Participating Teachers	M Decile	SD
Questionnaire	6.37	1.51
Interview	6.58	1.53

Table 7.9 shows the most advanced teaching qualification held by the perceived accomplished internet-using teachers. In the New Zealand context, the teachers were highly qualified with the majority of teachers (86%) having completed a minimum of an undergraduate degree. Another 20% of the participants had an advanced postgraduate qualification. Moreover, a number of the teachers (n=11), largely women, were currently studying toward a higher qualification, which often involved ICT-related work. Notably, one teacher possessed a masters degree.

Table 7.9
Most Advanced Teaching Qualification of Accomplished Internet-using Teachers by Technique

Participating Teachers (n)	Diploma of Teaching	Bachelor Degree	Undergraduate Cert/Dip	Postgraduate Cert/Dip	Masters Degree	Total Sample
Questionnaire	5	22	1	6	1	35
Interview	2	17	0	4	1	24

In sum, the background teaching experience of the perceived accomplished internet-using teachers showed that the purposive sample differed on a number of demographic variables from the wider population of teachers. Moreover, several differences were evident between the sample and those teachers who participated in Phase One. The majority of the sample, for example, was over the age of 40 and male teachers had significantly more years of teaching experience in all schools than their female colleagues. In addition, most participants worked in the senior school where they were employed either as senior teachers or in positions of senior management. The majority were also university graduates. Thus, the sample represented a group of highly experienced and highly qualified teachers in the New Zealand context.

7.2 PERSONAL COMPUTER AND INTERNET EXPERIENCE

This section presents data on teachers' personal computer and Internet experience. It describes further information on the background characteristics of the perceived accomplished internet-using teachers in terms of the first research question.

There was a high percentage of teachers with Internet access at home as shown in Figure 7.2. Indeed, the majority of teachers (89%) had personal Internet access. Notably, those teachers (n=4) without access were all women. The main use of the Internet at home was for personal email and to a lesser extent using the Web for educational and recreational purposes. As one teacher stated:

> *I enjoy talking with my sister in London and keeping in touch with friends and family around New Zealand. Sometimes I quickly check out something on the Web but it can be costly and time consuming... I probably use the Web less now than when we first got it [S9: 25-27].*

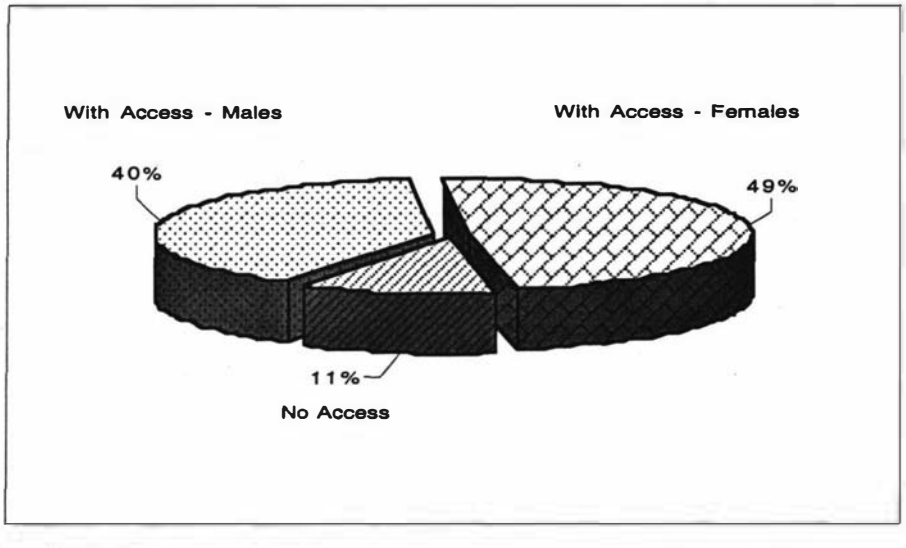

Figure 7.2 Percentage of teachers with personal Internet access at home by gender

In terms of their own education, a number of teachers (n=7) were using the Internet to support advanced study through a dedicated e-learning environment. It was common for this type of online study to require teachers to use the Web as a source of professional readings. Several teachers mentioned, for example, finding material from the Web on new educational trends including learning styles, constructivism and multiple intelligence theory. In addition, the Web was perceived as a good source of up-to-date information on educational developments in other countries. A number of teachers (n=16) mentioned they had specifically accessed Web material from overseas to make educational comparisons with teaching in New Zealand. As one teacher reported:

> *It's interesting to see what's expected of other teachers and the problems. I like what they're doing in Canada and I wouldn't mind working there one day. They seem to value teachers more... It wouldn't be that hard to organize a job... the curriculum looks more interesting than well ours and I reckon they have far better Internet access for kids [W13: 34-39].*

Teachers were using the Internet at home to access a wide range of information about curricula, salaries, employment opportunities and even templates for student assessment. Indeed, one teacher was now using an assessment checklist for computer skills based on something he had downloaded from the state of Texas. Another teacher had found out about the *International Computer Drivers License* from a New Zealand teacher working in the United Kingdom.

Closer to home, a few teachers (n=6) reported that they often accessed Web sites such as *English Online* for lesson plans and starters. These teachers also looked at educational institutions and museum sites for useful information when planning school visits. Two participants admitted they sometimes checked out other schools' homepages for ideas about Web design. Although most teachers were using the Internet in some capacity at home for professional purposes, a number of participants (n=9) did not make extensive use of Web-based resources. Instead, several teachers (n=5) objected to using their private Internet account for work purposes. This was how one teacher described her objection:

> *The Internet makes it too easy for your work to come home. Initially I spent ages looking at teaching stuff. But mostly I now use the Internet for... well my own stuff. You know you can find heaps on antiques and that's what I'm interested in... I believe there's a limit to the resources you need for teaching and I don't see that teachers should be spending all night on the Internet just to do their job [E9: 35-43].*

Table 7.10
Percentage of Teachers with Specific Responsibility for Computers and/or the Internet

Question	Yes %			No %		
	Female	Male	All	Female	Male	All
Do you have any special responsibility for the use of computers and/or the Internet in your school?	86 (n=18)	93 (n=13)	89 (n=31)	14 (n=3)	7 (n=1)	11 (n=4)

While these sentiments were shared by a number of teachers, the majority of participants (89%) were the designated ICT teacher, the person responsible for ICT, or a member of the school's ICT Committee. Table 7.10 gives information on teachers who had specific responsibility for computers and/or the Internet in their school. As described in Phase One, this role typically encompassed a wide range of tasks. Clearly, the majority of teachers had a genuine passion for their work. As one enthusiastic teacher stated:

> *I live and breathe ICT and I think it's great. The kids do too. I love playing with the technology and getting staff to embrace it. I get a real buzz from it... I think I'm making some real progress with the other staff and at the moment this is perhaps the best part of my job [S2: 39-44].*

However, not all teachers were as enthusiastic about the level of work associated with the installation and management of the Internet. A few teachers (n=6) were openly critical about the increasing demands and expectations of them to support ICT throughout the school. These teachers perceived they were working under considerable pressure, which was evident from the following comment:

> *To be honest, I find it increasingly difficult to juggle the demands of maintaining the network, keeping the computers going, doing the training, keeping the staff and principal happy, as well as doing my normal teaching... I get an extra unit but the money isn't worth it. I don't think other people realize that I'm doing two jobs in one [W9: 32-37].*

The amount of work involved in ICT was a recurring theme. Even the most enthusiastic teachers admitted they were sometimes struggling to keep on top of their work. This was particularly the case for those teachers who were concurrently undertaking advanced study. The nature of this study ranged from an undergraduate Diploma of Information Technology in Education to an online Postgraduate Diploma of Teaching endorsed in ICT. A couple of teachers were also studying toward an information literacy qualification and many others had already completed professional development in this area.

Several teachers highlighted the problem of finding time for study and balancing this work with family, the day-to-day demands of teaching and leadership in Internet use. As one teacher put it:

> *I have a real love-hate relationship with my study and technology. It's great to know that I can communicate with people who share a common interest but most times I don't have enough time... And the study is not always relevant to my teaching... On the other hand, it's my release from the work and it keeps me thinking and coming up with fresh ideas [S5: 49-57].*

In sharing a similar view, another teacher attributed her sanity to the study she was undertaking in the area of information literacy. This is how she described the learning experience:

> *It's been marvellous to learn after all these years how to be a student again. You forget what it's like and it's quite refreshing for your teaching... It's not easy to keep motivated always. Actually I find it keeps me sane... More people need a release like this as teaching grinds you down. I wish more staff and the school would see the value [W8: 61-69].*

While a subgroup of teachers were engaged in formal academic study, over the preceding six months a high proportion of participants (74%) had also received some type of internet-related professional development. Teachers who had recently undertaken professional development, along with those participants with experience of teaching other teachers about Internet use, are shown in Table 7.11. Notably, this involved 57% of the women as opposed to all of the men. The most common type of professional development was an after-school workshop dedicated to learning how to use a specific Internet application, where the training was facilitated by one of the participants.

Table 7.11
Percentage of Teachers who have Participated in Internet-related Professional Development

Question	Yes %			No %		
	Female	Male	All	Female	Male	All
In the last six months, have you attended any type of professional development on the use of the Internet in education?	71 (n=15)	79 (n=11)	74 (n=26)	29 (n=6)	21 (n=3)	26 (n=9)
In the last six months, have you been involved in the formal training of other teachers on the use of Internet?	57 (n=12)	100 (n=14)	74 (n=26)	43 (n=9)	0 (n=0)	26 (n=9)

In the last six months, some teachers (n=11) had also received school-based professional development during a teacher only day workshop. These workshops had sometimes involved a presentation from an invited guest with an established reputation in the area. As one teacher explained, some schools had been quite resourceful:

> *I went to a presentation by Mark Treadwell and so we contacted him about doing a presentation for the entire staff... It was well received... and it was good to have someone else doing the talking. Sadly we don't have the time or money to do too many of these special presenters [E2: 43-48].*

The outside expert was sometimes the local computer agent or hardware supplier. In this regard, both Apple and Compaq were mentioned as a source of professional development. Two teachers had recently spent a week on a bus tour of leading edge schools. Notably, several participants (n=7) were quite critical of the official ICT lead schools, as they perceived these were elitist and not conducive to the professional development of all teachers. As one teacher maintained:

> *The concept is great but where is the one in our region? We tried to arrange a visit to... and got nowhere. They simply weren't interested. I didn't get good vibes... Schools are in competition... and you can't expect other schools to help... I don't think they were that more ahead of us [W11: 61-66].*

Another important source of teacher learning was through the Internet itself. Table 7.12 shows that most teachers (83%) were using the Internet for their own professional development—that is, they were using the Internet from home or school for informal and *just-in-time* learning.

Table 7.12
Percentage of Teachers who use the Internet for Professional Learning

Question	Yes %			No %		
	Female	Male	All	Female	Male	All
In the last six months, have you used the Internet for your own professional learning?	86 (n=18)	79 (n=11)	83 (n=29)	14 (n=3)	21 (n=3)	17 (n=6)

As already indicated, it was common for small groups of teachers to meet after school for training sessions on the Web. Often these were informal "hands on" gatherings where teachers simply shared their favourite Web sites. This was particularly the case when an Internet-enabled computer was located in a shared workspace. As one teacher stated:

In the first few months we'd gather around the computer in our staff room and show each other our latest bookmarks. It was quite social. I have to say most of the sites were humorous ones but we learnt a lot from each other then... We don't do that as much now [E23: 76-80].

The percentage of teachers who provide support for informal technical and pedagogical learning is shown in Table 7.13. Notably, over half the teachers (63%) engaged most weeks or every week in some type of informal pedagogical discussion with colleagues. However, few teachers (n=3) provide this type of support on a daily basis. An analysis of frequency data by gender indicates that women provide informal pedagogical advice more often than men do. Conversely, male teachers report that they provide impromptu technical support on a more regular basis than women. Indeed, six of the seven teachers who provide this type of support most days or every day were men. It was noteworthy that overall the level of informal technical support was higher than reported in Phase One, which confirms the refined nature of the sample.

Table 7.13
Percentage of Teachers who Provide Support for Informal Professional Learning

Question	% Never	% Some Weeks	% Most Weeks	% Every Week	% Most Days	% Every Day
How often do you have informal discussions with colleagues where you offer advice about using the Internet for learning and teaching?	0 (n=0)	28 (n=10)	37 (n=13)	26 (n=9)	6 (n=2)	3 (n=1)
How often do you provide informal or impromptu technical support for other staff who are trying to use the Internet?	0 (n=0)	28 (n=10)	29 (n=10)	23 (n=8)	17 (n=6)	3 (n=1)

Table 7.14 shows the level of support the internet-using teachers perceived from their colleagues and senior management. The majority of teachers (60%) considered they receive good or very good support from other staff. Notably, most of the teachers (n=3) who report poor levels of support were men working in positions other than senior management. When male teachers were asked to comment on the low level of support in the follow up interview, they reported an increasing sense of isolation from their colleagues. To quote one teacher:

I think the others think I'm crazy or something. Sure, I probably bamboozle them with too much technical jargon but I only tell them what they need to know... I don't think they really understand how the Internet is changing the world... It's like some of us are on another planet and the rest of them don't want to know. I've given up on the boss [E1: 82-91].

Table 7.14
Perceived Level of Support for Using the Internet within their Teaching

Question	% Poor	% Adequate	% Good	% Very Good	% Excellent
How would you describe the level of support you receive from other staff for using the Internet within your teaching?	11 (n=4)	29 (n=10)	49 (n=17)	11 (n=4)	0 (n=0)
How would you describe the level of support you receive from the Principal and BOTs for using the Internet within your teaching?	8 (n=3)	29 (n=10)	40 (n=14)	17 (n=6)	6 (n=2)

This sense of isolation was not confined to men, as during the interview several teachers commented on how other staff just accommodated the Internet without really embracing the technology to the same degree as them. For some teachers, the gap in the level of commitment was a matter of particular concern. As one women stated:

> *The more I personally use the Internet the more I get concerned about the rest of the staff. You do wonder if they're stuck in the 19th century... They don't have the same level of commitment. I really don't know what to do. It seems to me it's business as usual and you know what they say about the Internet... if you're not online soon then you'll be out of business [S10: 99-107].*

A high percentage of teachers (63%) reported that they receive good, very good or excellent support from the principal and Board of Trustees. Similarly, few teachers (n=3) perceive poor levels of collegial support although only two teachers reported an excellent level of backing from their colleagues. A sizeable group (29%) of teachers perceived that the level of support was adequate. School decile was not strongly correlated with the perception of support (r = .23) based on the conventional level of significance (p <.05) derived from a Pearson product-moment correlation coefficient.

Table 7.15 shows the percentage of teachers who participate in non-formal professional learning related to the use of educational technologies. In the last six months, the majority of teachers (60%) had attended an internet-related educational conference. Notably, 71% of men, as opposed to 52% of women, had attended a conference with an Internet theme. These were predominately teachers in senior management positions. The most popular conference was one hosted by the Telecommunication Users Association of New Zealand (n=13). This was followed by the Compaq Education Conference (n=6) and the Apple Education Innovations Conference (n=2). In addition, a number of teachers (n=15) had attended a regional presentation on technology and research skills hosted by Dr Jamie McKenzie. Lastly, one person had attended the National Educational Computing Conference (NECC) in the United States.

Table 7.15
Percentage of Teachers who Participate in Non Formal Professional Learning

Question	Yes %			No %		
	Female	Male	All	Female	Male	All
In the last six months have you attended a conference, given a presentation or conducted a workshop on the Internet ?	52 (n=11)	71 (n=10)	60 (n=21)	48 (n=10)	29 (n=)	40 (n=14)
In the last six months have you or your school subscribed to any journals, magazines or online discussion groups on the use of the Internet in education?	37 (n=11)	57 (n=8)	54 (n=19)	63 (n=10)	43 (n=6)	46 (n=16)

The participants were not unanimous about the value of conference attendance. Although there was widespread agreement that conferences provided a valuable opportunity to network with other teachers, the content was often perceived to be of poor quality and the presentations dominated by commercial interests. Moreover, because a limited number of staff attended the conference they were perceived to have minimal impact on teaching practice. These problems were clearly summarized by one teacher:

> *First you either give up your holidays or go on the weekend. You can't expect all staff to go... Then there's the cost. I mean these things aren't cheap and the school can only pay so much. Half the time you sit and listen to people trying to sell their services and that's no good. Then you get the mine is better than yours... It's boring! Few people question why we should be using technology in the first place... Quite frankly the last conference was like going to church. The problem is you have to go to be seen... and just in case you miss something you should know. And what difference does it make? Two weeks later nothing has changed [E8: 77-89].*

A high proportion of teachers or schools (54%) subscribed to a journal, magazine or online discussion group related to using the Internet in education. Notably, this type of subscription was more common among men. However, the interview revealed some of these subscriptions included popular computer magazines such as *PC World.* It was noteworthy that more women (n=7) than men (n=2) subscribed to the journal *Computers in New Zealand Schools.* In addition, three teachers (or at least their schools) received the journal *Learning and Leading with Technology* as part of their ISTE membership. A number of teachers (n=13) also mentioned the online magazine *From Now On* written by Dr. Jamie McKenzie. The *Good Teacher* and *Starters and Strategies* were other "teacher friendly" publications cited as having useful internet-related information.

A number of teachers (n=12) commented on the problem of finding good quality information on Internet use in education. In this regard, the *NZCompEd* email list and the *New Zealand Learning Network* hosted by the University of Otago were singled out for praise. The teachers were less praiseworthy of Te Kete Ipurangi (TKI)—that is, the Online Resource Centre supported by the Ministry of Education. While 74% of the participants had accessed TKI, most people (n=21) were unimpressed by its content and design. Indeed, one teacher was highly critical of the ICT Community. He stated:

> *It's hopeless. Compared to Otago... and the Massey list there's nothing there for teachers. TKI is bullshit... You can't find anything and the site takes ages to load. I don't think they have the expertise to develop it... I don't recommend it to any of our staff. There is still a need for good information but I get this off From Now On and the email discussions... I even subscribe to one in the States [E4: 109-117].*

It was not unusual for teachers to subscribe to an international email list devoted to an educational topic. In the follow up interview, 16 teachers confirmed that they were, or had been at one time or another, a mailing list member. Similarly, subscription to an email newsletter, for example, *Teach-IT,* was also valued by teachers (n=5). The personal use of email was recognized by several teachers as helping them to develop a stronger sense community. As one teacher stated:

> *I don't feel as isolated as before... Whilst I don't contribute to the discussion, I like to see what's going on and it's nice to see that other teachers are at the same place as us. I also value the University connection... Overall I think the New Zealand email list... is a great way for teachers to share ideas and ask questions [S11: 88-95].*

This is how another teacher described her international experience:

> *I have to say that I've really enjoyed emailing with those American teachers. It can be a pain sometimes. I tried to unsubscribe once but in the end I just left it... I still delete a lot of my email but every often, every so often there's a real gem. It keeps you interested and looking beyond the classroom. You feel quite small you know when you know how many other teachers there are... It's good to expose yourself to other teachers like this. You really feel part of... well I suppose a global village [W8: 122-134].*

Table 7.16 presents data on the teachers perceived technical and pedagogical skill, knowledge and experience in relation to the Internet. The majority of teachers (97%) perceived their technical skill and knowledge in relation to the Internet to be either proficient or accomplished. Significantly, no one considered their technical know-how to be less than proficient. At the same time, no teachers reported their level of teaching experience with the Internet as expert but 20% of participants did perceive themselves to be accomplished. Over half the teachers (54%) fell within the proficient category. Significantly, there were no novice internet-using teachers within the sample. On the other hand, 26% of the sample reported their Internet teaching experience within the emergent category.

Table 7.16
Teachers Perceived Technical and Pedagogical Skill, Knowledge and Experience

Question	% Novice	% Emerging	% Proficient	% Accomplished	% Expert
How would you rate your technical skills and knowledge in relation to the Internet?	0 (n=0)	0 (n=0)	51 (n=18)	46 (n=16)	3 (n=1)
How would you rate your level of teaching experience at using the Internet in the classroom?	0 (n=0)	26 (n=9)	54 (n=19)	20 (n=7)	0 (n=0)

An analysis of data in terms of gender showed that men self-reported a higher level of skill, knowledge and experience than women. On a five-point scale, in which one represents the novice category, the mean for technical know-how for women was 3.43 as opposed to 3.64 for male teachers. In like manner, the mean teaching experience for women in using the Internet in the classroom was 2.81 and 3.14 for men but the degree of probability was not significant (p =.16) based on the conventional level of significance (p <.05) derived from a homoscedastic *t-test* (see Figure 7.3). Moreover, the apparent gender gap in perceived capability was less than reported during Phase One. In other words, the results show less of a difference between men and women and a higher mean level of skill, knowledge and experience than in the original nominated sample.

Table 7.17
Teachers Perceived Knowledge of Current ICT Developments within New Zealand

Question	% Poor	% Adequate	% Good	% Very Good	% Excellent
How would you rate your current knowledge of recent ICT developments within New Zealand?	0 (n=0)	0 (n=0)	26 (n=9)	54 (n=19)	20 (n=7)
How would you rate your current knowledge of recent ICT developments in other OECD countries?	11 (n=4)	23 (n=8)	37 (n=13)	23 (n=8)	6 (n=2)

Table 7.17 indicates that the sample of perceived accomplished internet-using teachers was up-to-date with recent ICT developments in New Zealand. The majority of teachers (74%) perceived their knowledge of recent developments as very good or excellent. Notably, none of the participants' report that their knowledge fits within the poor or adequate category. An important source of information and potential knowledge for teachers was the *Education Gazette.* This was mentioned by 13 of the participants as a good way to stay abreast of recent developments. Moreover, some teachers (n=9) read the *InfoTech Weekly* on a regular basis and others (n=4) accessed *theschooldaily.com* for up-to-date news. The following comment was evidence that many of the teachers accessed a wide range of ICT-related information from a variety of sources:

> *There's so much to keep on top of and I try my best... by reading the Gazette articles... and I always scan the Dominion on Monday. Every now again I've been known to look at that online newspaper for teachers – when I remember... Yeah it can be overwhelming at times but the staff expect you to know everything. So does the Principal.... I pride myself on being a good source of computer knowledge [E2: 109-118].*

The majority of participants (66%) rated their knowledge of ICT developments in other OECD member countries as good or better. Notably, few teachers (n=4) report a poor level of knowledge of international developments. A number of teachers (n=7) were familiar with recent ICT-related developments in Australia, evidenced by reference to the *Navigator Schools,* the *Learning Technologies Planning Guide* and comparisons with the New Zealand ICT Strategy. As one teacher stated:

> *It seems to me we're copying the Oz model. A bit late. They seem to be well ahead of us... we need to catch up. I mean otherwise New Zealand will be left behind. You only have to see what they're doing in Queensland... Did you know that principal stuff was from Australia? [S6: 87-96].*

Figure 7.3 presents a multi dimensional profile of the teachers' knowledge of national and international developments by gender. It shows the mean and probability value of the responses to the aforementioned questions alongside a gender profile of the teachers' technical and pedagogical skill, knowledge and experience, as reported in Table 7.16. On a five-point scale, in which five represents the highest category, both men and women appear to be equally well informed of recent national developments. However, male teachers (M=3.29) self-reported their knowledge of international developments at higher levels than women (M=2.52). The degree of probability (p <.05) indicated a significant gender difference but this should be interpreted with caution given the potential covariates.

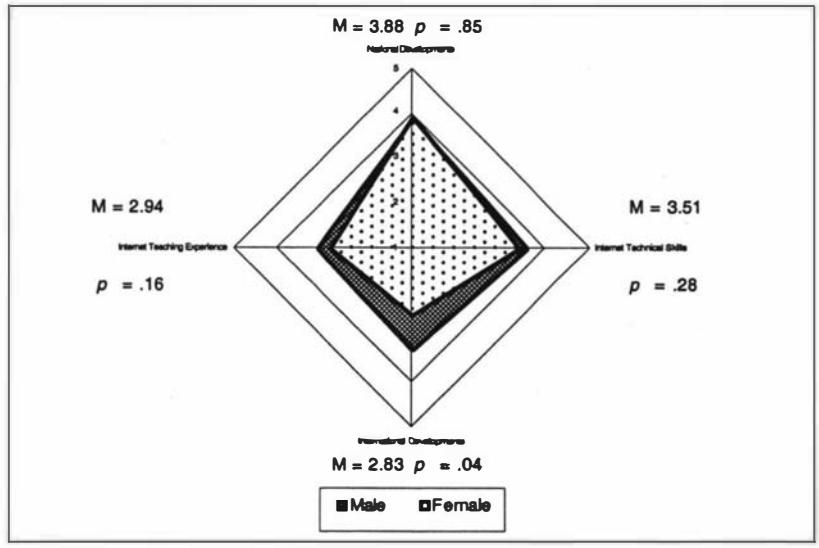

Figure 7.3 Profile of teachers' technical skill, pedagogical experience and contextual knowledge

Note: The level of significance is shown by the probability *(p)* values derived from a homoscedastic *t-test*.

In sum, the perceived accomplished internet-using teachers had a high level of personal Internet access. Teachers generally had some responsibility for Internet use in their school, but many of the participants were reticent about the workload associated with ICT and the rapid growth of the Internet. In the last six months, almost all of the teachers had participated in some form of professional development ranging from academic coursework to conference attendance and teacher only days. A high proportion of teachers were responsible for the professional development of their own staff; however, many still perceived a lack of support and sense of isolation from their colleagues. Despite this, the teachers were active hunters, gatherers and grazers of both traditional print and Web-based information. Suffice to say the teachers' personal and professional learning had a strong international flavour. The teachers perceived themselves to be proficient and accomplished in Internet use, although men self-reported a higher level of technical and pedagogical expertise than women. This tentatively evoked an image, again, of a sample of more skilled, knowledgeable and experienced male teachers.

7.3 USE OF INTERNET FOR LEARNING AND TEACHING

This section addresses more specifically the use of the Internet for learning and teaching. It presents data pertaining to the second research question: How do teachers use the Internet for learning and teaching?

The percentage of students (and teachers) with access to the Internet by level and connectivity type is shown in Table 7.18. In comparison to Phase One, most teachers (63%)

had direct access to the Internet in their classroom. Access was usually limited to a single computer and it was more common within the senior school. In the lower school, one teacher only had classroom Internet access.

Table 7.18
Percentage of Students with Access to the Internet by Level

Question	% Lower	% Middle	% Senior	% Intermediate	% All Teachers
Do children have regular access to the Internet in the classroom?	33 (n=1)	55 (n=5)	68 (n=13)	66 (n=2)	63 (n=22)
Do children have access to the Internet in a school computer suite?	100 (n=3)	77 (n=7)	85 (n=17)	100 (n=5)	86 (n=30)
Do children have access to the Internet in the school library?	100 (n=5)	100 (n=9)	100 (n=20)	66 (n=2)	97 (n=34)
Do you have Internet access through a network between classrooms?	33 (n=1)	55 (n=5)	65 (n=13)	66 (n=2)	60 (n=21)

A high proportion of students (86%) also had access to the Internet in a school computer suite. Indeed this included all of the lower school and intermediate level teachers. While some of these suites were purpose built, the majority were typically a converted resource or withdrawal room. Internet access was sometimes limited to a dial up modem through a single computer. Nonetheless, the majority of computer suites (63%) were fully networked via a central server. Excluding the intermediate school labs, the mean number of computers per suite was seven. According to some teachers, the advent of the "mini lab" had both a positive and negative impact on classroom practice. Overall, the lab concept was quite controversial and its perceived value polarized some teachers. As one teacher believed:

> *The pod of computers has really made a big difference. It's helped raise the profile and everyone is now expected to use it... they all have a slot. The kids love it and the teachers find it much easier to make time for computing and Internet... You just can't do the same sort of thing with one computer in your classroom [W1: 121-129].*

In contrast, the following teacher was quite critical of how the computer suite was being used within her school:

I have to say the suite is a mixed blessing. Sure, it gets used but I personally believe less is going on in the class now... The suite makes it too easy for teachers to tick the box and treat ICT like another subject. Half the time children are playing games and it's low-level stuff... I suppose this is the path of least resistance [E8: 122-129].

In the context of the computer suite, another teacher talked about the need for schools to get a return from their investment. Since the introduction of the suite, and the Internet, there had been an increasing pressure on teachers to document students' ICT skills. This trend was confirmed by a number of teachers (n=14) during the follow up interview. As the following teacher stated:

We now do regular skill checks... I've developed a spreadsheet from something I found on TKI and it has levels for each skill... Last year we prepared a graph for the Board showing how the children's ICT skills had improved over the year... I think this made them feel heaps better before our ERO report [S2: 152-159].

Virtually all teachers (97%) and their students could access the Internet from within the school library. This was still the most common method of Internet access. For a minority of teachers (n=5) library access was their only type of Internet connection. The Internet was generally perceived to be most "at home" in the library. This was evident from the interview responses when teachers were asked which area or level of the school benefited most from Internet access. There was almost unanimous agreement that the library was the natural home of the Internet, as the Web supported information and research skills. This view was succinctly expressed in the following comment:

In my view, the Internet should be available to all teachers in the school library. It's a must. This is where... well by and large, we house our other resources for reading and research. We have our encyclopedia there and you can't beat the Internet for this. It's a great research tool and that's what the library is meant to be part of [W3: 91-98].

A high proportion of teachers (60%) had Internet access through an intranet network between classrooms. However, these teachers were fortunate compared to their colleagues because network access was not widely available throughout the entire school. Indeed, few schools (n=6) were fully cabled or network enabled. Typically, networked schools were approximately 50% wired and the Internet was most prevalent in senior classrooms.

An analysis of Internet access and type of connection by decile showed no significant difference from the aggregated sample. The mean decile of schools with Internet access in the lab (M=6.44), library (M=6.32), and classroom (M=6.28) was close to the sample mean presented in Table 7.8. However, the decile of schools with an intranet network between classrooms (M=6.95) through a server was notably higher. The degree of probability (p <.05) indicated that decile was a significant factor in the networking of these schools.

Table 7.19
Frequency of Internet Use by Teachers to Support Student Learning by Level

Question	% Never	% Some Weeks	% Most Weeks	% Every Week	% Most Days	% Every Day
Lower School	33 (n=1)	33 (n=1)	33 (n=1)	0 (n=0)	0 (n=0)	0 (n=0)
Middle School	11 (n=1)	33 (n=3)	33 (n=3)	22 (n=2)	0 (n=0)	0 (n=0)
Senior School	10 (n=2)	15 (n=3)	40 (n=8)	20 (n=4)	10 (n=2)	5 (n=1)
Intermediate School	0 (n=0)	33 (n=1)	33 (n=1)	33 (n=1)	0 (n=0)	0 (n=0)
All Teachers	11 (n=4)	25 (n=9)	36 (n=13)	19 (n=7)	6 (n=2)	3 (n=1)

Table 7.19 presents frequency data on how often teachers were using the Internet with students to support their learning. Unlike Phase One, the majority of participants were using the Internet with their students. Notably, one teacher only reports that students were using the Internet every day. In a similar vein, less than 10% of teachers were using the Internet with students on a regular daily basis. The highest proportion of Internet use (36%) fell within the "most weeks" category. Another 36% of teachers were using the Internet "some weeks" of the year or not at all. Again, the most frequent Internet use was by students in the senior school and intermediate level. An analysis of frequency data by gender showed little or no difference in use between male and female teachers. Moreover, there were minimal differences in the frequency of Internet use based on age, experience or teaching status.

When asked how many hours students had actually used the Internet over the previous week, the mean was less than 110 minutes. Although data were calculated retrospectively on teachers' best estimates, this equates to approximately three and a half minutes per pupil in a typical class of 30 students. The follow up interview established that more than one person was often using the Internet at the same time, as students mostly worked in pairs or small groups. Thus, these types of extrapolations need to be interpreted with caution.

Table 7.20
Perceived Internet Access by Nature of Instructional Restriction

Statement	% Strongly Agree	% Agree	% Not Sure	% Disagree	% Strongly Disagree
Typically student access and Internet use is under my direction and supervision.	23 (n=8)	51 (n=18)	6 (n=2)	20 (n=7)	0 (n=0)
Typically student access and Internet use is initiated by children and under their own direction.	9 (n=3)	9 (n=3)	3 (n=1)	54 (n=19)	25 (n=9)

The nature of restriction that teachers place on student Internet access by instructional technique is shown in Table 7.20. A high proportion of teachers (74%) required students to use the Internet under their direction and/or supervision. Conversely, few teachers (n=6) report that Internet access is initiated by pupils and under the students' own direction. The interview revealed that concern about Internet safety was an important contributing factor in the relatively high level of teacher directed use. This was evident from the number of teachers (n=18) who were apprehensive about unrestricted student access. As one teacher pointed out:

> *Imagine if the kids came across, well... you know. Our jobs they would be on the line... you can bet it would reach the papers. You have to, well you can't afford to let them loose. We download a lot of the material ourselves first and then it's usually ok. They go to specific homepages we've listed as a favourite. God knows what they find at home but we have a professional responsibility to prevent misuse [E11: 143-152].*

These sentiments were reflected no doubt in the high proportion of schools (71%) with a written policy on Internet safety, as shown in Table 7.21. In the interview, a number of teachers (n=8) commented that their policy was based largely on the *Internet Safety Kit*, which had recently been sent to all New Zealand schools. This suggested that the policy was quite new. In this regard, at least three teachers acknowledged that their school's Internet policy had yet to be ratified by the Board of Trustees.

Table 7.21
Percentage of Schools with a Written Internet Safety Policy

Question	% Yes	% No
Do you have a procedure or written policy to ensure Internet safety?	71 (n=25)	29 (n=10)

Figure 7.4 displays the extent to which teachers were using specific computer applications more or less frequently compared to 12 months ago. Most teachers were using word processing (74%), educational games (74%), database and spreadsheets (83%), interactive fiction (86%), and drill and practice (97%) software to the same extent. On the surface, few teachers were making more use of this software, but these data give no indication of actual frequency of use on a comparative weekly basis.

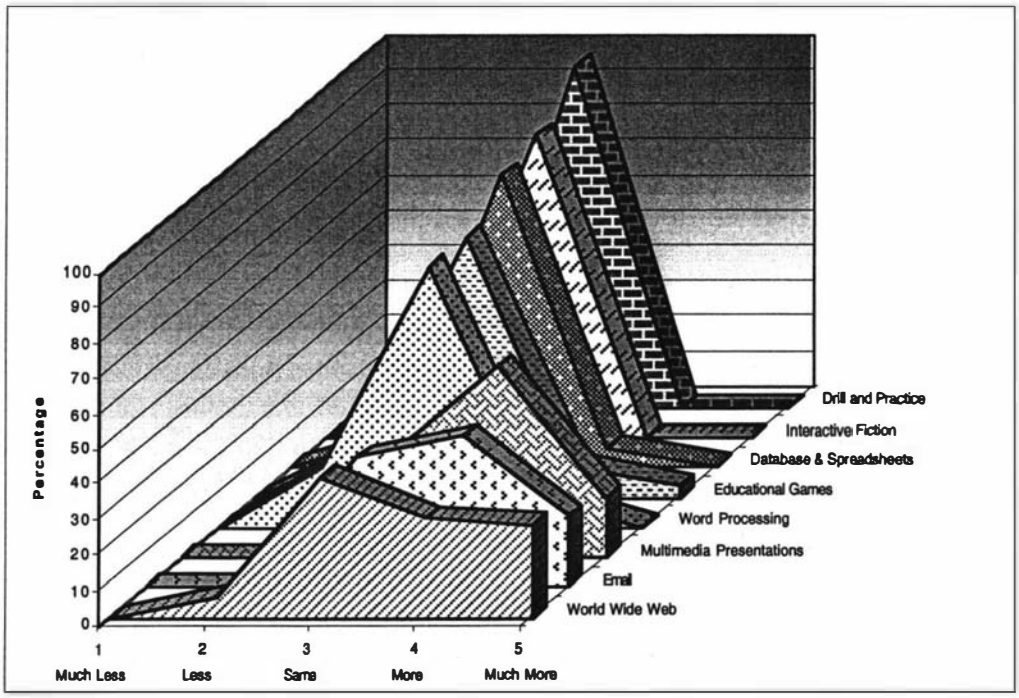

Figure 7.4 Frequency of computer use based on a 12 month comparison

In the follow up interview, nevertheless, teachers reported a gradual decline, over time, in their regular use of these software applications with the exception of word processing and desktop publishing. The participants were in widespread agreement that their use of interaction fiction, in particular, and databases and spreadsheets (excluding uses for school administration) to a lesser extent had fallen off in recent years. In fact, it had been some years since a number of teachers (n=17) had used a piece of interactive fiction in the classroom. As one teacher reminisced:

> *Yeah, it has been a while since I used software like that. The kids use to really enjoy those adventure games... it was hard work for me, but for some reason we've stopped doing that. It was good for problem solving and thinking skills. I don't think you can buy that sort of thing now. I guess we now have so much other stuff to use... and kids have heaps of new computer games at home [E7: 178-184].*

To some extent, interactive fiction was thought to have been replaced by sophisticated simulation and problem solving packages—such as, *Sim City* and the *Logical Journey of the Zoomnbinis*. Although there was evidence that these "games" may have filled the void left by interactive fiction, several teachers (n=6) suggested that the main reason for the decline of this software was that students now have them at home. This was how one teacher described the rise of edutainment:

> *It's really hard these days because so many of the children have that software at home. I mean you can buy it at the Warehouse for $19.95. These games are everywhere. Look at PlayStation... I think that's probably the main reason why we don't use games like this... as we did [S5: 156-162].*

In terms of database and spreadsheets, many teachers had never utilized these applications with students. Those who had complained that few teachers understood the educational benefits of this software. As one teacher pointed out, the main use of these tools is now for school administration:

> *I remember on the Acorn we use to use... PowerPoint... no it was something like... yes Pinpoint with the children. That was very powerful and easy to use... I think Excel is designed for adults and it would be hard for me to convince the others... Basically, these days, we only use that sort of software in our assessment records and school administration [E4: 176-184].*

The majority of teachers (71%) perceived that they were making more or much more use of multimedia presentations. It was apparent from the interview that students were now using applications such as *KidPix* and *PowerPoint* on a regular basis often in combination with a digital camera, which many teachers had quickly embraced as the single most valuable new piece of technology in the classroom. In like manner, the use of the Internet had increased considerably over this time. Indeed, 63% of teachers report more or much more use of email and no one was using it less. While two teachers were using the Web less, over half the participants (54%) were browsing the Internet more than previously. Notably, the greatest increase in computer use over this time was multimedia presentations—not the Internet.

The interview also revealed, however, that some teachers interpreted multimedia presentations to include both authoring software like *HyperStudio* and CD-ROM resources such as *Microsoft Encarta*. It was evident that teachers were now making extensive use of encyclopedia and reference type multimedia with their students. A related point is that the Internet was widely regarded by these teachers as an "online encyclopedia" from which students could research topics of interest. The encyclopedia or "content" metaphor of the World Wide Web was apparent in the following observation:

It's a marvellous resource for projects... Now instead of Encarta the children can find information using Explorer. It's like having the World's largest reference book at your finger tips. They can find the currency of Peru to the capital city of Brazil... Look at the Olympics information that children can use for their posters [E23: 134-139].

It was also apparent from the follow up interview that some teachers interpreted this retrospective recall question to include their wider professional use of these software applications rather than exclusively student use. This potential confusion was revealed when teachers talked about the increased frequency of email in their professional work. For this reason, these data must be interpreted with caution and they should be viewed in the wider context of the other research findings.

Table 7.22
Frequency of Internet Applications used in the Last 12 Months by Students

Question	% Never	% Some Weeks	% Most Weeks	% Every Week
Electronic Mail	51 (n=18)	26 (n=9)	14 (n=5)	9 (n=3)
Web Page Browsing	11 (n=4)	26 (n=9)	40 (n=14)	23 (n=8)
Internet Search Engine	51 (n=18)	29 (n=10)	14 (n=5)	6 (n=2)
Internet Chat	94 (n=53)	6 (n=2)	0 (n=0)	0 (n=0)
Email Lists	97 (n=34)	3 (n=1)	0 (n=0)	0 (n=0)
Discussion Groups	94 (n=33)	6 (n=2)	0 (n=0)	0 (n=0)
Web Page Construction	77 (n=27)	20 (n=7)	3 (n=1)	0 (n=0)
FTP	100 (n=35)	0 (n=0)	0 (n=0)	0 (n=0)
Telnet	100 (n=35)	0 (n=0)	0 (n=0)	0 (n=0)

Table 7.22 describes the frequency that students have used different internet-related applications over the last 12 months. Generally, frequency data were consistent with those reported in Table 7.19.

The most frequently used application was Web page browsing with 63% of teachers claiming their students engage in this activity either most weeks or every week. Notably, 23% of students use the Web every week. However, over half of teachers do not use email (51%) or Internet search engines (51%) with their students. In addition, data indicate few teachers (n=2) use some of the more specialized Internet applications such as chat, email lists and discussion groups. There was similarly no use of FTP and telnet but a small proportion of teachers (23%) were designing Web pages with their students.

Table 7.23
Percentage of Schools with an Internet Homepage

Question	% Yes	% No
Does your class or school have an Internet homepage?	69 (n=24)	31 (n=11)

In the future, Web page construction was an activity that a number of teachers (n=9) reported they would like to pursue. The current priority, however, was redesigning the school website and helping the class to use the Internet as a "research tool" before teaching students how to construct their own homepages. Nevertheless, a high proportion of schools (69%) already had an Internet homepage, as shown in Table 7.23. On average, these schools were half a decile point higher (M=6.56) than those schools without any Web presence (M=6.0). The difference was less than in the original sample in Phase One and the level of probability (p <.01) indicated that this finding was not statistically significant.

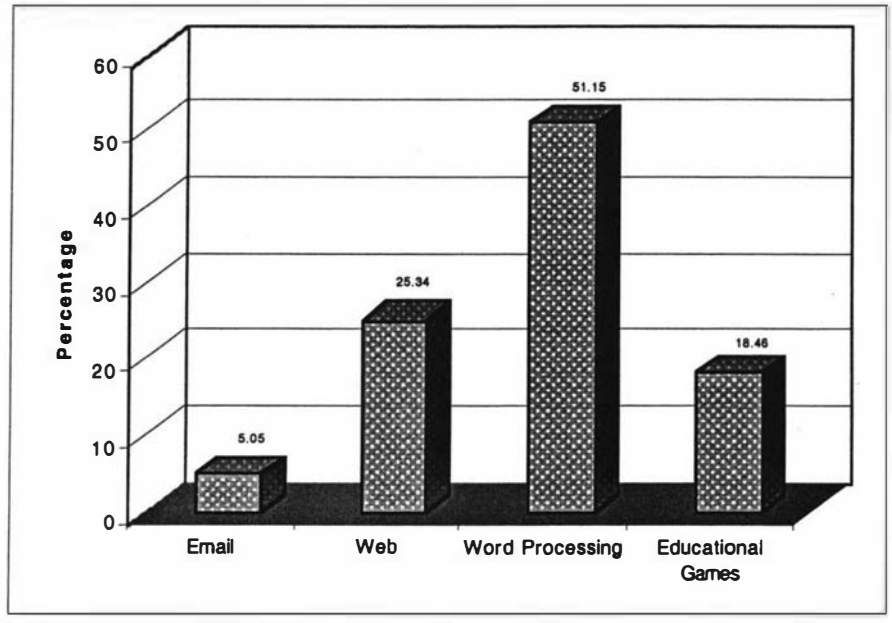

Figure 7.5 Mean percentage of computer time devoted by teachers to specific applications

The mean percentage of time devoted by teachers during a typical week to some of the main computer applications is shown in Figure 7.5. Notably, most of the computer time was devoted to word processing (51%) and students were now spending less time on educational games (18%) than the two combined internet-related applications. In contrast to Phase One, the Web (25%) was the second most time-intensive use of the computer by students. These data show teachers were using the Internet for approximately 30% of the available computer time. Comparatively, teachers at the intermediate (M=33.2) and senior (M=31.4) level devoted a higher percentage of time to internet-related applications over their middle (M=28.8) and lower (M=18.2) school colleagues. An analysis of data excluding the intermediate teachers showed little or no gender difference in the time devoted to different applications.

In the follow up interview, it was evident that the aforementioned data were potentially misleading, as the question was not inclusive of all computer applications (e.g., multimedia presentations). Some teachers calculated these other applications in their response, whereas others did not. The response to this question was further complicated when participants were asked if they were now using the computer more or less than previously. Most teachers (n=18) responded that more students were using the computer but overall no more time was being spent on computer-related activities. As one teacher explained this paradox:

> *Well I would have say about the same. Yeah well, you see we have the suite and the kids use that... but probably they don't get as much time in the classroom... The pressure isn't there in the same way. You don't feel the need to make the computer work all the time. The suite means they all get an equal turn at some time or another [S4: 177-186].*

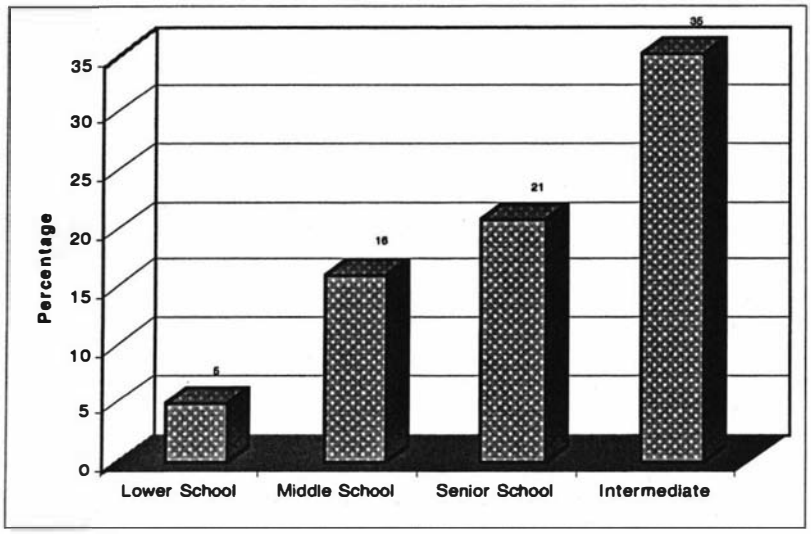

Figure 7.6 Mean percentage of classmates who use email per week by level

Figure 7.6 shows the mean percentage of students—that is, classmates—who use email per week in the teacher's class, by level. Data includes only teachers using email with their students. Again, more students use email at the senior school and intermediate level. It needs to be borne in mind that participants at the Intermediate level were specialist ICT teachers and this makes direct comparison problematic. However, based on the overall mean of just over 20% in the senior school, data indicates approximately six pupils per week use email within a typical class of 30 students. A related point is that few teachers (n=10) had a dedicated email address for their class although the use of *Hotmail* was an option used by some people.

The follow up interview showed that it was common for teachers to have designated monitors or experts for sending and receiving email. Typically, this responsibility was delegated to two or three students and email was checked on either a daily or a weekly basis. This was how one teacher operated the monitor system:

> *I have my computer monitors and they're responsible for looking after the software, checking the electronic mail, keeping paper in the printer and teaching the other kids. I change my monitors each term. The system saves me a lot of hassle... and time for other things [S10: 202-206].*

This system explains, in part, why teachers report a low proportion of students in their class using email on a regular basis. It was also apparent from the interview that the aforementioned data may under-represent email use in the lower and middle school, as sometimes teachers sent and received messages on students' behalf. As one teacher pointed out:

> *In an ideal world but it's not always practical. They write what they want to say in a word processor and save... then later in the week or whenever I copy these and send them off. I have a template that makes it relatively fool proof... You have to remember to check the mail and make sure you don't mix them up... Half the time you don't get replies [S5: 168-176].*

The mean percentage of students who use the Web per week in the teacher's class by level is shown in Figure 7.7. Data suggest few students in the lower school make use of the Web. Notably, in the senior school almost one third of the class use the Web per week and a higher proportion of students do so under the teaching of women (M=33%) than men (M=26%) but this finding was not statistically significant ($p > .05$). Across the sample, there was a wide variance of practice (SD=11.57) and based on the overall mean of 25%, data indicate more students use the Web than email per week within a typical class. However, the majority of students do not use the Web in a typical week.

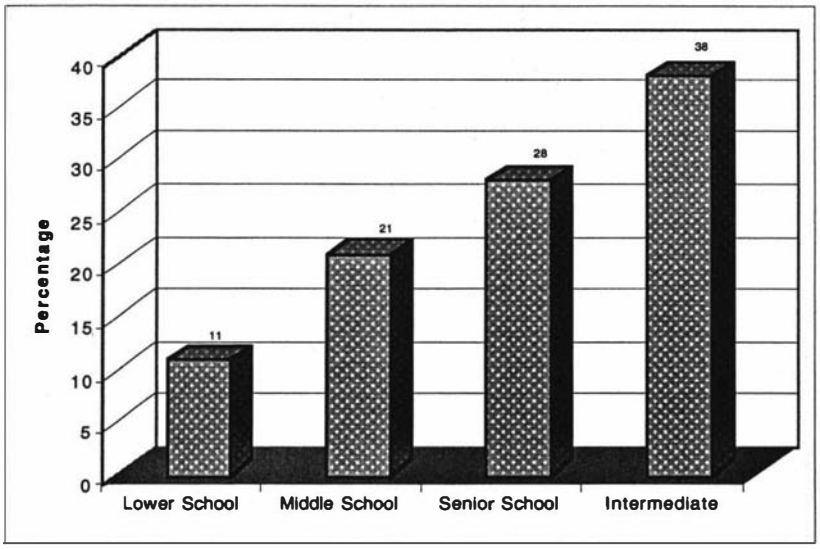

Figure 7.7 Mean percentage of classmates who use the Web per week by level

The follow up interview confirmed that the Web was predominantly used as an alternative source of information to the traditional library—that is, in keeping with the content metaphor. During regular library time, it was common for a small group of students to use the Web in order to locate reference material, albeit from an approved source. According to one teacher, the major advantage of the Web was that schools did not have to spend as much money on books:

> *Since we've had the "Net" we're saving money in our library... The library budget is down heaps as we don't need those books... I mean the reference ones. The children can now get everything they need including the pictures too from the Internet [E1: 181-185].*

On the other hand, the cost of the Web itself was a factor that contributed to the relatively low proportion of students using the Internet per class. Several teachers (n=9) commented on the expense of downloading information as an important reason why many students had limited time on the Web. In addition, teachers identified finding time within the busy classroom and fitting the Internet within the traditional curriculum as other important reasons for the lack of widespread use. As one teacher complained:

> *I don't think those pushing ICT know how little time teachers have in the real classroom. I mean you're expected to cover the curriculum and there's never a week that goes by without some disruption... There's choir, production, swimming, trips... the odd crisis. And now you have to make time for the Internet... There simply aren't enough hours in the day to fit it all in. You have to juggle and decide what's most important [W10: 136-145].*

The number of days that teachers devoted to specific internet-related learning experiences in their class over the previous 12 months is shown in Table 7.24. Over this time, the Internet was used more days for information searches than any other activity. The majority of teachers (91%) report having used the Internet in this way. Indeed, 17% of teachers from a wide cross section of the sample had devoted at least 25 days to this type of learning experience.

The follow up interview confirmed that teachers interpreted information searches to be activities that involved the Web as a research tool. A number of teachers (n=5) mentioned the *Action Learning Model* as a useful framework for teaching internet-related research skills. While these teachers were familiar with recent developments in information literacy, they were generally cautious about the use of the Web with students. Teachers expressed concern over the reliance of students on visual images rather than text and mentioned problems relating to the reading difficulty of the content. For one teacher, this was a major barrier to the use of Web-based activities in her classroom:

> *People don't understand the reading problem. I don't mean reading off the screen. That's another issue... We have children who can't read... putting them in front of the Internet doesn't help. Ok it looks bright but do they read the information... Some of my class can't. It's not easy you know... Those children really need one-on-one attention to achieve anything like a basic level of literacy [W1: 188-197].*

In addition, the interview revealed that teachers were concerned over the quality of the information available through the Web. It was common to hear to teachers report that information was sometimes inaccurate and out-of-date. On occasions, there was simply too much information for students to process. A related problem was the level of off-task behaviour caused by the delay as students waited for data to download and the information often turned out to be irrelevant when it eventually became available. This problem, along with the potential to inadvertently access inappropriate material, required teachers to carefully manage and supervise information searches. Consequently, student use of the Web was sometimes cumbersome in terms of existing routines and work practices. As one teacher stated:

> *I can't tell you the number of times... I've had to stop what I've been doing to check the Internet or to sort out the reason for a delay. Or to stop them. I don't like the children just sitting there and by the end of it they either have a heap of useless information or virtually nothing to show for their time. You have to keep an eye out for the... well you know and it just adds a lot more to your teaching [S4: 249-254].*

While some teachers were struggling to manage the Internet within their classroom, the "project approach" was popular as a methodology for promoting student research on the Web based on a specific theme (e.g., Animals). The interview revealed, however, a traditional interpretation of project-based learning and few teachers (n=4) were using the Web to investigate authentic problems with complex solutions. This observation was corroborated by the low proportion of teachers (43%) who had scheduled time for "open ended" Internet investigations. Typically, project-based learning involved "topic studies" in the traditional sense where the Internet was used as a replacement for, or supplement to, other information sources. This is how one teacher described this type of Web-based project in the context of the Olympics:

> *We've all done a project on the Olympics and we got heaps of good info off the "Net"... In some ways it was a lot better than other books and stuff like that... although not all the children could read it... They worked in pairs and each had a country to research. We still had to use other material as it wasn't practical to let them go to it completely... I mean you can't really because of the rubbish... In the end I printed off as much as I could before school. But I would say the Internet part got us more motivated [S10: 222-229].*

The Olympic Games was a popular theme. Two teachers had used a WebQuest on the history of the Olympics with their students. This experience was integrated into the language and social studies programme as part of a wider theme. Although the questionnaire showed that a number of teachers (n=14) from varying backgrounds had experimented with WebQuests, not everyone was convinced of their educational value. In one teacher's opinion, WebQuests offered nothing more than a dressed up scavenger hunt through the school library. As she stated:

> *A group of kids did one and... well they enjoyed it... it was fun for them, novel, but they're overrated. All it is... is copying low-level info and you could get the same type of information from the library. So, why bother?... Then you have the reading problems and the crap to put up with. It's still a bit of a mess. You may as well develop your own worksheet... And they're very American don't you think [S5: 232-239].*

Another common experience was key pal and information exchanges. While more than half the participants had not utilized these activities over the past 12 months, a handful of teachers (n=5) including men and women had used email exchanges for an extended period. Typically, this involved a reciprocal arrangement with another school where information was shared between students living in another country.

The interview showed, however, that in some cases teachers reported the same Internet experience under more than one category—for instance, travel buddies. Thus, frequency data were potentially inflated and these figures must be treated with caution.

Table 7.24
Number of Days Devoted to Internet-related Learning Experiences in the last 12 Months

Question	% 0 Days	% 1-5 Days	% 6-14 Days	% 15-24 Days	% 25+ Days
Web Quests	60	11	9	14	6
Information Searches	9	11	44	19	17
Internet Investigations	43	15	28	11	3
Information Exchanges	51	23	17	9	0
Key/Pen Pal Exchanges	60	11	19	6	9
Ask an Expert	94	0	6	0	0
Electronic Guests	82	6	3	9	0
Virtual Field Trips	85	3	3	6	3
Online Adventures	91	6	3	0	0
Internet Competitions	80	0	3	17	0
Sequential Stories	94	0	6	0	0
Electronic Publishing	82	3	6	9	0
Author Book Raps	82	3	9	6	0
Travel Buddies	85	6	0	3	6
Social Action Projects	91	0	0	6	3

The interview also revealed that email exchanges between schools were established typically through an existing contact—often an expatriate New Zealand teacher. In the case of travel buddies, nevertheless, the initial contact was usually made through a dedicated website—such as, *Oz-TeacherNet.* The travel buddy experience was not always positive for students. In general, teachers were disappointed by the lack of response and many people were frustrated by the whole experience. As one teacher summarized:

> *From my experience, it's hard to make these exchanges work. First you have different holiday breaks and you rely so much on the other party. You begin with high expectations and it's easy for the whole thing to fall to custard...*

By the second week you might not get a message. Where does that leave you... Our travel buddy worked best... but you can only do that once every couple of years. The novelty would wear off... It has potential but I don't push it any more. It hasn't really lived up to expectations [E8: 187-199].

On a more positive note, three teachers were highly enthusiastic about their virtual field trip experience as part of the LEARNZ programme. One teacher with experience of audio-conferencing from participation in a Telecom project believed this added yet another dimension to the Internet. These younger teachers were unanimous that online adventures and virtual field trips had great potential and they intended to make greater use of them in the future. As one teacher claimed:

Next year, I'm definitely going to work an adventure into the curriculum... I'm not sure what term or topic... I'll have to talk to the others first. They're cool and I'm sure the kids will really get into it... Yes, I will for sure. The potential benefits are enormous [W3: 208-213].

Despite their enthusiasm, the aforementioned teachers admitted that to date they had been unable to fully integrate the online experience into their classroom; they had signed up too late and/or run out of time because of other commitments. The problem was that staff had already formulated their long-term plan at the beginning of the year. As this was their first attempt at this type of experience, the teachers all agreed that next time they would need to start planning well in advance. They also indicated a strong preference for adapting the online materials and virtual experience to suit their students and their own teaching methods.

Over the past 12 months, a number of teachers (n=7) had participated in some type of Internet competition. It was not possible from the interview sample to fully explore the nature of these competitions, but at least two teachers had a small group of students participating in *ThinkQuest*. The experience was used to extend some students who were perceived to be gifted and talented. Likewise, electronic publishing and Web page construction was largely reserved for the "clever kids" who were perceived to benefit most from these extension activities. As one teacher commented:

I have a pupil who has his own website... it's like water off a duck's back to him. So, I left him to show the others... my bright ones... and they all came up with something different. I was impressed... This year I'll give it more thought and we might put their work on the school site [S2: 234-241].

Although less than 20% of teachers had participated in an author book rap, this appears to have been the single most successful internet-related learning experience. The teachers reported that book raps augmented the reading and language programme and were feasible in the regular classroom. Unlike other experiences, the technical demands were minimal and they were tightly focused over a definitive period. The main source of book raps was though *English Online* and this website was highly recommended by these teachers. As one teacher described the book rap experience:

> *It was great to talk about a book like this with other kids. You all have the same book, so there's something already in common... But there are so many ways of reading the story and it's great to see the different perspectives. I think it takes questions to another level... Best of all you don't have to be a rocket scientist... as it only requires not a lot of technical knowledge. And takes a short amount of time... This is about the only thing I'd bother with from now on... as you can waste a lot of time. You need an experience that doesn't constrain you like some of the other activities [E23: 256-267].*

Lastly, the interview revealed that three teachers, all women, had participated in an online learning experience as part of World Vision's 40 Hour Famine—that is, a social action project. This corroborated the questionnaire findings and showed that at least some teachers understood the terminology used to describe the various internet-related learning experiences. Again, the experience was not entirely successful for these teachers and the proposed programme was not fully implemented as intended. As one highly passionate teacher pointed out, the regular curriculum got in the way:

> *I was real keen to do this... yeah as the famine is real big in our school. We raise a lot of money and I genuinely believe the children actually learn something about how most of the world lives. It's real for them... You know this is their problem as much as ours. I firmly believe we need to educate them at a young age about the world... The problem for me was finding time whilst doing all of the other learning areas. In the end, it was too complicated and simply too much effort for the payoff [S5: 273-281].*

Table 7.25 reports the percentage of teachers who use the Internet for lesson planning and preparation. The majority of teachers (91%) utilize the Internet in this way but very few do so every week. As in Phase One, data suggest a higher proportion of women (71%) than men (64%) regularly access the Internet for this purpose. In the follow up interview, few participants (n=3) reported having ever used a pre-packaged lesson plan or unit from off the Internet.

Table 7.25
Percentage of Teachers who use the Internet for Lesson Planning and Preparation

Question	% Never	% Some Weeks	% Most Week	% Every Week	% Most Day
How often do you use the Internet in lesson planning and preparation?	9 (n=3)	23 (n=8)	54 (n=19)	14 (n=5)	0 (n=0)

The difficulty of integrating the Internet into the regular curriculum is shown in Table 7.26. It was noteworthy that few participants (n=7) rate their success better than "good" and a high proportion of teachers (40%) perceived their effort to have been poor. Based on mean responses, gender was not a significant factor in perceived success (p >.05). The interview showed that this group of teachers set high standards for themselves and they were not satisfied with their use of the Internet thus far.

Table 7.26
Perceived Success of Integrating the Internet into the Curriculum

Question	% Excellent	% Very Good	% Good	% Adequate	% Poor
How would you rate your success at integrating the Internet into the school curriculum?	0 (n=0)	6 (n=2)	14 (n=5)	40 (n=14)	40 (n=14)

That said most teachers pointed out that the Internet was still new and this along with inadequate access was the main reason for the lack of curriculum integration. As one enthusiastic teacher explained:

> *It's early days and with more effort and time we should realize the benefits. We need more teachers with the skills and better access. I'm convinced this is the future and you can't expect us to walk or run... let alone fly... overnight. But we will get there you know [E1: 268-274].*

In contrast, some teachers (n=5) were beginning to question the role of ICT in education and the so-called benefits of the Internet in their school. These teachers were suspicious of the hype surrounding the Internet and conscious of their failure to fully integrate it into the classroom, despite having experimented with a number of innovative internet-related activities. This was not the first time they had attempted to realize the claims of a new educational technology, and their growing scepticism based on the legacy of previous failure was evident in the follow up interview. As one teacher critically reflected:

I've seen it before... when the dust settles little changes at the chalk face. You have to be wary of previous experiences. The Internet is a little different but it depends on what you do with it... I'm reserving judgment at this stage. We're doing our best but all the networking stuff is distracting me from teaching... I can't say it's yet making a big difference [W1: 245-256].

Table 7.27 shows a low proportion of teachers (37%) perceived the Internet was making major improvements to the quality of the curriculum. Indeed, an equal number of participants from a wide cross section of the sample disagree with the relevant statement. Another 26% of teachers were unsure of any improvements.

Table 7.27
Perceived Improvement to the Quality of the Curriculum

Statement	% Strongly Agree	% Agree	% Unsure	% Disagree	% Strongly Disagree
The Internet is already making major improvements to the quality of curriculum delivery at our school.	3 (n=1)	34 (n=12)	26 (n=9)	37 (n=13)	0 (n=0)

It was apparent from the interview that the majority of teachers (n=18) could not provide evidence of any major improvements to learning in a measurable sense. Rather, improvements were thought to be qualitative and related to student motivation and the relevance of school to life in the 21st century. This view was reflected in the following comment:

The real improvement comes from the pupils' interest and motivation. They thrive on it. You can see it on their faces. School is no longer boring... and we're preparing them for their life and the technology of the future... We have to keep up with the times [W8: 251-257].

In sum, the Internet was most accessible in the senior school but teachers at all levels had some access through either their classroom, library or computer suite. While nearly all teachers were using the Internet with students to some degree, the most frequent usage was at the senior school and intermediate level. Yet, even at this level, relatively few students were using the Internet on a regular basis. With the possible exception of multimedia, the Web was now second only to word processing as the most frequently utilized computer application in the classroom. It was used most frequently as a research tool, although teachers had attempted a variety of other internet-related learning experiences. Overall, most teachers were still endeavouring to successfully integrate the Internet into their teaching to enhance the quality of the curriculum.

7.4 APPROACH TO TEACHING WITH THE INTERNET

This section describes the teachers' pedagogical beliefs along with their perceptions of how the Internet supports learning and teaching processes, and perceived changes to teaching practice as a result of using the Internet for educational purposes. It relates to the following research questions: What perceptions and beliefs do internet-using teachers have about the learning and teaching process? What perceptions and beliefs do teachers have of how the Internet supports the learning and teaching process? What changes to their practice and work culture do teachers report from using the Internet for learning and teaching?

Table 7.28
Perceived Approach to Teaching with the Internet

Question	% Instructor	% Manager	% Coach	% Guide	% Facilitator
Which one of the following terms best describes your current approach to teaching with the Internet?	11 (n=4)	11 (n=4)	9 (n=3)	40 (n=14)	29 (n=10)

Table 7.28 reports the metaphor that teachers perceive best describes their approach to teaching with the Internet. The most common term was Guide, which was selected by 40% of teachers. Facilitator (29%) was the second most frequently reported term. The least common response was Coach (n=3). Similarly, few participants (n=4) perceived they were an Instructor or Manager with most of these teachers (75%) men. The follow up interview revealed, however, the idiosyncratic interpretation of these terms; when asked to elaborate on their response different teachers used the same metaphor to describe quite different teaching orientations. This is apparent in the following two interview extracts from teachers who both selected the term Guide:

> *I like to think of myself as a guide on the side. Kids need to learn for themselves... it doesn't always help if I'm there each step of the way. So I give a lot of responsibility to children. I don't like telling them what to do... it's best if they have to figure it out. They're more than capable... I'm there in the background to support the kids' learning. [W3: 278-285].*

> *I consider myself a guide. My role is to point children in the right direction as they travel on their learning journey and... to stop them from going down blind alleys. I can save them a lot of time and wasted effort by showing them the right way... and I can generally make their learning more success oriented. My role is to ensure all children succeed not just some [W9: 253-258].*

The participants' response to the two contrasting teaching scenarios is reported in Table 7.29. Both scenarios were adapted from the instrument used by Becker and Anderson (1998) to identify and distinguish constructivist pedagogy from traditional teaching methods. However, minor changes were made for the New Zealand context including the use of androgynous names. Almost half the teachers (46%) identified themselves as being most comfortable with the student-centred discussion in Sam's class. Nevertheless, a high proportion of teachers (34%) selected the more teacher-centred discussion lead by Chris. A number of teachers (n=7) were unsure which type of class discussion they would prefer. There was more agreement, however, over the type of discussion that teachers thought students would prefer with the majority of participants (68%) opting for Sam. Despite this view, most teachers (66%) perceived that students would gain more knowledge from the class taught by Chris. Indeed, 60% of teachers indicated that this scenario was more conducive to the acquisition of useful skills. Thus, a minority of teachers (28%) perceived that students would gain more knowledge and useful skills from participation in Sam's class.

Table 7.29
Response to Observations from Two Contrasting Teaching Scenario

Chris	**Sam**				
Chris was talking to the class in an animated way, asking questions that the students could answer quickly; based on the work they had done the day before. After this review, Chris taught the class new material, again using simple questions to keep students attentive and listening to what was being said.	Sam was having a discussion with the class where many of the questions came from the students themselves. Though Sam could clarify students' questions and suggest where the children could find relevant information about the topic, the teacher could not really answer most of these questions.				
Response	% Definitely Chris	% Probably Chris	% Not Sure	% Probably Sam	% Definitely Sam
Which type of class discussion are you most comfortable having in class?	23 (n=8)	11 (n=4)	20 (n=7)	17 (n=6)	29 (n=10)
Which type of discussion do you think most students would prefer to have?	9 (n=3)	11 (n=4)	11 (n=4)	37 (n=13)	31 (n=11)
From which type of class discussion do you think students gain more knowledge?	26 (n=9)	40 (n=14)	6 (n=2)	14 (n=5)	14 (n=5)
From which type of class discussion do you think students gain more useful skills?	23 (n=8)	37 (n=13)	11 (n=4)	17 (n=6)	11 (n=4)

When asked to comment on the two teaching scenarios during the follow up interview, it was apparent that some teachers had a preference toward both student-centred and teacher-centred approaches. Teachers did not regard the two scenarios as mutually exclusive. This was clearly articulated in the following response:

Yeah, I sort of understood what this was trying to get at. But I think this is where the education theory is often too simplistic. It depends... I don't believe that you always teach the same way and it would be silly to dismiss one approach from your teaching. You have to teach according to the different learning styles in your class [E8: 267-274].

Another teacher also commented on the simplistic dichotomy between the two scenarios and reiterated the point that students have different learning styles. The teacher explained how the context of the class discussion would determine her response: She stated:

You can't say. There are times when teacher directed is appropriate. At other times you want the kids to take the lead. It depends on the level and the kids' learning style. There is no simple answer to this... I think teachers often think they're constructivist and student-centred when the reality is sometimes very different [W9: 208-216].

This last comment was echoed by a number of other teachers. According to one teacher, the uncritical and superficial adoption of new teaching methods explains, in part, the apparent paradox between student-centred and teacher-centred preferences. When asked to explain the perception that students prefer more student-centred approaches to teaching but that many teachers perceive teacher-centred approaches are more effective, two themes emerged. First, student-centred learning was often nothing more than "dressed up" teacher-centred teaching. In other words, the difference between the two approaches was merely cosmetic as one teacher pointed out:

I know that constructivism is where we're meant to be heading. And I'm all for making learning more relevant to pupils. But if we're honest it's a bit of a snow job. I mean the teacher is always in charge - regardless. We have to set the learning outcomes... Because I believe teachers fool children into thinking that they're in control. And the bright ones see through this... I'm not sure people actually realize these ideas are nothing new [W10: 278-289].

The second theme was the curriculum itself. There was some consensus that the *New Zealand Curriculum Framework* (Ministry of Education, 1993a) was counter-productive to student-centred teaching despite all the rhetoric. The crowded nature of the curriculum and the increased expectation of teachers from parents, principals and policy-makers to achieve high standards were offered as reasons why many people reverted to teacher-centred methods. As one teacher explained:

It's not easy to fit everything in that's expected of us. Half the time you're a social worker and it's a lot easier to just tell the whole class what they're expected to know... Now there's also ICT but reading is still a big problem in our school. Quite simply as far as I'm concerned, it's impossible to do everything and you sometimes have to be a real teacher in order to survive. That's why... I find that traditional methods are sometimes the best if you want to satisfy the curriculum requirements [E7: 303-312].

Figure 7.8 presents a profile of the teachers' response to the two contrasting teaching scenario by gender. On a five-point scale, in which two represents "definitely Chris" and negative two the "definitely Sam" category, there was little or no difference between the profile of men and women. The mean response to each question was similar with the exception of comfort level in terms of student-centred discussion. Generally, men were less comfortable than women with the discussion in Sam's class—for example, the mean for women was –0.42 as opposed to --0.07 for male teachers. The degree of probability (p <.05) was right on the threshold of the conventional level of significance.

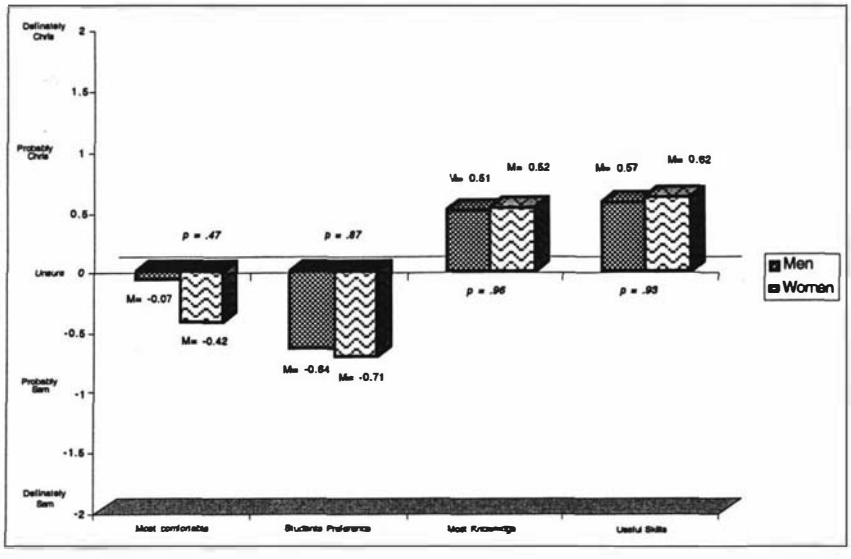

Figure 7.8 Profile of response to student-centred and teacher-centred scenario by gender

Note: The level of significance is shown by the probability *(p)* values derived from a homoscedastic *t-test.*

The characteristics of accomplished teachers in order of perceived educational importance is shown in Figure 7.9. Participants were asked to rank a list of desirable teaching qualities in order of their importance. The figure shows a range of responses in terms of the three most important characteristics. As depicted by the smoothed line, a clear educational philosophy based on critical reflection was ranked as the most important characteristic of accomplished teachers. Indeed, this was selected by 57% of the participants either as their first or second choice.

Sound knowledge of the national curriculum was ranked by 29% of teachers as the second most important characteristic. This attribute was also ranked highly as a second choice. The next characteristic ranked as a first choice was that teachers met the core professional standards. In fact, 31% of teachers selected this attribute as either their first or second choice.

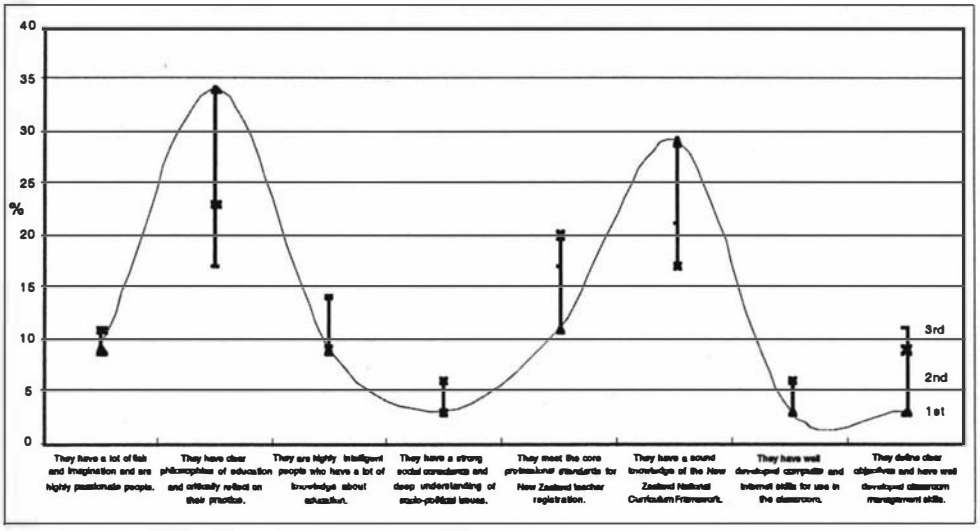

Figure 7.9 Perceived characteristics of accomplished teachers by order of importance

In contrast, the 9% of teachers who selected "flair, imagination and passion" or "intelligence and knowledge of education", as their first choice, followed this attribute equally. Notably, only one younger teacher identified "computer and Internet skills" as the most important quality. While few people (n=4) ranked this attribute as either their second or third choice, they were the least experienced teachers. Across the board, "the ability to define clear objectives and possess well-developed management skills" was not ranked highly by participants. It was noteworthy that few people (n=4) perceived "a strong social conscience and understanding of socio-political issues" was an important characteristic of accomplished teachers.

Figure 7.10 presents the mean profile of the first and second ranked characteristics of accomplished teachers in terms of Snook's (2000) distinction between teaching as a practical craft and teaching as a learned profession. Although there was some overlap between the choice of "philosophy and reflection" and "official curriculum knowledge", the latter was ranked first by all those teachers who selected "professional standards" as their second choice. Conversely, teachers who either ranked "social conscience", "flair and passion", or "intelligence and knowledge" of education as their second choice all selected "philosophy and reflection" as their first. This gives the impression of a correlation between the first and second ranked characteristics of accomplished teachers, which appeared to follow the aforementioned distinction—albeit somewhat artificially.

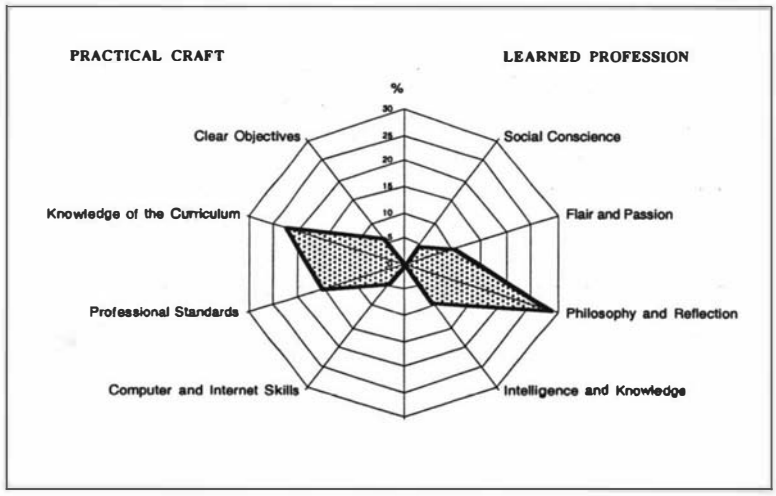

Figure 7.10 Mean profile of first and second ranked characteristics of accomplished teachers

Further analysis of the responses based on demographic variables showed that a similar proportion of men and women selected both "philosophy and reflection", and "knowledge of the curriculum" as their first choice. Of those teachers who ranked the former as their first choice, 29% were men and 38% were women. This group represented a wide cross section of the sample in terms of age, level and teaching status. Similarly, an equal distribution of male and female participants (29%) from the sample at large selected curriculum knowledge as their first choice. A slightly higher proportion of men (29%), mainly in positions of senior management, as opposed to women (14%), ranked "meeting professional standards" as their second choice. While potential correlations were not statistically measured because of the small sample and the greater emphasis on qualitative data, there were no obvious demographic patterns in the selection of characteristics of accomplishment.

When asked to elaborate, however, on the relative importance of these characteristics in the follow up interview, a number of teachers (n=8) reaffirmed the view that knowledge of the *New Zealand Curriculum Framework* and suitability for teacher registration were the most essential attributes of accomplished teachers. As one participant maintained:

> *You have to know what to teach, so you have to know the curriculum. It's the foundation of teaching... The TRB is the body that decides if you're fit to teach. So, this has to be important and you have to meet their criteria. If you don't then you can't teach – it's as simple as that... Then you have to demonstrate your knowledge and skills to ERO [S2: 299-305].*

On the contrary, some teachers (n=5) argued that simply meeting the requirements of teacher registration was no measure of accomplishment. They claimed that there was more to good teaching than curriculum knowledge alone. A teacher's philosophy coupled with their flair and imagination set them apart from their colleagues. As the following teacher posited:

I would have to say that professional standards are irrelevant. It's not a factor... If it was... all teachers would have to be defined as good teachers. And that's not the case. Just another bureaucracy... The difference is you can see it in their eyes. They think different and seem to have more energy... It's not an age thing... I suppose there's a real X factor that goes with genuine talent. It's beyond what you see in most teachers. You can't really put your... well finger on it. They truly inspire their students [E8: 299-309].

It was noteworthy that two participants strongly believed that accomplished teachers should possess a critical understanding of contemporary developments in education. In other words, they need to be concerned with developments both within and beyond walls of the classroom. As the following comment indicates, an understanding of the wider socio-political context of education was an important attribute of accomplished teachers:

There are some people who just go through the motions... but then other teachers really live their work. It's more than a job to me. It keeps me young and stimulated... You can't just accept the way things are being done. My study taught me that... What's it they say - education is political. You have to question always and ask why. You have to try, well to change the system... I mean that's what comes with experience... basically that's what teaching is all about to me [W10: 336-349].

In comparison to other attributes, the relative unimportance of computer and Internet skills was confirmed during the interview. The general sentiment was that the Internet was simply another tool for teachers to build into their existing style of teaching. Thus, ICT was less important than many enduring traits of accomplished teachers, as identified in the questionnaire. This view was reflected in the following comment:

Actually, your question has made me think that we probably are putting too much emphasis on ICT at the moment... It's just a tool. I see ICT skills as being down the pecking order. I'm not sure other people would agree... this makes me feel better about our progress... We don't want a profession of computer geeks or... let alone a class of IT nerds. There's more to teaching and learning than this [E12: 288-297].

At the same time, ICT skills were important. A number of generally younger teachers (n=7) believed that the ability to use the Internet would become essential to good teaching in the future. They perceived the Internet was changing the type of skill and knowledge that schools would need to promote. These people were critical of their colleagues and believed that teaching, and the curriculum itself, was stuck in the past. As one teacher stated:

This is the future. Future teachers will all need to be Internet savvy. You can't keep your head in the clouds... You know teachers need to move with the times as the Internet is changing the world and what's important about teaching... Good teachers in the future will need to possess a lot of Internet skills. That's what schools and employers will want – not old knowledge [W3: 312-321].

The extent to which the Internet had changed the teacher's philosophy is shown by age in Table 7.30. As in Phase One, the majority of participants (74%) did not consider the Internet had changed their teaching philosophy. However, a disproportionate number of teachers both male and female (n=5) under the age of 40 gave an affirmative response to this question.

Table 7.30
Perceived Change to Teaching Philosophy by Age

Question	Yes %					No %				
	% 20-29	% 30-39	% 40-49	% 50-59	% All	% 20-29	% 30-39	% 40-49	% 50-59	% All
Has the advent of the Internet changed your teaching philosophy?	66 (n=2)	60 (n=3)	18 (n=4)	0 (n=0)	26 (n=9)	33 (n=1)	40 (n=2)	82 (n=18)	100 (n=5)	74 (n=26)

The lack of change to philosophy was discussed in the follow up interview where the majority of teachers appeared to have assimilated the Internet into their pre-existing educational beliefs. As one teacher put it:

I wouldn't say it's had a major impact... You see my teaching philosophy evolves all the time... anyway. I take new bits every year and add these on to my previous teaching. The Internet is just part of this... It may be too soon to say but at this stage I haven't radically changed my teaching style just because of the Web... I mean it does come into it but it's just one of the many things you think about in your teaching [S11: 311-321].

It was common for teachers to report that the Internet had simply complemented their existing philosophy rather than caused radical changes in the way they teach. The melding of the computer with existing ways of teaching was especially the case when teachers claimed to already place strong emphasis on student collaboration, inquiry-centred learning and the development of research skills in the classroom. In the words of one teacher:

Well I already adopt an inquiry model in my teaching so new Internet skills go perfectly with that... My philosophy has become more refined over the years but the way I use the Internet is basically the way that I've always taught in the classroom anyway [W6: 267-272].

As another teacher pointed out:

I'd teach the same way with or without the Internet. It's just who I am as a teacher [E4: 219-220].

The limited impact of the Internet on teaching philosophy was explained also by the belief that it was just another tool—similar to other resources in the classroom. There was a common perception that the effect of the Internet was linked closely to how well teachers used it and new computer technology *per se* did not enhance teaching. In this sense, these teachers regarded the Internet as a tool just like the overhead projector and other modern teaching aids. From their perspective, the teacher was far more important than any new educational technology. As the following two teachers report:

It's just another tool we have in our toolbox. Teachers are always on the look out for new ideas and the Internet happens to be a very powerful way of locating fresh material for your teaching... It's just another resource like the National Library for supplementing your teaching [E25: 187-193].

No not at all. The Internet is simply another tool... I'm now using within my classroom programme. I've added it as another activity around my language and current events time but at the end of the day we need to focus on teachers not technology [W11: 311-316].

Table 7.31 shows the perceived categories of experience at implementing the Internet for learning and teaching. More teachers (43%) identified themselves as "Committed Innovators" in comparison to any other category. While proportionately male teachers (n=8) over-represented this category, overall the group possessed a broad mix of previous Internet experience. Thus, the level of prior experience was not a strong factor by itself in the selection of this category. Likewise, the two male "Accomplished Achievers" were not the most experienced internet-using teachers. What is more, they did not have access to the Internet in their classroom. Notably, some of the teachers with the best levels of Internet access selected the "Cautious Integrator" category. Most of the teachers (n=3) in this category were women. Similarly, the majority of internet-using teachers in the "Enthusiastic Beginner" (75%) and "Struggling Adopter" (66%) categories were female. At the same time, some of these teachers were the most experienced women in terms of Internet use. Overall,

there was no obvious pattern in terms of prior Internet experience in response to this question.

Table 7.31
Perceived Categories of Experience at Implementing the Internet for Learning and Teaching

Question	% Enthusiastic Beginner	% Struggling Adopter	% Committed Innovator	% Accomplished Achiever	% Cautious Integrator
Which term best describes your level of experience at implementing the Internet for learning and teaching?	23 (n=8)	17 (n=6)	43 (n=15)	6 (n=2)	11 (n=4)

The response to the different stages of technology adoption derived from the Apple Classrooms of Tomorrow (ACOT) Project (Fisher, Dwyer & Yocam, 1996) is shown in Table 7.32. It was noteworthy that the highest proportion of teachers fell within the "Invention Stage". Nevertheless, these participants were not the most experienced internet-using teachers and some reported minimal use of the Internet for learning and teaching purposes. A similar proportion of men (36%) and women (38%) selected this stage of Internet adoption. Notably, the majority of these teachers (62%) identified themselves as "Committed Innovators" in the previous question.

Table 7.32
Perceived Stages of Internet Adoption for Learning and Teaching

Question	% Entry	% Adoption	% Adaptation	% Appropriation	% Invention
Which one of the following stages best describes your level of Internet adoption for learning and teaching?	9 (n=3)	17 (n=6)	23 (n=8)	14 (n=5)	37 (n=13)

There were few teachers at the "Entry Stage" of adoption, which included both "Enthusiastic Beginners" (n=1) and "Struggling Adopters" (n=2). The remaining teachers were distributed across the other stages of Internet adoption. Indeed, the Adoption and Adaptation stages between them attracted responses from participants within all five categories of Internet implementation, as described in Table 7.31. The only group not represented in the "Appropriation Stage" was the "Cautious Integrators". These teachers were divided equally between the Adaptation (n=2) and Invention (n=2) stages. Proportionately, with the exception of the "Entry Stage", men and women from each age group were evenly distributed across the stages. This suggests a relatively weak correlation between the different stages of adoption and the different categories of Internet experience, as there were marked gender differences in the latter. Alternatively, it raises some questions as to the validity of these data and the trustworthiness of the self-report classification technique.

In the follow up interview, the tenuous link between these two questions was partly explained when teachers expanded on their response. A less experienced teacher, for example, who identified herself as an "Enthusiastic Beginner", claimed to select the "Inventor Stage" because she was always searching for new and creative ways of teaching. Although the teacher perceived herself to be very much a beginner, it was not her aim to merely support learning and teaching with the Internet. She went on to say:

> *There's got to be more to it than this. Otherwise, why bother with the Internet? You know, I like to think I'm an innovative teacher... The only reason I'm using the Internet is to be more innovative. Those other stages they don't convey where I'm at. Does that make sense? [E23: 341-347]*

In a similar vein, a teacher who claimed to be a "Committed Innovator" believed that he was also at the "Inventor Stage" of Internet adoption, as this best described his orientation toward teaching. He suggested that the proposed stages could easily be inverted to describe his own career path. The teacher stated:

> *I've been using the Internet for a few years now but I don't believe... or at least recall moving through different stages... Basically, I'm a leader not a follower. I'm well known for my wacky ideas and for no other reason I see myself as... well an inventor. You could say gosh this is the first stage for me. You see I usually leap off into the unknown... It's where I start in most things I undertake. It's far more fun [E2: 328-337].*

In contrast, another teacher who selected the Inventor Stage considered herself a Cautious Integrator because she did not believe the Internet should be assimilated into the traditional curriculum. Previously this teacher ranked highly the need for a strong social conscience and deep understanding of socio-political issues. For this reason, she was highly critical of some of the assumptions underpinning the *New Zealand Curriculum Framework*. The teacher drew on a biblical analogy to explain her response:

> *I'm a little wary of the curriculum. It's no Bible you know. It can be a very constraining thing and... I hate the way teachers try to make learning outcomes fit Essential Skills. Like real life, learning is not as black and white as this... I believe teachers need to learn there are lots of religions and interpretations of the Bible. You could even say some of these are great inventions... This is why you can call me an inventor [W10: 383-391].*

These three examples show how a number of participants selected the same stage of adoption based on different but well reasoned explanations for their chosen response. Thus, the interview served to both amplify and "muddy" the questionnaire data on the different stages of adoption and categories of Internet implementation. In short, it accentuated the idiosyncratic and deeply subjective nature of each teacher's response.

Table 7.33
Response to the Internet as a Social, Economic and Educational Phenomenon

Question	% Booster	% Doomster	% Deschooler	% Critic	% Other
Which one of the following terms best describes your current response to the use of the Internet in education?	63 (n=22)	0 (n=0)	26 (n=9)	6 (n=2)	3 (n=1)

Table 7.33 reports the teachers' response to the Internet as a social, economic and educational phenomenon based on Bigum and Kenway's (1998) four broad groupings of influences shaping the use of educational technology. It shows that most teachers (63%) perceived themselves to be Boosters—that is, general proponents of Internet use in schools. The next largest group was Deschoolers (n=9). These typically younger teachers appeared to be strong advocates of using new computer technology as a vehicle for reforming traditional schools. Only two teachers identified themselves as Critics. In other words, they were highly critical of the claims about the Internet and its potential to transform education. It was also noteworthy that both teachers previously selected the "Cautious Integrator" category. There were no Doomsters—that is, general opponents of the Internet in schools—but one teacher listed himself under an original heading, namely Rooster. A brief note explained that he regarded himself as an early adopter who was "loudly proclaiming the benefits of the Internet". At the same time he was "waiting to get his head chopped off" at any moment.

Table 7.34
Perceived Enthusiasm for Using the Internet in Teaching

Statement	% Strongly Agree	% Agree	% Not Sure	% Disagree	% Strongly Disagree
I feel enthusiastic about using the Internet in my teaching.	40 (n=14)	57 (n=20)	3 (n=1)	0 (n=0)	0 (n=0)

The perceived enthusiasm of teachers for using the Internet in their teaching is shown in Table 7.34. Clearly, the majority of teachers (97%) were enthusiastic toward the Internet. Significantly, none of the participants expressed an unenthusiastic response to this statement. The follow up interview confirmed that the sample of teachers was generally enthusiastic toward the Internet, albeit that some participants were slightly more critical and cautious than others were.

Table 7.35
Perceived Confidence at Using the Internet for Learning and Teaching

Question	% Excellent	% Very Good	% Good	% Adequate	% Poor
How would you rate your level of confidence at using the Internet for learning and teaching?	20 (n=7)	37 (n=13)	40 (n=14)	3 (n=1)	0 (n=0)

Table 7.35 reports the perceived confidence of teachers at using the Internet for learning and teaching. Notably, 57% of teachers perceived their confidence to be very good or excellent. A high proportion of teachers (40%) report a good level of confidence and there was little or no variation between the self-efficacy of different age cohorts based on perceived confidence.

Table 7.36
Perceived Knowledge of Learning Theory and Learning and Teaching with the Internet

Question	% Excellent	% Very Good	% Good	% Adequate	% Poor
How would you rate your knowledge of contemporary learning theory?	14 (n=5)	31 (n=11)	54 (n=19)	0 (n=0)	0 (n=0)
How would you rate your knowledge of learning and teaching in relation to the Internet?	0 (n=0)	26 (n=9)	60 (n=21)	14 (n=5)	0 (n=0)

Teachers perceived knowledge of contemporary learning theory and learning and teaching in relation to the Internet is reported in Table 7.36. Nearly half the teachers (45%) perceived they had very good or excellent knowledge of learning theory. Significantly, none of the participants reported their knowledge to be adequate or poor. Thus, all of the teachers claimed to have a good theoretical knowledge of learning. In contrast, 14% of teachers perceived their knowledge of learning and teaching with the Internet to be adequate. Moreover, there were no teachers with an excellent level of knowledge. Hence, the majority of participants (60%) reported their knowledge within the good category.

Figure 7.11 presents a multi-dimensional profile of teachers' confidence, knowledge of learning theory and knowledge of learning and teaching practice in relation to the Internet by gender. On a five-point scale, in which five represents the excellent category, there was little or no difference in the mean confidence (p >.05) of either gender, nor any significant variation (p >.05) between the mean profile of men and women in terms of perceived knowledge.

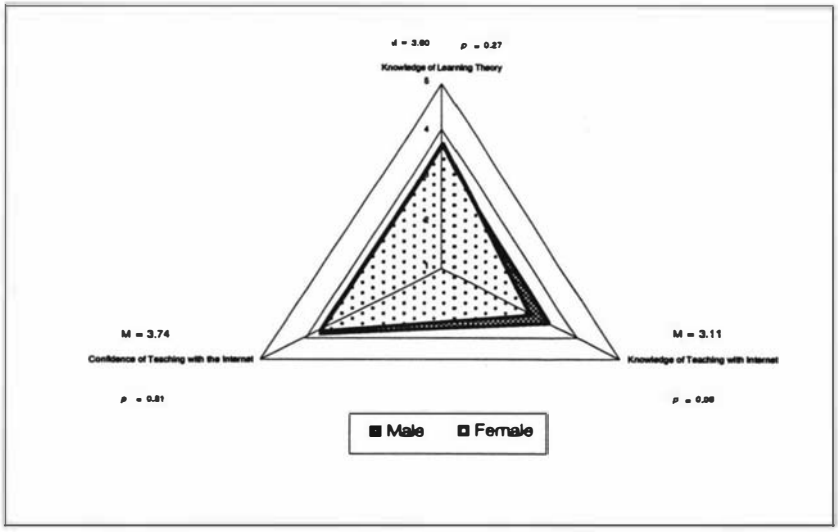

Figure 7.11 Profile of confidence, knowledge of learning and teaching with the Internet by gender

Note: The level of significance is shown by the probability *(p)* values derived from a homoscedastic *t-test.*

An analysis of these data showed men (M=3.42) perceived themselves as having less knowledge of contemporary learning theory than women (M=3.71), but the difference was insignificant (p >.05). However, the gender difference was inverted in relation to learning and teaching with the Internet. The mean for women (M=2.95) was lower than that for male teachers (M=3.35) with the degree of probability (p =.06) marginally above the conventional level of significance. There was no significant difference (p >.05) in the response from teachers under and over the age of 40 to this cluster of questions.

Table 7.37
Perceived Effect of Internet on Way of Teaching

Statement	% Strongly Agree	% Agree	% Not Sure	% Disagree	% Strongly Disagree
I believe the Internet has positively affected my way of teaching.	14 (n=5)	23 (n=8)	57 (n=20)	6 (n=2)	0 (n=0)

The perceived effect of the Internet on the teacher's way of teaching is presented in Table 7.37. Less than half the participants (n=13) agree or strongly agree that the Internet has positively affected their teaching. Instead, the majority of teachers (57%) were unsure of its pedagogical impact. Although data analysis showed little or no gender difference in the response to this statement, younger teachers self-reported a significant (p =.02) positive effect. The follow up interview suggested a possible link between perceived effect and the extent of change to the teacher's educational philosophy. During the interview, several teachers commented that the Internet had not really had a major effect on their teaching because it had yet to change their teaching philosophy *per se*. Further analysis revealed that seven of the nine teachers who indicated the Internet had changed their teaching philosophy also reported it had positively affected their way of teaching.

Table 7.38
Perceived Instructional Changes for Students since the Introduction of the Internet

Statement	% Strongly Agree	% Agree	% Not Sure	% Disagree	% Strongly Disagree
Since using the Internet, my students are now working more in groups.	6 (n=2)	11 (n=4)	14 (n=5)	63 (n=22)	6 (n=2)
Since using the Internet, my students are now undertaking longer projects.	0 (n=0)	6 (n=2)	17 (n=6)	60 (n=21)	17 (n=6)
Since using the Internet, my students now have more choice over what they learn.	9 (n=3)	17 (n=6)	9 (n=3)	37 (n=13)	28 (n=10)
Since using the Internet, my students are now studying more real-world problems.	14 (n=5)	20 (n=7)	11 (n=4)	37 (n=13)	17 (n=6)

Table 7.38 reports the perceived instructional changes for students since the introduction of the Internet. Notably, few teachers (n=6) believe that students are now working more in groups. Even fewer teachers (n=2) consider that since using the Internet their students are undertaking longer projects. At least 60% of participants disagree with the two relevant statements.

A high proportion of teachers (28%) also strongly disagree that students now have more choice over what they learn. Indeed, a number of teachers (n=4) claimed in the follow up interview that because of caching and concerns about Internet safety there was now more control over what students learnt. Conversely, 26% of teachers perceived the opposite by indicating their agreement or strong agreement with this statement. Despite this, the majority of teachers (65%) did not believe the advent of the Internet had resulted in more student choice.

The greatest change to student learning was the study of more real-world problems with 34% of teachers supporting this item. A recurring theme during the follow up interview was the potential of the Web to augment the investigation of contemporary problems and issues. Nevertheless, most of the participants disagree or strongly disagree with this statement which is further evidence that few internet-using teachers are undertaking such investigations on a regular basis. At the same time, the interview revealed that some teachers disagreed with the aforementioned statements because they were already making widespread use of groups, project-based work, student-centred learning, and real-world problem solving. These data, therefore, should not be interpreted as evidence that teachers are under-utilizing such learning strategies and instructional techniques in the classroom.

Table 7.39
Perceived Pedagogical Changes by Teachers since the Introduction of the Internet

Statement	% Strongly Agree	% Agree	% Not Sure	% Disagree	% Strongly Disagree
Since using the Internet, I have become more creative and inventive in my teaching.	6 (n=2)	14 (n=5)	29 (n=10)	48 (n=17)	3 (n=1)
Since using the Internet, I have become more critical and reflective about my teaching.	0 (n=0)	14 (n=5)	40 (n=14)	46 (n=16)	0 (n=0)
Since using the Internet, I use more complex and challenging activities in my teaching.	6 (n=2)	17 (n=6)	23 (n=8)	48 (n=17)	6 (n=2)
Since using the Internet, I use more authentic and interdisciplinary activities in my teaching.	9 (n=3)	17 (n=6)	14 (n=5)	54 (n=19)	6 (n=2)

Table 7.39 presents the perceived pedagogical changes made by teachers since the introduction of the Internet. It was noteworthy that few teachers (n=7) believe they are now more creative and inventive in their teaching. Indeed, more than half of the participants (51%) disagree or strongly disagree with the relevant statement. Even fewer teachers (n=5) consider that since using the Internet they have become more critical and reflective about their teaching. Although a high proportion of teachers (40%) offered an unsure response, the largest group (46%) fell within the disagree category. Notably, none of the participants strongly agree or strongly disagree with the critical reflection statement.

The interview, nevertheless, showed that at least one person believed she was far more critical now of the technological solutions being "sold" to teachers to solve the problems of education. As a "Cautious Integrator", she believed that:

> *I'm now wary more of the sales pitch... The Internet has certainly got me thinking... especially about the future. You know my father was a teacher and I remember him talking about the use of radio. I have started to wonder recently whether the Internet will go the same way... It's good though because it has... it has really made me think more about what's important in teaching. I think the Internet has even helped me to recall why I became a teacher in the first place [S5: 376-389].*

There was greater support for the statement that teachers are now using more complex and challenging activities. Indeed, 23% of participants claim to have increased the level of challenge in their teaching since using the Internet. Nevertheless, the majority of teachers (54%) reject the suggestion that they have changed the nature of their teaching in this way.

The statement that attracted the highest level of support was that teachers were using more authentic and interdisciplinary activities in their teaching. This received a positive response from 26% of participants. Despite this, most teachers (60%) either disagree or strongly disagree with the relevant statement. Of course, these data do not necessarily mean that teachers are failing to be creative and inventive, critical and reflective, complex and challenging, and authentic and interdisciplinary in their teaching. This point was confirmed in the follow up interview, as one teacher elaborated on his response:

> *Well I kind a think I'm already a creative teacher. That's why I didn't agree with that question... The Internet probably opens up some other possibilities but I wouldn't say the Internet on its own has changed me as a teacher. I am who I am... if you see. You have to be a certain person to be a teacher... and I've always adopted a creative approach [E8: 347-359].*

Figure 7.12 presents the perceived instructional and pedagogical changes since using the Internet by gender. On a five-point scale, in which two represents strongly agree and negative two the strongly disagree category, there was little or no difference in the mean response of either gender. The degree of probability was greater than the conventional level of significance for each response. Thus, gender was not a significant factor in any perceived instructional and pedagogical changes since the advent of the Internet. Notably, the mean response for men and women was consistently negative in relation to each statement. Further analysis of these data showed little or no significant variation based on other demographic variables, including age, level and teaching experience.

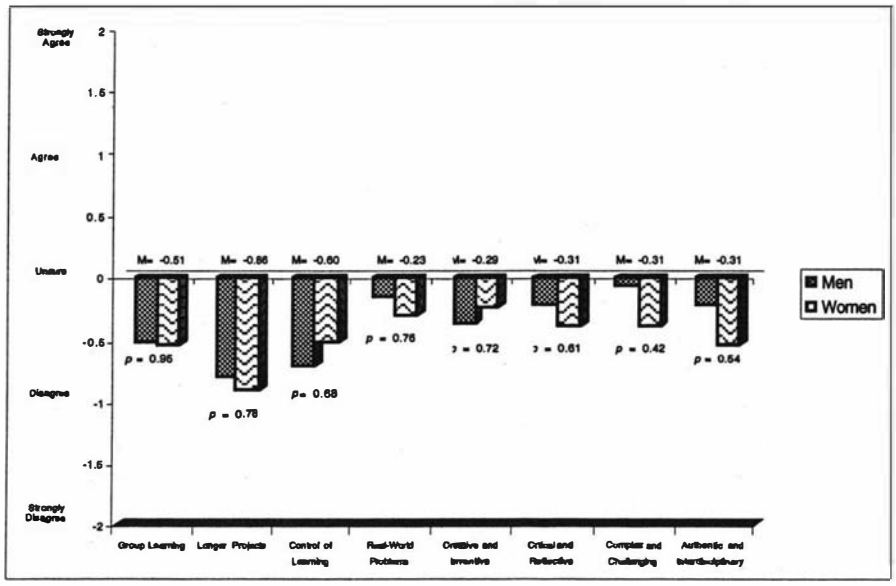

Figure 7.12 Perceived instructional and pedagogical changes since using the Internet by gender

Note: The level of significance is shown by the probability *(p)* values derived from a homoscedastic *t-test.*

The perceived instructional benefits from students using the Internet are presented in Table 7.40. A high percentage of teachers (65%) perceived that the Internet helps to increase social interaction between students. Nearly half the teachers (48%) also consider the Internet allows for better individualized instruction. There was little or no difference in the response to either statement based on age, gender, or teaching status—nor any obvious pattern in relation to other pedagogical and/or philosophical variables reported in earlier questions.

Table 7.40
Perceived Instructional Benefits from Students Using the Internet

Statement	% Strongly Agree	% Agree	% Not Sure	% Disagree	% Strongly Disagree
I find the Internet helps to increase the social interaction between children in my class.	14 (n=5)	51 (n=18)	32 (n=11)	3 (n=1)	0 (n=0)
I believe the Internet allows for better individualized instruction of children in my class.	6 (n=2)	42 (n=15)	26 (n=9)	23 (n=8)	3 (n=1)

The follow up interview suggested that the perception the Internet had helped to increase social interaction was based largely on the need for students to share the computer as a limited resource. Moreover, the novelty of the Internet had created a great deal of enthusiasm, which was conducive to social interaction and student-student and student-teacher collaboration. As one teacher described this dynamic:

> *There's a level of infectious enthusiasm that comes with the Internet. The kids have to share in order to get screen time... and so they don't spoil it for the whole class... The Internet is a privilege. You can use this to your advantage... It's a great carrot whilst the novelty lasts. Often you feel, sense, get a real buzz when the kids are using the Internet [W8: 321-329].*

The high level of student motivation when using the Internet was a common response to the question: *What is the single most significant contribution the Internet has made to your teaching?* A number of participants (n=9) commented on students' enthusiasm and even their infatuation with the Internet. This, in turn, was making teaching more fun. However, not everyone perceived that the current attraction of the Internet was a good thing. As one teacher wrote on her questionnaire:

> *They love it. The children have developed a real thirst for technology and this is making my job more enjoyable. They want to learn. However it can be like "candy" to a baby and the children still have to learn basics. Their desire for more Internet time is a double-edged sword.*

Another teacher developed this point further during her follow up interview:

> *Yes the motivational side of things is important and you can't underestimate that but you have to channel their motivation in the right way... I find the kids just want to play games or they get distracted by other things they've seen on TV. It's not really educational [S11: 235-239].*

Beyond heightened motivation, the greatest pedagogical contribution of the Internet reported by participants was the availability of online resources. This was the single most frequent response by teachers (n=17). In the follow up interview, the internationalization of learning and teaching was a recurring theme. Several teachers (n=8) alluded to how the Internet had expanded their teaching horizon beyond New Zealand. In this regard, the Web was perceived to have added a real international dimension to their teaching. Thus, access to online magazines, web-based projects and other dedicated professional resources located around the world was highly valued by these teachers. As this teacher stated:

> *The most useful thing about the Web is the wealth of teaching resources... The world is your resource room. You can search the entire world for what you want... This means you can benefit from other teachers' experience... I think teaching is the same the world over. And it makes you feel part of a much larger professional community [E25: 278-287].*

In sum, the perceived accomplished internet-using teachers held a range of pedagogical and philosophical beliefs about learning and teaching. While responses were distributed across a continuum from manager of instruction to facilitator of learning, this dichotomy was not perceived to be mutually exclusive. Teachers endorsed the value of a sound educational philosophy, and they did not rank highly the importance of Internet skills in terms of desirable teaching qualities—regardless of their current Internet experience, as determined by the different categories of implementation. The participants interpreted these categories and the different stages of Internet adoption based on their individual pedagogical and philosophical worldviews. At a personal level, the advent of the Internet was not perceived to have greatly changed the participants' educational philosophy, although it appears to have had more impact on younger and less experienced teachers. In turn, these teachers were more likely to perceive that the Internet had positively affected their teaching. Most participants were proponents of ICT who expressed high levels of confidence and enthusiasm toward the Internet; yet, the teachers report only minor instructional and pedagogical changes since using the Internet for learning and teaching purposes.

7.5 PERCEPTIONS ABOUT THE INTERNET IN EDUCATION

This section presents data on teachers' perceptions and beliefs about the Internet in education. It describes the participants' response to the Internet as a social, economic and educational phenomenon, along with their perception of factors that inhibit and/or enable the use of internet-based technologies in schools. In particular, this section addresses the following two research questions: What perceptions and beliefs do teachers have of how the Internet supports the learning and teaching process? What factors do teachers believe inhibit and/or enable the use of the Internet for learning and teaching?

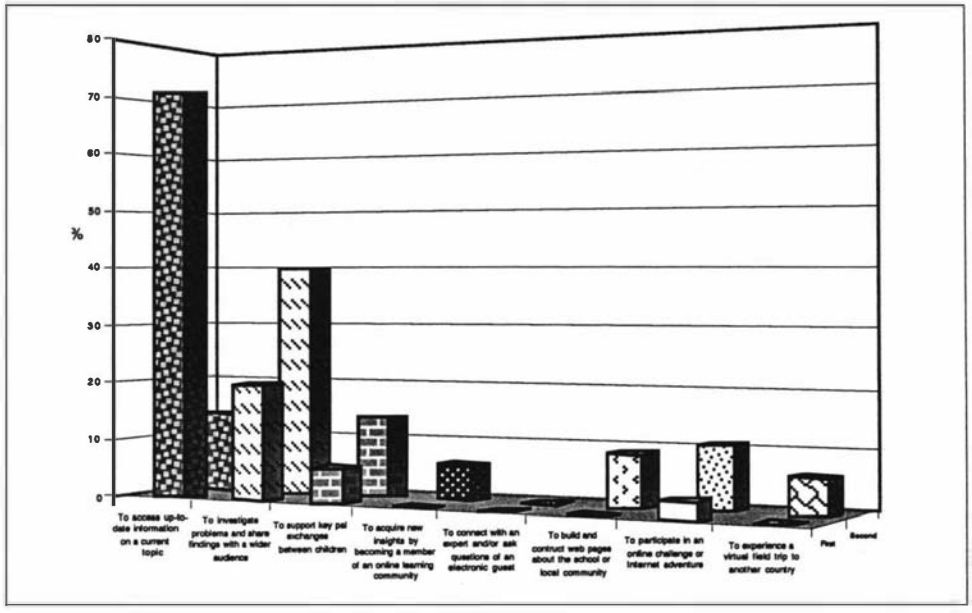

Figure 7.13 Perceived value of internet-related learning activities

Figure 7.13 presents the two internet-related learning activities that teachers perceived as having the most educational value. As was the case in Phase One, most teachers (71%) ranked "accessing up-to-date information on a current topic" as the most valuable use of the Internet. In a similar vein, the potential to "investigate problems and share findings with a wider audience" was ranked by 20% of teachers as the next most valuable activity. This statement was also ranked by 40% of the participants as the second most valuable activity, followed equally by "the use of key pal exchanges" and "the ability to access up-to-date information". Few teachers (n=3) ranked highly "the design and construction of Web pages" in terms of perceived educational value. Notably, with the exception of "online challenges and Internet adventures", there were little or no gender differences in the ranked response to these activities. Age was not a determinant factor either in the way that different teachers responded to this question.

The two statements that teachers perceived as having the most educational significance for using the Internet in New Zealand schools are shown in Figure 7.14. The top ranking statement by 43% of teachers was "to develop students' thinking and problem solving skills". A high proportion of teachers (37%) also supported "the development of basic skills and computer literacy". There was little support for any of the other statements although a number of participants (n=4) ranked "developing skills for future employment and meeting parental expectations" as their first choice. This statement was ranked also by 23% of the participants as their second preference in terms of educational significance. As in Phase One, the aforementioned statement was second to "the development of social skills for collaboration and working with others", which was supported by 34% of teachers.

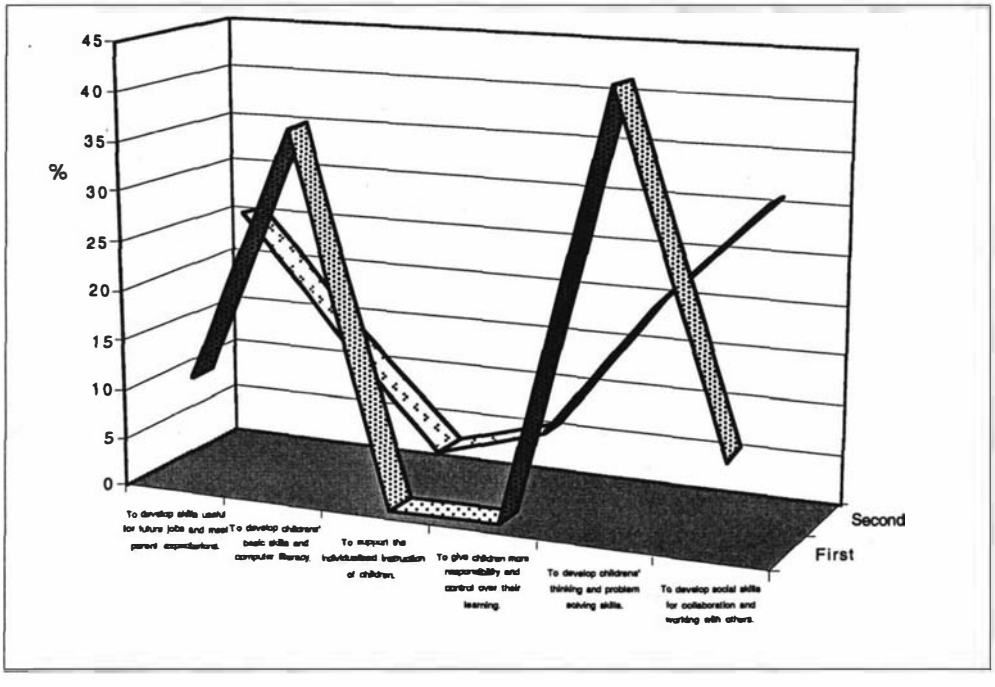

Figure 7.14 Reasons for using the Internet in terms of educational significance

Although there was some overlap between the selection of "thinking and problem solving skills", and "development of basic skills and computer literacy", the latter statement was ranked first by the majority of teachers (77%) who selected "skills for future employment and meeting parental expectations" as their second choice. Conversely, teachers who ranked "social skills for collaboration" as their second choice more often selected the statement about "thinking and problem solving skills" as their first. Thus, in terms of educational significance, there was, once again, an apparent correlation between the teacher's first and second preference. While this appeared to neatly divide the participants into two groups, the correlation was not fully statistically measured because of the limited sample size and the increasing emphasis on qualitative data for greater explanatory insight given the idiosyncratic nature of earlier responses.

However, a preliminary analysis of the responses showed that men, especially those who identified themselves as "Committed Innovators", were more inclined to select "the development of basic skills and computer literacy" than women. Of those who ranked this statement as their first choice, 62% were male teachers. Seven out of the eight men who selected the "basic skills and computer literacy" statement also perceived themselves to be "Committed Innovators". Conversely, a higher percentage of women (67%), as opposed to men (33%), from a broad cross section of the research sample, ranked "the development of thinking and problem solving skills" as their first choice.

Table 7.41 provides additional data on the perceived economic and vocational significance of the Internet. It shows 65% of teachers agree or strongly agree that students must use the Internet if they are to secure good jobs in the future. Once again, more men (n=12) than women (n=11) supported the relevant statement.

Table 7.41
Perceived Economic and Vocational Significance of the Internet

Statement	% Strongly Agree	% Agree	% Not Sure	% Disagree	% Strongly Disagree
I believe that students must use the Internet if they are to get good jobs in the future.	20 (n=7)	45 (n=16)	6 (n=2)	20 (n=7)	9 (n=3)
I believe that teachers must use the Internet for the future success of our knowledge economy.	14 (n=5)	43 (n=15)	17 (n=6)	17 (n=6)	9 (n=3)

In like manner, the majority of teachers (57%) perceived that Internet use in schools is linked to the future economic success of New Zealand's Knowledge Economy. Comparatively few teachers (n=9) disagree or strongly disagree with this statement. It was noteworthy that most of the participants (n=7) who rejected the economic significance of the Internet in schools were women. Indeed, three women strongly disagreed with the economic and vocational assumptions implicit within the two statements.

On the surface, the different perceptions of men and women in relation to the economic significance of the Internet were evident in the follow up interview. For example, a number of men (n=5) were adamant that students need a high level of computer literacy if New Zealand is to have a viable Knowledge Economy. These teachers appeared to perceive a strong link between the acquisition of computer skills, information literacy, future employment prospects and the nation's long-term economic success. As maintained by the following teacher:

I firmly believe that New Zealand's future depends on kids developing the right IT skills... The way the world is going you won't be able to get work without computer skills... The children need to learn information skills and become adept users of the Internet . The whole world is available at your finger tips and what they need is the research skills. We owe it to children to give them a head start... Look at what's happening overseas. Our economy is stuffed if we don't pull finger right now... If we don't act like Australia... we'll become a Third World holiday resort. Look at what they're doing at the moment compared to us. We need to act quickly if we don't want to be left behind [E1: 393-408].

The interview revealed, nevertheless, that participants who claimed they were primarily concerned with using the computer to develop higher order thinking skills were not impervious to the economic benefits of the Internet. While it was common to hear these teachers say *the Internet is about learning and teaching* rather than business, when probed, most participants acknowledged that computer skills would play a major role in future employment prospects. Thus, the potential economic benefit of the Internet was not removed from these teachers' consciousness. This shows that the pedagogical value of the Internet was framed by a wider economic discourse, which appeared to promote ICT for economic prosperity rather than education for democratic citizenship. As the following comment demonstrates, the catechisms of metacognition and life-long learning were used to support the teaching of information literacy, whilst anchored within an overarching economic and globalization imperative:

We must teach children to become information literate – just to survive the next century... They must learn how to learn and become life-long learners... and we can help... by teaching how to navigate knowledge... By using ICT to teach information literacy, I believe children have a compass that points them in the right direction... The combination of skills will unlock new economic opportunities that give today's kids a major advantage. It will help them get better jobs in a global market place... and will give us as an important advantage in the future [W13: 378-395].

Figure 7.15 reports the perceived educational value of different computer and Internet applications. It shows as a stacked column the three applications that teachers ranked as having the most educational value.

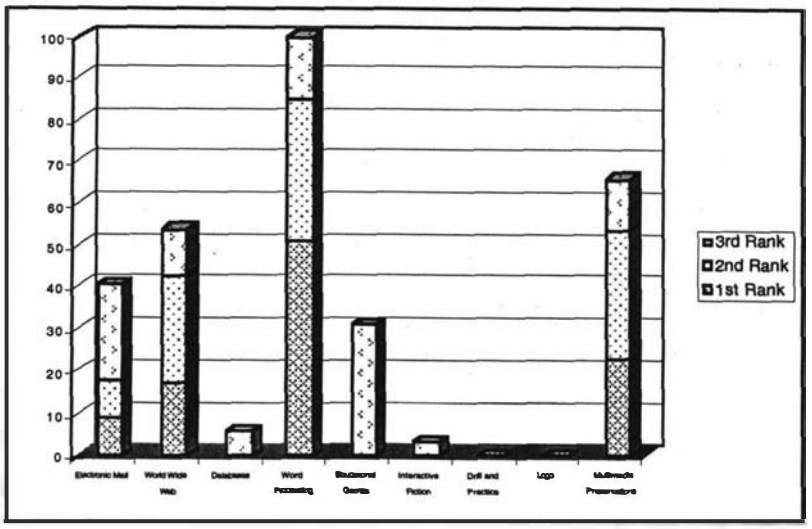

Figure 7.15 Perceived educational value of different computer and Internet applications by rank

Word processing was ranked by 51% of teachers as the single most valuable computer application in the classroom. The use of multimedia presentations (23%), followed by the Web (17%), was perceived to be the next most valuable. The only other application to be selected by teachers was electronic mail (n=3). Three teachers also ranked this application as their second choice. The highest ranked second choice followed a similar pattern with the main applications being word processing (34%), multimedia presentations (31%) and the Web (26%). It was notable that educational games (31%) was the highest ranked third preference. There was also a high level of support for electronic mail (23%) but Logo, databases, interactive fiction, and drill and practice software did not feature highly. Overall, word processing stood out as the most valuable computer application.

Table 7.42
Perceived Level of Priority on the Internet in Schools

Statement	% Strongly Agree	% Agree	% Not Sure	% Disagree	% Strongly Disagree
I think the priority being given to the Internet is at the expense of other computer applications.	14 (n=5)	34 (n=12)	26 (n=9)	20 (n=7)	6 (n=2)
I think the priority being given to the Internet is at the expense of other non computer educational innovations.	26 (n=9)	31 (n=11)	14 (n=5)	23 (n=8)	6 (n=2)

The level of priority that schools place on the Internet in comparison to other computer applications and educational innovations is shown in Table 7.42. A high proportion of participants (48%) across all demographic variables perceived that the growth of the Internet in education has been at the expense of using more traditional computer applications. Further evidence of their displacement by the Internet was provided during the follow up interview. As one teacher reflected:

It does seem that the Internet is king in our school. We do quite a bit of multimedia but nothing with other software. I mean like we once did. There's simply no time... I still remember teaching the children to use Logo... And the staff, well all talk about the latest websites instead of trying to make the turtle do what you want... It's sad in some ways because some of that older software was really good. And you tend not to think about it these days... Instead you can waste a lot of time finding good web sites [S4: 409-417].

The majority of teachers (57%) perceived that the advent of the Internet has been at the expense of other non computer educational innovations. Proportionately, there was a similar response from men and women across age cohorts. It was noteworthy that 30% of teachers only perceived the level of priority afforded to the Internet has not negatively affected other educational innovations within their school. Accordingly, the cost of the Internet in terms of general curriculum reform and school-wide improvement was a common theme during the follow up interview. A number of teachers (n=7) were critical of money being directed toward computers and networking when their school was still struggling to maintain, let alone improve, existing curriculum resources. Their concern was highlighted by the widespread perception that schools were reducing expenditure in other areas, especially books, to increase Internet access. As one teacher claimed:

I know for a fact that our school has reduced the library budget to accommodate the Internet and the extra computers. We're now spending less on books and subscriptions than we did last year and the year before. The problem is that books don't last forever... they need replacing. Whilst I think the Internet is great, I still love my books. It's the basis of teaching... You can teach a whole unit around one good book... It's fair to say I'm concerned we're putting too much faith in the Internet [E9: 367-379].

In addition, some teachers expressed concern about the time devoted to computers and the Internet, and the idiosyncrasies of managing the school network, over and above other dimensions of their work. It was evident from the interview that many internet-using teachers went beyond the call of duty by frequently undertaking evening, weekend and holiday work. In one case, the ICT co-ordinator forwent her two-week holiday break in order to ensure the computer lab was virus free, and the new network was functional between classrooms. This was not an isolated example. The main message to emerge from the interview in this respect was that teachers with responsibility for ICT, and the Internet, often have little time for other types of curriculum innovation. They are simply too busy. As one teacher stated, the lack of time for low-tech innovation can be quite frustrating:

I'm innovative and that but... I don't want to spend all my time on computers. Despite what others think, I don't love it. They [computers] can be a real pain and they can bog you down... The problem is hey I'm stuck in this job. People expect me to do the computer... You know, it would be nice to go back to some of the old stuff I did in the early days. I was creative then and willing to try new things... There's still heaps you can do with kids... that's fun. That's why I teach... ICT isn't always fun [E8: 391-405].

A related point arising from the cost of internet-based innovation was the perception that early adopters and highly committed ICT-using schools were more likely to find it difficult to focus on, and successfully implement, other types of school-wide improvement. This view was based on the assumption that there is only so much a school can do at once, as demonstrated by the experience of implementing recent curriculum developments. As one teacher lamented:

We've had it all. The Technology then Social Studies Curriculum - it just goes on... There's a lot of time being devoted to the new admin demands... Then we still have a big push for literacy... You can't do everything justice. It's a case of deciding what's important and giving this a team effort... We place a strong emphasis on social skills and this has been the major thing for us... We want to put more emphasis on ICT but assessment is a high priority at the moment... What I'm saying is that it's better to do one or two things well rather than everything poorly [E12: 414-427].

Table 7.43 reports the level of Internet adoption by other teachers on a school-wide basis. It shows the sample was indeed atypical of the wider population. The majority of teachers (77%) perceived their colleagues to be a long way behind them in their use of the Internet. The general sentiment to emerge from the interview was that most teachers were at least five years behind the participants in terms of Internet adoption. By analogy, one teacher proposed that only a few people are flying high while most of the teaching profession is still grounded in traditional practice. The teacher pointed out:

The sky is the limit but most of the time they think you have your head in the clouds... They pay you lip service but most teachers simply don't get off the ground. The reality is that they're years behind... they can't see the possibilities because they're stuck in the past. Staff are not prepared to take the risks... by piloting the new teaching technologies [W3: 419-427].

Contrary to this flight analogy, a high proportion of participants report that many good practitioners are not yet using the Internet in their teaching. Indeed, 43% of the participants agree or strongly agree with the relevant statement, as presented in Table 7.43. There was little or no significant difference in the response to these statements based on gender.

Table 7.43
Perceived Level of Internet Adoption by other Teachers on a School-wide Basis

Statement	% Strongly Agree	% Agree	% Not Sure	% Disagree	% Strongly Disagree
I think that other teachers are a long way behind me in their use of the Internet in education.	48 (n=17)	29 (n=10)	6 (n=2)	17 (n=6)	0 (n=0)
I think some of the best teachers are not yet using the Internet in their teaching.	17 (n=6)	26 (n=9)	14 (n=5)	23 (n=8)	20 (n=7)

In the follow up interview, where the nature of good teaching was a topic of considerable discussion, two schools of thought emerged. First, a core group of participants (n=10) believed that all teachers should be extensively using the Internet. This implied that in order to be a good teacher it was now essential to integrate the Internet within your teaching. The following comment was typical of this view:

> *How can you be considered a good teacher if you don't make use of the Internet? It just doesn't stack up. The way things are moving... a good teacher must be up with the play and informed of latest trends. Hey, it's as simple as that... the old skills are no longer as important [S2: 391-399].*

In contrast, a number of teachers (n=7) maintained that the Internet was largely irrelevant to the definition of good teaching. According to these participants, many good teachers make little or no use of new computer technology in their classroom. Indeed, the hallmark of a good teacher was not the ability to use educational technology but rather their astute judgment, clever planning and smart classroom management, which had been refined from many years of teaching experience. As one teacher stated:

> *The Internet is no substitute for experience. I believe you can't buy the type of experience that good teachers have... True some people are born teachers... in the main this comes with lots of practice... The best teachers I know thoroughly plan and... make the right decisions... They have an excellent toolbox of techniques... You can always learn something new from these... clever people [W6: 410-419].*

Table 7.44
Perceived Type of Skill and Knowledge Required of Teachers and Students

Statement	% Strongly Agree	% Agree	% Not Sure	% Disagree	% Strongly Disagree
I believe that all teachers should be required to meet a basic set of ICT competency standards.	23 (n=8)	51 (n=18)	9 (n=3)	0 (n=0)	17 (n=6)
I believe that all students should be required to meet a basic set of ICT competency standards.	26 (n=9)	57 (n=20)	3 (n=1)	11 (n=4)	3 (n=1)

The perceived type of skill and knowledge required of teachers and students is reported in Table 7.44. Although a high proportion of participants (74%) support the introduction of basic ICT standards for teachers, there was a level of opposition to any such initiative. This was most evident in the interview where those teachers (n=5) strongly opposing the introduction of ICT standards made their views known. The following comment was indicative of the reaction:

> *As far as I'm concerned this would be a major backward step. I've taught in the UK [and] we don't want these in New Zealand. Standards are a waste of space and... they merely stifle learning... You end up teaching to the standards because it's risky to do otherwise. That's not teaching. I mean do we have teaching standards for creativity and thinking? [W9: 345-353]*

This response, again, highlighted two quite different schools of thought about the type of skill and knowledge required of internet-using teachers. The majority of the teachers who participated in the interview believed that ICT professional development should concentrate on the procedural knowledge of learning to use the Internet itself—that is, the technical skills of mastering the technology. As one teacher stated:

> *You have to learn how to use the various stuff. That's the first objective. Teachers need small group and one-on-one training in the main aspects of Internet... Even before then you need to teach basic computer house keeping and... now the network functionality stuff... In my experience, training must be hands on and highly practical for it to work [E11: 378-387].*

On the other hand, a small number of teachers (n=6) were concerned with durable opportunities that the Internet provides for personal, pedagogical and professional learning in all aspects of their work. Above all, these teachers believed that the Internet should be used in authentic contexts that directly influence teaching in all manner of ways.

According to one teacher:

> *You have get away from skills training. The PD must be done in authentic situations where there's a direct impact on the classroom. Only then will you see a real change for the longer term... I'm sorry but I also think teachers need to be made more aware of the bigger picture. This is my study coming out... What's the Internet doing for education? Because you can't just accept the Internet as a good thing [W10: 433-442].*

Despite this last comment, most teachers (83%) agree or strongly agree that all students should be required to meet a basic set of ICT standards. Few teachers (n=5) disagree with the relevant statement and, generally, the introduction of standards for students was far less controversial than ICT standards for teachers. In the follow up interview, a number of teachers (n=12) bemoaned the lack of explicit ICT assessment guidelines. Indeed, some of these teachers were in favour of introducing an ICT curriculum, which would clearly state what students should know and do in relation to the Internet. It is fair to say that most teachers were uncertain of the type of skill and knowledge students should be acquiring with ICT in their classroom. This was reflected by the following comment:

> *To be honest I don't know what the kids are meant to be learning. I suppose the Essential Skills... and the Technology Curriculum. But it doesn't work like that. We try to assess their ability to send and receive email, look up information on the Web and so on. I have a checklist for each child that includes their basic computer knowledge... It would be helpful if the Ministry was more explicit given the strong ICT push at the moment [E9: 428-437].*

Table 7.45 reports the perceived effectiveness of recent ICT initiatives by the Ministry of Education. Few teachers (n=6) considered the ICT Strategy for Schools to have been particularly effective. A high proportion of teachers (74%) appear to disagree or strongly disagree with the relevant statement. Comparatively this included a similar proportion of teachers from each age cohort. The follow up interview showed that the ICT Strategy was perceived to lack status and sufficient resources. It did not have a high profile amongst the general population of teachers, as indicated by the following comment:

> *It's a cop out really... schools are still being asked to implement the strategy without the resources. Sure, we've got more equipment and PD than last year but it falls a long way short of what's required. You have to take money from other areas if you want to be serious about ICT... Frankly, the other staff don't give it the same weight as the three Rs [W1: 357-375].*

Table 7.45
Perceived Effectiveness of ICT Initiatives by the Ministry of Education

Statement	% Strongly Agree	% Agree	% Not Sure	% Disagree	% Strongly Disagree
I believe the ICT Strategy for New Zealand schools has been very effective.	0 (n=0)	17 (n=6)	9 (n=3)	51 (n=18)	23 (n=8)
I have found Te Kete Ipurangi (TKI) to be a very effective online resource for my teaching.	3 (n=1)	20 (n=7)	9 (n=3)	62 (n=22)	6 (n=2)

In addition, some of the perceived accomplished internet-using teachers (n=4) claimed that the "lead school" concept within the ICT Strategy was flawed and highly elitist. As one teacher questioned:

> *Is lead schools the way we should be going? What incentive is there for a school to share their experience? What happens when the ICT teachers are teaching the other teachers? A school can't afford to be so heavily involved in the PD of other teachers... School is there for the children not the teachers. It's about image... I reckon it sets up schools in competition... Hey if it works then all schools will need this extra money [S5: 426-435].*

In relation to TKI, few participants (n=8) agree or strongly agree that the Ministry of Education's website has been particularly useful in their teaching. Notably, the majority of teachers (62%) disagree with the relevant statement. The follow up interview revealed that most teachers recognized the potential of TKI but few people were using it on a regular basis. Most of the participants (n=16) who had accessed TKI were highly critical of both its design and content. The consensus was that TKI was poorly designed and very difficult to navigate. According to one teacher:

> *It's a pain. The site takes so long to download and then you can't find the information... There's hardly anything useful... At least you don't need to go back very often. In fact I've almost given up... There's far better sites elsewhere... I could put together a better set of links. The whole thing is so cumbersome... It was probably designed by computer nerds [S11: 414-421].*

The perceived dominance of boys in terms of internet-related learning experiences is reported in Table 7.46. Notably, over half the teachers (51%) was unsure if boys were dominating girls. The remaining teachers were split evenly between an affirmative and negative response. It was mostly women, however, who perceived that girls were not being disadvantaged during Internet activities. With one exception, all the participants (n=7) who disagree or strongly disagree with this statement were female teachers.

Table 7.46
Perceived Gender Dominance of Boys

Statement	% Strongly Agree	% Agree	% Not Sure	% Disagree	% Strongly Disagree
I find that boys tend to dominate the Internet learning experiences in my class.	3 (n=1)	17 (n=6)	51 (n=18)	14 (n=5)	6 (n=2)

In the follow up interview, some of these teachers (n=4) elaborated on their response to the gender statement. Clearly, this group of teachers was aware of potential for gender inequity in both computer and Internet access. The teachers claimed, therefore, to be proactive in this area by adopting a degree of positive discrimination within their classroom. As the following teacher explained:

> *It could be a problem but in my classroom I go out of my way to ensure the girls get their time. I like to think I'm a positive role model... I would have to say that there are times the girls keep the boys off the Internet. Actually, my impression is that girls seem to find Internet more interesting than boys... I mean look at MSN... I don't see gender as a major issue [E25: 361-368].*

Figure 7.16 reports the barriers that teachers perceive inhibit the effective use of the Internet for learning and teaching. In keeping with Phase One, the participants were asked to rank a list of well-known potential barriers in order of their significance. The stacked columns display the combined responses of the three most significant barriers to effective Internet use.

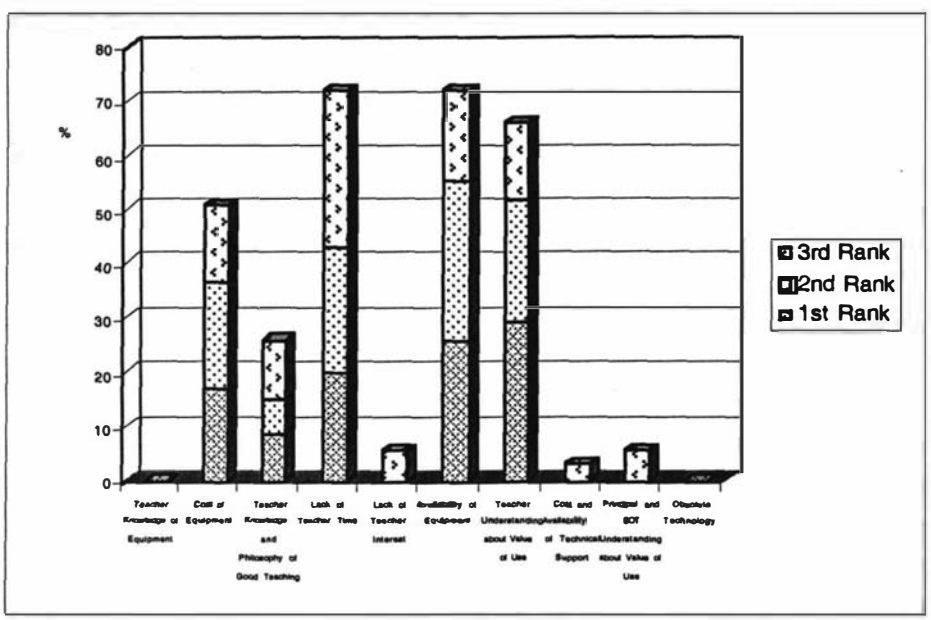

Figure 7.16 Perceived barriers to the effective use of the Internet in order of significance by rank

In terms of the first most significant barrier, "teacher understanding about value of use" (29%) and "availability of equipment" (26%) were ranked at a similar level. These two barriers were followed by "lack of teacher time" (20%) and the "cost of equipment" (17%). Again, only a few participants (n=3) identified "teacher knowledge and philosophy about good teaching" as the most significant barrier. In terms of the second ranked barrier, "availability of equipment" (29%), "teacher understanding about value of use" (23%), "lack of teacher time" (23%) and the "cost of equipment" (20%) were all well supported. As in Phase One, "obsolete technology", "availability of technical support", "teacher knowledge of equipment", "lack of teacher interest", and "principal and Board of Trustees understanding about value of use" were not ranked highly. Overall, "cost of equipment" and "lack of teacher time" were equally ranked as the main barriers to effective Internet use. There was no clear pattern in the selection of these barriers based on either age or gender.

The follow up interview provided an opportunity for teachers to elaborate on their understanding of the aforementioned barriers to Internet use. Although there was some discussion about the limited availability of equipment, most talk concentrated on the lack of teacher understanding about the educational value of the Internet. Generally, teachers perceived that most people were uninformed in terms of the Internet's potential. This knowledge gap was partly attributed to insufficient time for teachers to acquire experience and expertise due to work pressures. It needs to be remembered that most participants report that they learnt to use the Internet in their own time. As the following teacher states:

> *I don't blame staff. How can you learn something new when most of the time you're struggling to keep on top of the workload? To be fair, it's an interest of mine and... I've got most of my skills from playing around at home. You can't expect other teachers to spend their evenings on the Internet. It's just another extra pressure of work... But the problem is that without first hand experience you can't envisage the possibilities and you can only get this experience by investing the time [S4: 445-456].*

Yet, not all people agree that more time (and money) is the solution to the problem of overcoming the lack of teacher understanding. This is too simplistic. According to some participants (n=5), the lack of understanding about the Internet was symptomatic of a deepening chasm between traditional classroom practice, contemporary educational theory and the demands of life in the twenty-first century. There was a widespread perception that many teachers were being left behind by the rapid changes to teaching and technology. In this regard, the advent of the Internet was claimed to highlight a pre-existing problem. That is, the conservative nature of teachers' beliefs coupled with the aging demographic of the teaching profession. As one younger teacher observed, the major barrier to Internet use was cognitive rather than technical:

Well you can take children out of a teacher-centred classroom but it's a lot harder to take teacher-centred teaching out of the teacher. It's a deep-seated problem. You have to confront their whole way of teaching and... then try to change the way teachers think. For me the Internet is a minor part of the overall equation [W11: 437-444].

Another teacher described a culture of resistance, built on the teaching profession's distributed knowledge of past technology failures. In his opinion, the historical overselling of educational technology was fuelling the current level of resistance. Several other teachers supported this view and were critical of the hype and some of the exorbitant claims about what the Internet can do for schools. Ironically, these teachers believed that the high profile of the Internet was counter-productive to its widespread adoption by the profession in an enduring or a transformational sense. As far as one teacher was concerned, the latest attempt to transform schools with educational technology was doomed to fail because it greatly underestimated the level of passive resistance, which had its roots in a lack of debate over the reasons for change in the first place. The teacher went on to theorize:

You see the track record is poor in this area... Because I don't believe teachers understand why schools need to change and why the Internet is so important... There's been little public debate. If you don't convince teachers, then you don't stand a chance... Teachers are not convinced by commercial hype and Government policy. Because it goes much deeper than this. You have to understand why we teach in the first place and why we want to make a difference... I'm not sure teachers genuinely believe the Internet will help us to create a better education system [W10: 456-471].

For this reason, the teacher was reluctant to criticize her colleagues. Indeed, she endorsed a cautious approach toward the Internet. Because, from her perspective, there had been virtually no critical debate of the imperative for schools to embrace ICT and the Internet, teachers were rightly suspicious.

In like manner, a healthy degree of scepticism was supported by a group of teachers (n=4) who held the belief that computers were too closely associated with popular forms of entertainment. In their opinion, the educational value of the computer was undermined by its widespread use in the home as merely a "games machine". Accordingly, the Internet was tainted by this perception. Thus, this latest form of "edutainment" was unlikely to attract a strong following by all teachers even though it would no doubt secure a foothold in the classroom. As one teacher observed:

To be honest it doesn't resonate with what most teachers associate as good educational practice. I don't necessarily agree but that's my take on the problem... You only have to ask the parents. I think there was a time the computer was in and TV was clearly out... I believe we've moved on and most parents and teachers now associate computers with games... The Internet suffers from this. You only have to listen to what the kids are using the Internet for – mostly PlayStation cheats... I'm simply saying that I can understand why so many teachers believe the technology is fundamentally foreign to good learning and teaching [S9: 427-441].

Table 7.47 shows the level of caution that teachers perceive is required when using the Internet in education. In keeping with the above interview responses, most of the participants (63%) agree or strongly agree that teachers need to be very cautious. On average, men (57%) were slightly less cautious than women (66%) although the gender difference was not significant in response to this statement ($p > .05$).

Table 7.47
Perceived Level of Caution by Teacher in Relation to Using the Internet in Education

Statement	% Strongly Agree	% Agree	% Not Sure	% Disagree	% Strongly Disagree
I think teachers need to be very cautious about using the Internet in education.	9 (n=5)	54 (n=19)	26 (n=9)	11 (n=4)	0 (n=0)

Clearly, concerns about Internet safety were an important consideration in the teachers' response. Although their concern is understandable, it was evident from the following comment that the issue of Internet safety could easily be understood as a new moral panic. As one teacher feared:

The Internet has the potential to erode traditional values. We have a responsibility to protect children from the dangerous stuff. We can't expose children to that. It's effect is well known... and I see a real danger if we don't take a firm stand... I'd rather not use the Internet in my teaching if I thought children were going to access inappropriate web sites. It's not worth that kind of risk [W13: 333-341].

Despite this type of comment, few teachers (n=2) had taught students how to respond if they came across inappropriate material. Rather, the problem was either ignored, controlled by restricted Internet access, or perceived to have been solved by the adoption of a written acceptable use policy (AUP).

Finally, teachers were invited to share any additional opinions, perceptions or beliefs about the role of the Internet in education. Typically, responses confirmed or reiterated data from earlier sections of the questionnaire and/or interview schedule. It was apparent, however, from this last question that there were three broad categories of response to the Internet as a social, economic and educational phenomenon. The first type of response was unashamedly enthusiastic. A core group of teachers regarded the advent of the World Wide Web as the most exciting innovation to enter schools in the last 50 years. This view was epitomized by the following comment:

> *There hasn't been anything like this for over half a century. I don't know where the Internet is steering us but for me it's exciting... The classroom has suddenly become an executive jet where children can experience the riches of the globe -- Paris, London, New York... We have a chance to build the future. And it's inspiring me to new heights. It's a great rush [E1: 439-448].*

The second type of response was more reserved. It was fair to say that the majority of teachers fell within this category. Despite a more subdued level of enthusiasm, these teachers were willing to experiment with the Internet in order to enhance the traditional curriculum. Hence, they were not blinked or unadventurous toward the range of new learning and teaching experiences that the Internet was now making possible. In the main, this type of teacher was attempting to "bolt" the Internet on to the curriculum as an instructional tool. The following comment was typical of this response:

> *Technology is part of the curriculum. You may as well accept the fact and start developing your skills... You need to keep your feet on the ground... Hey it's just a tool. Like it or not the Internet is going to be a part of the future. We simply don't have any choice... If you're here for the long haul... then there's bound to be some initial discomfort... Personally, I doubt the Internet will radically change the curriculum [S11: 467-478].*

The third type of response was highly critical of the drive to wire New Zealand schools to the Internet. Although few teachers (n=5) fell within this category, those who did held strong views about the social, economic, and vocational agenda underpinning current educational reform. At a policy level, some of these teachers located the Internet in the context of globalization and internationalization. They were, therefore, concerned about the potential cultural and economic imperialism associated with the so-called global economy that in their view had little to do with education. In brief, the teachers were ideologically opposed to a global movement that promoted a less socially just world.

At a practical level, most of these teachers were concerned about the zealous enthusiasm shown toward the Internet when many schools were already struggling to cope with significant social problems. For this reason, they questioned the cost of the Internet in terms of displaced activities and redirected human and technological resources. This is why, in part, some of these teachers were wary of professional development, which sought to enhance ICT skills at the expense of other knowledge. In their view, the abundance of ICT professional development would potentially deskill the teaching profession, as it was divorced from a wider socio-political context. In short, the teachers were philosophically opposed to a school reform movement that was technology driven.

Irrespective of this, the teachers were not neo Luddites but actually well educated capable technology users who had consciously rejected the Internet as a "silver bullet" solution. It was noteworthy that most of these people had undertaken advanced postgraduate study and they were drawing on their wider knowledge of educational theory to challenge the current policy direction. The following comment suggests that these teachers were well-informed "critics" with a reconceptualist educational philosophy:

> *The Internet is an electronic manifestation of capitalism on an international scale. I'm talking about the move to exploit people in other countries... It's called globalization. I don't understand why teachers see the Internet is such a big deal when we have huge social and environmental problems... I'm sorry if I sound cynical... but teaching teachers to surf the Internet will do nothing for their real education... We need to fundamentally restructure the curriculum... if we want a better system leading to a better type of society... The Internet is not the answer [W10: 488-499].*

In sum, this last comment was indicative of a small but potentially growing backlash against the introduction of the Internet in schools. It was evident from the questionnaire and interview responses that a number of teachers perceived the current emphasis on the Internet would only serve to further obscure the real goals of education. For these teachers, education was a political and transformative process with deep roots. The personal misgivings that a few of these teachers were struggling to resolve was encapsulated by the following statement:

> *Perhaps it's technology burnout or the fact I'm getting older but for the first time I'm beginning to seriously question where this is taking me... Do I really want to be responsible for a generation of obedient workers highly skilled and knowledgeable in Microsoft products. For me teaching is not about producing a class of clones that get upgraded each year... It's about preparing young minds who can one day change the world – for the better [E8: 444-451].*

7.6 SUMMARY

This chapter has presented the results for Phase Two of the research. It has described the background experiences, perceptions and practices of perceived accomplished internet-using teachers, gathered through a postal questionnaire and follow up informant interview. The findings confirm that participants were well-qualified and highly experienced teachers in senior positions of responsibility. As expected, they were atypical of the wider population of teachers. In terms of computer experience, the participants enjoyed a high level of personal Internet access, although men self-reported a superior level of technical and pedagogical knowledge than their female colleagues. While the Internet was used most frequently at the senior school and intermediate level, few students were accessing the Web and sending email on a regular basis. Generally, most teachers were still experimenting with the Internet to enhance the quality of their teaching. This was reflected in the diversity of practice, low frequency of use and different stages of so-called Internet adoption. These stages were shown to be idiosyncratic and highly problematic, as teachers held a range of pedagogical and philosophical beliefs about learning and teaching and the Internet. Despite most people being proponents of the Internet, few teachers reported that it fundamentally changed their teaching philosophy. The participants, nevertheless, revealed a wide range of opinions, perceptions and beliefs about the Internet, which gave considerable insight into the different factors that inhibit and/or enable the successful adoption of a specific new educational technology. Overall, the findings show teachers' different subjective realities and orientations toward teaching with technology, and the multiple layers of understanding in terms of the Internet as a social, economic and educational phenomenon.

The following chapter presents a brief interpretation of the findings before the beginning of Phase Three.

CHAPTER EIGHT

Interpretation of Findings: Phase Two

'We must be wary of sweeping rulings on the success or failure of new technology' (Crook, 1994, p.8).

8.0 INTRODUCTION

This chapter provides an interpretation of the results for Phase Two. It interprets the responses to the follow up questionnaire and informant interview prior to and before the completion of Phase Three. The chapter is structured around the main research questions. First, it considers the background characteristics of perceived accomplished internet-using teachers. In the second section, the teachers' use of the Internet for learning and teaching is examined in relation to theoretical models and previous research findings. This section is followed by an interpretation of the teachers' beliefs about the learning and teaching process. In a similar vein, the fourth section addresses perceived changes to teaching practice and work culture since the introduction of the Internet. Teachers' perceptions of how the Internet supports better learning as a new educational innovation are then interpreted. The last section considers factors that inhibit and/or enable the pedagogical use of the Internet in schools. Finally, a brief synthesis of emergent themes is provided serving a dual purpose: it summarises the key findings from Phase Two and offers a useful basis for comparison with the results of Phase Three.

8.1 BACKGROUND CHARACTERISTICS

This section interprets the results that relate to the research question: What are the background characteristics of internet-using teachers? It considers three key findings, namely: (a) gender differences, (b) personal and professional Internet use, and (c) teachers' professional orientation to their work.

Gender Differences

Although the women had acquired greater Internet access and experience since the initial data collection phase, predictably many of the responses continued to follow a differential gender pattern. This is hardly surprising given the nature of the original sample and that those teachers still without personal Internet access were women. Thus, the sample continued to be skewed toward a group of male teachers with better access and greater personal experience of the Internet.

On some counts, however, the gender gap appeared to level out, evidenced by the higher proportion of female teachers with personal Internet access—an increase from 65% in Phase One to 81% in Phase Two. Of course, direct comparison between the two phases may inflate the "real" improvement in the level of access as the sample now represents a group of accomplished internet-using teachers more likely to possess the Internet at home. There is also a danger of adopting a deficit perspective when interpreting the so-called skill gap between men and women. As Selby and Ryba (1993) point out, the adoption of "gender-centric" thinking implies that the problem resides with girls and women.

Gender issues aside, a recent New Zealand survey found that 61% of primary schools estimate that 50% or more of their teaching staff have personal Internet access (Fink-Jensen, McLennan & Dickinson, 2001). This figure compares to an Australian study of 1014 teachers conducted by AC Nielsen in December 1999, that found 61% of respondents nationally had Internet access at home (Schoolsnet, 2000). At the time of the research, this compared favourably with the national average of 23% of all households throughout Australia. Similarly, in the United States, a three-prong survey of computer use found that 63% of teachers employed in public schools had the Internet available at home (National Center for Education Statistics, 2000). While neither study disaggregates data by gender, the higher level of personal Internet access by the perceived accomplished internet-using teachers (89%) confirms the purposive nature of the sample on an international basis.

Although individual responses were not tracked, there is an overall increase in the technical and pedagogical know-how between the two phases, which confirms the greater skill, knowledge and experience of the perceived accomplished internet-using teachers. On a five-point scale, for example, in which one represents the novice category, the mean level of teaching experience with the Internet shifted from 2.55 to 2.94 in Phase Two. While this increase is slightly misleading given the purposive nature of each sample, it may indicate a real improvement in individual teachers' skill and knowledge due to further experience. After all, one would expect teachers to report increased technical and pedagogical accomplishment as they gain more Internet experience in their workplace.

Despite the greater accessibility of the Internet, the sample continued to reflect a group of experienced male teachers who perceived themselves to be more technically and pedagogically accomplished than their female colleagues. The difference was consistent but unlike Phase One the gap in the level of Internet-know-how between men and women was not statistically significant. Thus, the comparative increase in perceived capability of women from Phase One gives limited support to the theory that the gender gap may eventually close once female teachers acquire sufficient Internet access and personal experience. Again, gender may not be the determinant variable, especially since teaching level was also a key factor in student Internet use.

While the hypothesis that gender differences will diminish through increased experience is appealing, history suggests this is too optimistic. After all, the sample remains over-representative of male teachers, as *Education Statistics of New Zealand for 2000* (Ministry of Education, 2001a) show less than 20% of all primary and intermediate teachers are men including senior management. Thus, it would appear that men have influenced the early adoption of the Internet within this population of teachers far more than one would normally expect.

On the other hand, their influence is consistent with gender differences within the structure of the teaching profession. Apple (1995) reminds us that men mostly conduct school administration, whereas teaching is largely a female occupation. Although this claim is highly stereotypic, it generally fits the sample profile where all of the deputy principals were men. A similar gender pattern was found by Bryson and De Castell (1998a) in their research on the implementation of computers in British Columbia, Canada. At the time, data on staffing positions by gender derived from the Ministry of Education showed that 97% of elementary teachers were women. In contrast, school administration continued to be primarily a male preserve with 80% men in positions of authority. Although the gender imbalance of principals in New Zealand primary schools is not so marked (Ministry of Education, 2001a), the key point is that we should not be surprised if differences between men and women follow similar patterns to those found in school administration and the information technology (IT) industry where males still dominate positions of status.

According to Bryson and De Castell (1998a), this domination extends to the position of computer co-ordinators. From official data, men occupied over 90% of these teaching positions in British Columbia. Similarly, Cox, Preston and Cox (1999) found in their study of experienced teachers involved in the MirandaNet Project that over 60% of these were men. They suggest this is probably due to there being more male information and communication technology (ICT) teachers and co-ordinators nationally. While such an extreme imbalance does not appear in the sample from Phase Two, a number of other differences in the background characteristics of the teachers suggest that it is too early to celebrate the accomplishment of gender equity. A higher proportion of male teachers, for example, had attended a conference with an Internet theme in the previous six months, which supports McMillan's (1993) observation that men are typically over-represented at New Zealand educational computing conferences. In a similar vein, male teachers self-reported significantly higher level of knowledge of international developments in the area of ICT, possibly due to their greater administrative experience and extended professional networks.

The paradox is that, on average, women had attained or were pursing more advanced and/or specialized qualifications than their male counterparts. This is despite female teachers having fewer years of teaching experience and the problems they face in pursuing further qualifications due to traditional patriarchal relations (Apple & Jungck, 1998). Of course, it may be that some of this study was completed during periods of broken service.

Whatever the reason, it was interesting that female teachers claimed to provide more frequently informal pedagogical advice on Internet use. On the other hand, six of the seven teachers who provided impromptu technical support most days or every day of the week were men. This distinction in the nature of informal professional collaboration lends tentative support to Bryson and De Castell's (1998a) claim that 'male computer coordinators and principals alike seemed to have very clearly gender-differentiated conceptions of male and female technological competence' (p.558). Further evidence of differentiated gender patterns appears in Becker's (2000a) secondary analysis of data from the 1989 survey of computer use in US elementary and secondary schools. This analysis involved three percent of teachers from the original sample who fulfilled the exemplary criteria based on Hadley and Sheingold's (1993) Bank Street study. Becker (2000a) found that men and women differed sharply in the amount of time that they spent using computers. Male teachers used school computers for about twice as many hours per week as their female colleagues. But the differences were even greater for out-of-school use where men spent two and a half times more time on the computer than women (Becker, 2000a). Using a multivariate analysis procedure, Becker (2000a) concluded that gender was still among the stronger independent predictors of exemplary computer-using teachers.

Irrespective of the ecological validity of this research to New Zealand, recent national surveys on the use of ICT in schools have failed to gather data that might reveal potential gender differences. Instead, the major reports from The Information Technology Advisory Group (ITAG) (Sullivan & Anso, 2000), The Learning Centre Trust (Fink-Jensen, McLennan & Dickinson, 2001), and The International Association for the Evaluation of Educational Achievement (IEA) (Pelgrum & Anderson, 2001) contain a strong male bias by relying on principals' and ICT co-ordinators' perceptions. After all, 37% only of New Zealand primary and intermediate school principals are women (Ministry of Education, 2001a). The reliance on principals' perceptions, in particular, is a serious weakness of research on ICT in education as there is strong evidence of distinct differences in the career paths of men and women (Huberman, 1993). For this reason it should not be surprising to find gender differences in the background experience of internet-using teachers. Indeed, it is perplexing that ITAG, The Learning Centre Trust and so forth have not sought to report potential gender differences.

From a broader perspective, it would be naïve to believe that gender differences are simply the outcome of insufficient access to, and experience of, the Internet. The collective evidence from Phase One and Phase Two suggests that there are numerous potential covariates, such as, age, level and teaching experience to name a few. Beyond demographic variables, the differential gender pattern is part of a wider social practice that has been well documented previously in the educational literature (e.g., Kirkpatrick & Cuban, 1998b; Newton & Beck, 1993; Sutton, 1991). As Apple and Jungck (1998) posit, many women are already doing two jobs, and their lack of time and enthusiasm for learning new computer skills is anything but a simplistic response to technological innovation. In everyday life, the computer is embedded in a wider social system that has a wealth of cultural meanings, which often alienate females and is derogatory towards women—for instance, the images portrayed in computer advertising (Weinstein, 1998).

The deeply gendered nature of technological innovation is also apparent in recent policy initiatives emanating from the United States. Arguably, the discourse of major policy and stakeholder groups (e.g.,, The Milken Exchange and the National Governors' Association) promotes a highly competitive economic rationale that is inherently male-centric. This bias is evident from the "hard" and disproportionately male imagery in several recent publications including the frequently cited policy roadmap entitled *Transforming Learning through Technology* (Sweeney, 1999). The assumed link in this report between economic prosperity and educational success is obvious in the opening statement from The Chairman of the National Governors' Association:

> *Just as e-commerce connects people to new methods for conducting trade, e-learning links students to new methods for achieving higher academic standards (Sweeney, 1999, p.ii).*

In sum, the background teaching experience of the perceived accomplished internet-using teachers differs on a number of demographic variables from the initial sample and wider population of teachers. Teachers enjoyed greater access to the Internet and reported on average higher levels of technical skill and pedagogical experience. Yet, Internet know-how followed a differential gender pattern similar to Phase One in which the sample was skewed toward a group of more proficient, older, male, European, veteran teachers in positions of responsibility or senior management. Regardless of whether or not the gap between men and women in the level of Internet access and pedagogical experience is "real", over a period of time, gender differences need to be interpreted with caution. Researchers must avoid simplistic explanations and instead attempt to unravel the mutually entwined covariates that contribute to different internet-using teachers' experiences, perceptions and practices.

Personal and Professional Internet Use

Another standout feature of the sample was the extent to which teachers were active hunters, gatherers and grazers of traditional print and electronic information. The teachers demonstrated this trait by their use and knowledge of a wide variety of traditional and nontraditional information sources. A general propensity toward information consumption extended to teachers' personal and professional Internet use. At a personal level, the teachers were active users of the Web as a source of information relevant to their interests outside of school. In their professional work, the vast majority of teachers were regular Internet users evidenced by those who utilized it for lesson planning and preparation.

Suffice to say that teachers' professional Internet use had a strong international flavour. This was apparent by use of Internet resources from North America and through teachers' awareness of curriculum developments in other countries. Interestingly, the participants were not overly impressed with the design or quality of resources available under Te Kete Ipurangi (TKI). It was not their first source of information. An international gaze was also evident in the teachers' high level of familiarity with contemporary educational theory, including knowledge of recent developments in constructivism, learning styles, and multiple intelligences. Notably, many teachers first learned about these developments through the Internet itself but not exclusively.

While teachers still obtained information from traditional sources, the Internet had quickly become an important vehicle for formal, informal and non-formal learning. Despite several participants objecting to using their personal computers for teaching purposes, all teachers were using the Internet in some professional capacity. The growth of professional use is confirmed in an Australian survey where 30% of teachers in December 1999 were using the Internet at school on a daily basis (Schoolsnet, 2000). There is no evidence, however, in this survey to support the claim that teachers with fewer years of teaching experience have more skill and are making greater professional use of the Internet, as found elsewhere in Australia (Russell, Finger & Russell, 2000) and the United States (US) (National Center for Education Statistic, 2000). On the whole, no clear pattern of greater usage by younger participants with less teaching experience appears in the sample of perceived accomplished internet-using teachers. In general, the sample represents a group of regular, well informed internet-using teachers with a strong desire to keep abreast of new pedagogical developments.

Professional Orientation

The third notable background characteristic of the perceived accomplished internet-using teachers was the professional orientation to their work. Overall, the teachers were orientated towards leadership and professional engagement, as opposed to adopting a classroom

orientation in accordance with the continuum first proposed by Becker and Riel (1999). In keeping with the concept of "professional practice" (Becker & Riel, 2000), most teachers demonstrated a high level of commitment and responsibility to their colleagues, and to the larger educational community. Although one teacher used a church analogy to describe the revivalist nature of the ICT-related educational community, the participants engaged in sustained professional contact and many were leaders in their field. In short, there were no "private practice" teachers. That is, teachers with '...little time for meetings, conferences, or other forms of professional engagement' (Becker & Riel, 2000, p.5). The level of engagement and leadership was evident by the high proportion of teachers committed to some form of professional development ranging from after school workshops, to conference attendance and formal academic study. It was also apparent in the number of teachers who were responsible for professional development of their colleagues. Many teachers went beyond the call of duty by frequently undertaking evening, weekend and holiday work. It follows that the sample represents a group of dedicated teachers many of whom were centrally involved in the day-to-day leadership and management of ICT in their school.

The enduring impression, nonetheless, was that many teachers were finding it difficult to juggle the demands placed on them due to the rapid growth of the Internet and increasing emphasis on ICT generally throughout the school system. By and large, teachers appeared to accept this extra responsibility without complaint but the position of ICT co-ordinator was already demanding before the advent of the Internet. As Ronnkvist, Dexter and Anderson (2000) show, most technology co-ordinators are required to undertake a number of additional jobs. Hence the teachers were all extremely busy people who admitted, often reluctantly, that they were overworked and struggling to cope. This observation is consistent with the Canadian experience where Bryson and De Castell (1998a) found:

> *Teachers' needs either remained at a constant or had increased... creating a workload for computer coordinators that seemed entirely discordant with the material provisions of their work (p.550).*

The teachers acknowledged that the workload associated with responsibility for computers and the Internet came at a cost, especially in terms of other creative and intellectual dimensions of their work. Consequently, support for other teachers in the ICT area was described as more often than not *just enough, just in time,* and *just in case* something goes wrong. The need to maintain the equipment, keep the system running and provide technical support for teachers contributed to the remark that the ICT co-ordinator was really two jobs rolled into one. This view was common, which explains why several teachers were reticent about the amount of work associated with the position of ICT co-cordinator. It should be borne in mind that Cooke (1998) found a large proportion of the ICT coordinators job entails solving technical problems in which few teachers have any formal training.

Added to this it was not always a job that ensured teachers would remain popular with colleagues. The results suggest that there is a cost associated with being known as the champion of ICT in schools, which does not always evoke a positive reaction. Indeed, it was common for teachers to perceive a lack of support and sense of isolation from colleagues. In some cases, it would appear the teachers were experiencing a reasonably high level of passive resistance toward the integration of ICT within and across the curriculum. Consequently, a number of teachers were critical of their colleagues' attitude, lack of understanding and inaction toward curriculum innovation using new educational technologies. The level of frustration indicates that the sample is not yet a group of well-supported internet-using teachers working in a "technology learning organization" with a culture of distributed leadership as defined by Anderson and Dexter (2000).

In sum, the teachers were committed professionals. Although at an individual level the teachers' commitment and perspective toward the use of the Internet in schools varied greatly, their interest in ICT extended beyond the classroom and a high level of professional leadership characterized the sample. Indeed, many teachers were passionate about the Internet's potential in education and willingly accepted a leadership role. However, it would seem that from what teachers *have to say* they are working under considerable pressure and feeling the strain of leading curriculum innovation in such a burgeoning area. Despite this, there is every indication to suggest that the sample selection technique was successful in identifying a reasonable proportion of technically and pedagogically accomplished internet-using teachers as defined by the criteria.

8.2 USE OF THE INTERNET FOR LEARNING AND TEACHING

This section interprets the results that relate to the research question: How do teachers use the Internet for learning and teaching? It considers three key aspects of Internet use in schools, namely: (a) the level of use, (b) the method of use, and (c) the type of use by students and teachers.

Level of Use

By the beginning of Phase Two, the level of Internet access in New Zealand schools was widespread, as reflected by the growth in accessibility and connectivity within the purposive sample. The rapid growth of Internet access is confirmed by The Education Review Office's (ERO) (2000) analysis of Accountability Reviews of 285 schools—10.8% of all state and integrated schools—completed between October 1999 and April 2000. From these reviews, ERO report that 89% of primary schools had Internet access compared to 95% of intermediate schools. Notably, the level of access is slightly lower than extrapolated from the survey conducted at the end of 1999 by Sullivan and Anso (2000).

Not surprisingly, the level of Internet access had expanded since completion of Phase Two. In June 2001, The Learning Centre Trust (Fink-Jensen, McLennan & Dickinson, 2001) found from their random survey of 512 primary schools that 98% of those who responded (67%) had Internet access. While the results are potentially biased by the inducement of a substantial prize, ERO (2001) reports a similar level of Internet access in their latest Accountability Reviews of 355 schools completed between July 2000 and April 2001. They observe that:

> *...the very small number of schools that do not have access to the Internet choose not to do so for philosophical or religious reasons rather than because of any practical or financial constraints (ERO, 2001, p.8).*

Clearly, the level of access is well above the 77% of primary students in New Zealand schools that were found to have Internet access in November 1998, during the Second Information Technology in Education Study (SITES) of infrastructure, goals and practices in 26 countries (OECD, 2000). This major international study (Module One of Three Phases) involved a stratified representative sample of over 200 New Zealand primary schools and all secondary schools (Pelgrum & Anderson, 2001). Although the study provided the Ministry of Education with evidence of New Zealand's progress in comparison to other countries, arguably, at best SITES offered a crude snapshot of computer access in schools from a traditional evaluation perspective.

In the case of primary schools, the response rate is difficult to calculate, as there are inconsistencies in the sampling information. The SITES Report claims that 210 primary schools participated in the survey, which reflects an 84% response rate; however, the information presented by Pelgrum and Anderson (2001) on the number of cases per questionnaire does not reconcile with this figure. For example, exactly 200 principals responded to the questionnaire along with 174 teachers with formal or informal responsibility for computers and ICT in their school. This latter group was known as the technical respondents. Inclusion of single responses—that is, the principal or technical respondent only—may have misleadingly closed the gap between the official response rate and the questionnaire returns. Also, fewer returns from teachers could be due to the number of principals who fulfill both positions in smaller rural schools. Whatever the explanation, the point is that sampling information on New Zealand is confusing in the SITES Report.

Although international comparisons remain problematic, the trend in Phase One—that Internet access is more common as students progress through the school system—is repeated in Phase Two, and confirmed by SITES. Indeed, it was found that in all countries the use of email and the Web '...was most widespread in *upper secondary education*, less widespread

in *lower secondary education,* and was least evident in primary education' (Pelgrum & Anderson, 2001, p.108). In terms of primary education, the results of Phase Two suggest that the level of Internet access has improved at each sub level especially in classrooms, but overall it was far less commonplace in the lower and middle primary school. Hence, this reinforces the earlier perception that the Internet is a domain for teachers working with older students at the senior level in dedicated technology-rich settings, but also increasingly in the classroom.

This observation, however, needs closer analysis. After all, there is a danger of confusing the level of access and potential usage with the frequency with which teachers are using the Internet for learning and teaching. The key point is that while better access might correlate with greater usage or frequency of use by teachers at the senior level, this relationship is not necessarily causal. In this regard, it is important to note that despite teachers having greater Internet access and using it more in their teaching compared to Phase One, less than 10% of all participants make use of email or the Web with students on a regular daily basis. So, just as Becker, Ravitz and Wong (1999) found, relatively few teachers are using the Internet with students on a regular basis in the regular context of the curriculum.

This conclusion, however, needs to be fleshed out before it is accepted as an accurate interpretation of the results. The usage pattern varies across each sub level with a higher proportion of teachers at the senior level using the Internet with their students. In total, 35% of teachers at this level use the Internet with students at least every week compared to 22% in the middle school and none in the lower school. While usage follows a similar pattern to access, which is logical and consistent with the work of Becker and colleagues, these frequency data by level still potentially mask the "true" extent of Internet use. Another layer or valuable indicator of use is the proportion of students using the Internet in a specific class on a regular basis. This distinction recognizes that some teachers might report making frequent use of the Internet, but their usage might not extend to all students in the class. In other words, there is a possibility that a handful of students rather than the whole class are enjoying the benefits of Internet access.

To some degree, the findings support this observation as teachers appear to allocate responsibility for computers and the Internet to certain individuals, and relatively low proportions of students use email and/or the Web each week. Although a higher proportion of students use the Web as opposed to email on a regular basis, these data suggest that less than one third of a typical class of 30 students at the senior level utilize the Internet in a typical week—that is, during school hours. Not surprisingly, the interview responses highlight the problematic nature of such rough calculations based on retrospective estimates. It was evident from the interview that teachers used the Internet with students in very

different ways depending on the level of access, specific context and intended purpose of use. Therefore, like previous surveys, researchers and policy-makers should not read too much into these types of usage and frequency calculations.

On the other hand, this line of inquiry exposes the superficial nature of previous research and does little or nothing to seriously challenge ITAG's conclusion that usage of the Internet is generally low among students (Sullivan & Anso, 2000). While teachers now have better Internet access, the overall impression at the end of Phase Two is still one of limited usage and frequency of use by students. This summation of student Internet use is consistent with Phase One and the situation described by Becker (2000b) and others in the international literature. In a comparative study, for example, SITES found that only in Canada, Finland, Luxembourg, Norway and New Zealand were more than 50% of students at each educational level using the Internet for instructional purposes (Pelgrum & Anderson, 2001). Nevertheless, SITES did not report the frequency of student use, which if investigated might paint an even less encouraging image of the Internet as a widely used pedagogical innovation. On a positive note, however, New Zealand compares favourably with other countries with a high score in terms of student control and emphasis on learning ICT skills (Pelgrum, 2001). It is important also to acknowledge that the Internet's introduction into schools is still gaining momentum.

Although this may bode well for the future, ERO confirms the limited use of the Internet by students thus far in New Zealand schools. Based on their Accountability Reviews, they claim that effective Internet access—a concept without an agreed definition—for learning and teaching is available in only 44% of New Zealand primary schools (ERO, 2000). Despite the undisclosed definition of what constitutes effectiveness, at the time, this figure was reasonably close to Sullivan and Anso's (2000) extrapolation that approximately 36% of all classrooms in New Zealand primary schools have Internet access. More recently, ERO (2001) report from their Accountability Reviews conducted over 2000/2001 that 61% of students have Internet access. They found that:

> *It was less likely for schools to have only a single dial-up connection and more likely for the Internet to be available to individual students in classrooms (ERO, 2001, p.8).*

Of course, there remains an implicit assumption in this type of statement that classroom access is a major barrier to effective Internet use when from an insiders' perspective the obstacles to ICT may be far deeper and more complex than currently envisaged by education reviewers, policy-makers and researchers alike. In short, access is not an indicator by itself of effective Internet use by teachers.

Interestingly, ERO (2000) claims that the level of student Internet access does not vary significantly on the basis of socio-economic decile or school size. That said, decile 10 schools were more likely to have at least one computer in each classroom (95%) than those schools classified as decile one (65%) (ERO, 2001). Moreover, it was not clear whether ERO statistically tested the aforementioned claim. Of particular interest is that effective Internet access for students was more common in intermediate (63%) and secondary (68%) schools (ERO, 2000), which supports the conclusion that accessibility is less common at the primary level. A similar pattern is reported in ERO's (2001) latest Accountability Reviews. Thus, it is reasonable to conclude with a fair degree of confidence that Internet access has been more readily available to teachers working with older students at senior levels. Moreover, few students at any level are using the Internet on a regular weekly basis whether in the classroom or within dedicated technology-rich settings—that is, the computer lab.

Another picture of the level of Internet usage in schools is attained by comparing the proportion of time devoted to internet-related applications in a typical week relative to other software uses. As expected, most of the available computer time was devoted to word processing (51%) but surprisingly since Phase One, the Web has quickly displaced educational games as the second most intensive use of the computer by students. In total, the Internet now constitutes approximately 30% of total available computer time, which is double that found in Phase One. Comparatively, more time is devoted to internet-related applications in the senior school. This estimate, of course, is rather crude, as it does not include CD-ROMs and multimedia presentation software. These applications were excluded to allow direct comparison with the results of Phase One, so it remains ambiguous whether or not teachers calculated other software in their response to this question.

Another problem is the implicit assumption that available "computer time" is a fixed variable when lower student-computer ratios due to additional computers and new ICT labs may enhance accessibility and, thereby, potentially increase time overall for whole class internet-related activities. In other words, the relative comparison of the time allocated to specific applications does not reveal whether teachers are spending more instructional time using ICT *per se*. Following on from this an interesting paradox emerged during the interview—that is, the possibility that more students are now using computers but not necessarily integrated within the curriculum over longer periods of time. Rather, there has been a tendency for teachers to separate computer time in the computer lab from the regular classroom programme. It was of concern to hear some teachers report that the advent of the computer lab has contributed to a narrow skill focus, as evidenced by the use of ICT skill checklists in a number of schools. The way teachers are incorporating newly developed computer labs into the curriculum is an interesting phenomenon that requires further investigation.

Overall, it can be concluded from Phase Two that the Internet does not appear to be dominating classroom computer use. While Internet access and usage is most prevalent at the senior level, comparatively few students at all levels were using email or the Web at school on a frequent basis. This claim is confirmed by Fink-Jensen, McLennan and Dickinson (2001) who surmise that 'despite nearly all schools now having access to the Internet, usage levels are generally low, particularly for students' (p.24). Nevertheless, across the board, it would appear that student Internet access, usage, and frequency of use is increasing and is likely to continue to do so in the future, possibly at the expense of traditional computer applications. The unanswered question that requires further investigation is to what extent the Internet will *extend* rather than *displace* other computer-related activities as classroom access becomes more widespread across the school system.

Method of Use

The Internet was available through a number of methods at a variety of locations within each school. In many cases, teachers could now access email and the Web through a combination of the office, school library, computer suite and/or their own classroom. However, the location and distribution of the Internet was uneven within and across schools. It was more common in the senior school and the provision of classroom Internet access through a local area network (LAN) was the exception rather than the rule. Moreover, few schools possessed a comprehensive network that connected all classrooms and those that did were on average of a higher decile ranking. Thus, networking was most common in schools within higher socio-economic communities. A similar trend was found by ERO (2000) where 20% of decile one schools was networked in comparison to 52% of schools with a decile 10 ranking. At the time, ERO (2000) concluded that:

> *... low decile schools are less likely to be networked than high decile schools (p.1).*

In their follow up report, however, ERO (2001) found that this difference was all but eliminated, which they attributed to the success of initiatives such as *NetDay* and the provision of government funding through the *Financial Assistance Scheme.* Despite these initiatives, there is strong evidence to suggest that high decile schools continue to lead the way in terms of ICT expenditure if the current situation in the US applies to New Zealand (e.g., Anderson & Becker, 2001). It remains to be seen whether this will translate into a long-term advantage in the way that schools of higher socio-economic status are deploying networking technology for learning and teaching.

That aside, the extent of networking in Phase Two, where 60% of the participants had network access in their classroom, adds further weight to the atypical nature of the sample in comparison to the wider population of teachers. For example, ERO (2001) report 50% only of primary schools have all computers networked, up from 32% a year earlier. At the time of the study, it would appear that the perceived accomplished internet-using teachers were more connected than many of their colleagues. On the other hand, the difference in networking between the two samples could be much smaller if ERO's calculation includes only those schools that are fully networked as implied. Despite this, the sample remains relatively atypical based on Fink-Jensen, McLennan and Dickinson's (2001) finding that 54% only of primary schools have at least 80% of their classrooms networked and just 26% have 80% or more of their computers connected to the Internet. In many ways, the discrepancy between these figures highlights the problem of making direct comparisons when terminology is left undefined and when the innovation itself is still in a period of rapid development over a short space of time.

Intricacies of networking aside, the majority of teachers now have direct access to the Internet in their classroom. This is an important development since Phase One. The level of classroom access (63%) is well above Sullivan and Anso's (2000) estimate that 36% of classrooms in all primary schools are connected to the Internet. In theory, the expansion of the Internet into the classroom opens the opportunity for greater student use within the regular curriculum. It should be remembered that Becker, Ravitz and Wong (1999) found that classroom-based Internet connectivity had a significant effect on baseline levels of use. While this effect is unsurprising, significance is not causal and there is no way of determining in Phase Two whether the apparent growth in student Internet use is the result of greater connectivity in the classroom.

On the surface, nevertheless, there was every indication to suggest that teachers are making greater use of the Internet with students and some of this usage is in the classroom. In Phase One, 9% of the sample, for example, used the Internet with students at least every week, whereas this figure had increased to 28% of the perceived accomplished internet-using teachers. Put another way, 89% of these teachers were now using the Internet with students in some capacity as opposed to 50% in Phase One. This figure is artificially inflated, of course, by selection criteria in Phase Two that sought teachers with greater levels of Internet proficiency and teaching experience. Despite this, it is reasonable to surmise that Internet access in the classroom has been an important contributing factor in the growth of student use—albeit that few teachers yet are using their classroom Internet connection with students on a frequent basis.

Notwithstanding the growth of classroom access, the most common Internet connection was still through the school library and/or computer lab. Essentially all teachers (97%) and their students could access the Internet from within the library, which reflects a slight increase in real terms from the 73% in Phase One. The level of accessibility in the library is consistent with ERO's (2000) finding that:

> *The Internet is often available in the library or office rather than classrooms (p.1).*

At the time, the situation was similar in Australia where AC Nielsen found that the library was the most common location of computers with Internet access (Schoolnet, 2000). Accordingly, the research claims that to date most Australian teachers view the Internet as a library resource rather than a tool for classroom and/or professional use. It would appear the perceived accomplished internet-using teachers share this perception by reporting that the Internet is most *at home* in the library. Generally, teachers associate the Internet with the Web rather than a new mode or method of communication involving new kinds of online interaction. This suggests that so far they have assimilated the Internet into their teaching based on its potential and original introduction into the school system as an information resource. If the content metaphor is commonplace, there are wider implications for the way that the teaching profession might envisage the Internet as an educational innovation. By framing the Internet in this way, the terrain of online pedagogy (TOP) may be relatively improvised by restricting the types of activities that support new relationships and engage students in active and meaningful communication.

In addition to the library, a high proportion of teachers (86%) had access to the Internet through a dedicated computer lab, which is an increase from just over half of the participants (52%) in Phase One. As mentioned previously, growth in the number of computer labs available to teachers was a standout feature of the sample. For this reason, methodological weaknesses aside, it is important to recall that Becker, Ravitz and Wong (1999) claim the classroom has a clear advantage over the computer suite. This advantage is confirmed by the National Center for Education Statistics (2000) where in the US students and teachers with Internet connections in their classroom were found more likely to use computers elsewhere in the school more often than those people without network access in their classroom. The reported correlation, of course, may not be causal as teachers with classroom Internet access are likely to represent an atypical sample of early adopters and there are many other potential covariates. Interestingly, the study found that teachers were more likely to use the Internet when it is located in their own classroom, whereas students make greater use of it outside the classroom (National Center for Education Statistics, 2000). The research, therefore, presents a somewhat paradoxical response to the use and perceived value of the computer lab.

On the one hand, the lab made it possible for a higher proportion of students to use computers on a regular basis, evidenced by the number of perceived accomplished internet-using teachers who scheduled lab time in their classroom programme each week. For some teachers the introduction of the computer suite helped to address the obvious problem of a whole class sharing just one or two classroom computers with great difficulty. In addition, there is evidence to suggest that the lab situation makes it easier for teachers to control and supervise Web access, especially in light of concerns about Internet safety. A number of teachers perceived the lab was an ideal solution to the logistics of using ICT in the classroom. On the other hand, there was a perception that some of their colleagues were using the computer suite and the new "moral panic" over Internet safety (e. g. Lawson & Comber, 2000) as an excuse to ignore the challenge of genuine curriculum integration. In this sense, time scheduled in the lab for ICT was a convenient way for some teachers to avoid the wider use of computers within the day-to-day classroom programme. It was of concern to hear teachers report that these labs have led to ICT being taught as a standalone subject with a strong emphasis on computer skills.

This raises the question of what teachers have might have decided to leave out of the curriculum to accommodate the time and attention now devoted to ICT both within and outside of the regular classroom. There is a potential displacement cost. At this stage, little or nothing is known about the way that teachers are reshaping the curriculum to "fit" this latest educational facility at their disposal. Historically, the use of computer labs has attracted heated debate, which has typically placed too much attention on the technology itself. In this regard, the debate has been too binary, as the value of the lab cannot be removed from the multifarious contexts of computer use. Thus, labs are not the key issue. There is, nevertheless, a long and largely unsuccessful history of curriculum integration in dedicated computer environments (Salomon, 1990b). With this in mind, there is a need to investigate the way that experienced internet-using teachers are strategically deploying these newly developed labs and mini computer suites to create opportunities for active and meaningful learning.

Type of Use

The key issue beyond access and infrastructure is the type of use that teachers make of the Internet. Interpretations of access, usage, and frequency have little value if they are removed from consideration of the type of Internet use. This is where national and international surveys on teachers computer use have consistently told only part of the story by often providing nothing more than a crude stock-take of available computer hardware and software. Thus far, the same problem applies to educational research on the Internet. There is

still a gap in our knowledge of *how* different teachers are using different Internet applications in different contexts for different purposes. In this regard, Phase Two helps to provide a more complete picture—albeit localized and temporal—of how teachers (and students) are using different types of internet-related applications within and across the curriculum.

At a basic applications level, for example, the study revealed that Web page browsing is the most frequent type of student Internet use. Very few teachers (11%), unlike Phase One (43%), do not require their students to use this type of Internet application. The next most frequent application is email although the latter is not yet common on a regular basis. A consistent theme is the relative infrequency of email as opposed to the Web, which follows the pattern up until now in the international literature (e.g., Becker, 1999). In keeping with the first phase, there is very little evidence that students frequently use a wider range of applications such as chat, email lists, discussion groups and Web page construction. Consequently, the enduring impression was that teachers' Internet use is somewhat one-dimensional confined largely to the Web.

As demonstrated in Phase One, the Internet competes with other types of software uses and applications in the classroom. While self-report quantitative data indicates teachers frequency of student use of email, the Web, and multimedia presentations has increased over the past 12 months, there is no marked corresponding decrease in other types of computer applications. On the face of it, this suggests that teachers may be making more use of a wider diversity of computer applications within schools. However, this conclusion is potentially misleading because it fails to take into account the relative frequency on a weekly basis in which teachers are using these applications in the first place. It is highly probable, especially based on Becker, Ravitz and Wong's (1999) claim that most teachers use only one or two types of software, that the majority of the sample had not used the full gamut of computer applications with students to begin with. Hence, an indication that teachers are using the application about the same amount of time does not have a lot of meaning on a comparative weekly basis.

The problematic nature of this question is underscored by the aforementioned finding that more computer time is being devoted to the Internet in comparison to educational games. Although the term "educational games" was left undefined, and is, therefore, open to interpretation, the interview responses confirm a decline, over time, in the use of more traditional computer applications. Indeed, few teachers were still using interactive fiction and the main use of databases and spreadsheets is for school administration, clearly a growth area of computer use in schools. Thus, there is tentative support for the displacement hypothesis first proposed in Chapter Six.

The exception, of course, is word processing and desktop publishing. Again, it would seem that the word processor, or at least activities involving writing and electronic presentation, still dominate classroom computer use. At this stage, there is no sign of word processing being dethroned as the most common or frequent type of computer use in schools. This observation is confirmed by SITES where technical respondents report that 99% of typical New Zealand students would have used a word processor by the end of their primary education (Pelgrum & Anderson, 2001). This compares to 96% of students for interactive encyclopedias, 43% for spreadsheets, and 22% for simulation software. Pelgrum and Anderson (2001) report that 'word processing software was used the most and covered about (...) one-fifth of the total number of applications' at the primary level (p.211). Interestingly, they also found that across all levels, communications software accounted for approximately one-tenth of the software applications. In Australia, word processing would also appear to be the most common use of computers in the teaching environment, followed equally by the Web and CD-ROMs (Schoolsnet, 2000). Thus, despite the growth of the latest "Media Wave", the computer as a word processor and presentation tool remains the quintessential *heart* of educational computing.

The demise of interactive fiction, nevertheless, and the rise in popularity of "edutainment" software on the home PC and standalone game console, such as *PlayStation,* engendered considerable discussion. It was interesting that several teachers perceived a sense of competition between home computing and the use of ICT at school. For some teachers there was a direct link between the decline of their pedagogical use of "game-like" software and the recent proliferation of edutainment. These teachers no longer perceived this type of software to be novel and because of its widespread availability, they did not consider it conferred the same motivational value as in the past. This observation adds support to Roberston's (1998) concern that, like television, the computer has quickly become a medium for "fun" rather than a serious medium for learning. On a positive note, the teachers' response to the proliferation of edutainment in children's lives demonstrates the level of thoughtful reasoning that went into decisions to use or not use certain types of software packages for learning and motivational purposes.

While traditional software applications may have lost their pedagogical appeal, the Internet alone has not replaced this attraction. Instead, teachers reported multimedia presentations as the type of software application that has most increased in use over this time. Having said that, the problem of comparing results based on different typologies comes into play as some teachers interpreted the term multimedia to include CD-ROM reference software rather than authoring packages such as KidPix and PowerPoint™. Without doubt, a parallel increase in the use of CD-ROMs needs disentangling from the responses especially in light of the type of electronic resources identified in the survey conducted by The Learning Centre Trust (Fink-

Jensen, McLennan & Dickinson, 2001). Notwithstanding this problem, the interface between the rise in multimedia—whatever multimedia presentations involve—and the advent of the digital camera illustrates how patterns of software use are far more complicated and nested in practice than suggested by ranked lists of individual applications. It is noteworthy that teachers perceived the digital camera, rather than the Internet or multimedia, was the single most valuable item of new educational technology, which is consistent with the findings from Fink-Jensen, McLennan and Dickinson (2001).

At a pedagogical level, the Web is not a one-dimensional innovation. There are a number of Web-based activity structures (e.g., Harris, 1998b) and each type needs to be considered when interpreting the way teachers are using the Internet for pedagogical purposes. With this in mind, it is important to note that students used the Web for research and information gathering more than any other purpose, which is consistent with prior research (e.g., Becker, 1999; Schoolsnet, 2000). On this occasion, 91% of teachers devoted at least some days to using the Internet with students for information searches, compared to 54% of the participants in Phase One. Since the first phase, it would appear that WebQuests have become the second most intensive Internet use with 20% of teachers using these 15 or more days over the last year. The number of teachers using the Internet as a "research tool" was inclusive of the 89% of participants who reported in an earlier question that they were using the Internet with students in some capacity. Such a consistent response suggests that these data have internal validity, despite the undefined nature of each category and the different way teachers conceptualized information searches.

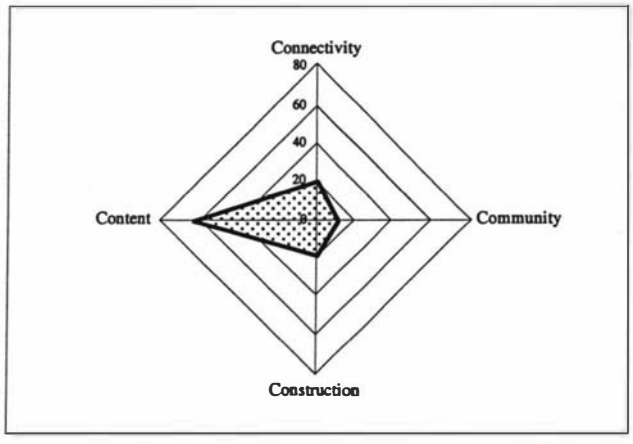

Figure 8.1 Mean percentage of one or more days devoted to using the Internet by category

Although teachers have experimented with different types of internet-related learning experiences, an information bank conception of the Web was dominant. This perception was confirmed when different activities were aggregated in terms of the four main "Cs" of Internet use. The mean percentage of one or more days that teachers devoted to different types of pedagogical applications of the Internet over the last 12 months, collapsed by category, are shown in Figure 8.1.

Again, the most common type of pedagogical application falls within the "content" metaphor (63%), where many internet-related activities were nothing more than a supplement to traditional information sources. Notably, some teachers considered that WebQuests merely engaged students in low-level information retrieval. With few exceptions, there was little or no evidence of students using the Internet to investigate authentic problems with complex solutions. Instead, a number of teachers were critical of the Web in terms of its credibility, readability and suitability as a student learning resource. Teachers identified a raft of problems with the Internet as a research tool, which closely mirrored Burbules and Callister's (2000) four types of content effects—that is: (a) misinformation, (b) malinformation, (c) messy information, and (d) useless information.

An emphasis on information was followed by the use of the Internet for "connectivity" (20%) in which few teachers reported a successful experience. Despite the considerable potential of book raps, key pal exchanges, virtual field trips and the like, these were not always feasible in the busy classroom, especially when teachers had already planned units and set objectives well ahead of time with their colleagues. The key point to emerge was that internet-related learning experiences, which rely heavily on people and events outside of the classroom, require astute planning, careful coordination and sustained effort by a skilled teacher.

In some cases, teachers calculated the effort was not worth the reward and a number of participants were no longer experimenting with these types of activities. Indeed, several teachers perceived that many of the current types of pre-packaged internet-related activities constrained them from teaching in the way that they wished. Thus, the vast majority of teachers did not exploit the connectivity of the Internet on a regular basis, which follows the pattern found by Becker (1999) and Berg et al. (1998) in the US.

While the aggregation of data under these categories obscures some of the less common and potentially more innovative online learning experiences, use of the Internet for "community" (12%) and "construction" (18%) activities over a continuous period were the exception. In some instances, teachers decided after a brief encounter that the feasibility and practicability of such activities especially in large group settings is unrealistic. Put simply, the demands are too high for the potential returns. Moreover, teachers identified a clash between the goals of new internet-related learning experiences and the expectations of their colleagues and the traditional curriculum. Consequently, a number of early adopters had already reached the conclusion that Web publishing and other sophisticated internet applications are beyond most teachers and should be seen as extension tasks only for capable students.

In sum, the Internet has evoked a mixed response from teachers. It continues to be seen primarily as a resource for expanding the information environment for students rather than a vehicle for self-expression and real-world contact with other people. That said, there is no single approach to Internet use within and across the curriculum, as teachers have begun to adapt and assimilate the Internet within their teaching based on different patterns of access, conditions of use, technical know-how, pedagogical beliefs, pre-existing methods of teaching, collegial relationships and school culture. The overriding impression is that student Internet use, including non-use, of different pedagogical applications is the outcome of teachers' thoughtful reasoning shaped by their own circumstances and unique personal worldview.

8.3 BELIEFS ABOUT THE LEARNING AND TEACHING PROCESS

This section interprets the results that relate to the research question: What beliefs do internet-using teachers have about the learning and teaching process? It reflects on: (a) the idiosyncratic nature of the teacher's role, (b) the false dichotomy between learner-centred and teacher-centred pedagogy, and (c) competing conceptions of accomplishment in the context of teaching with technology.

Teacher's Role

In hindsight, the attempt to neatly classify teachers along a continuum from manager of instruction to facilitator of learning was a predictable failure. Although this question successfully grouped people in terms of a single teaching metaphor which was perceived a "best fit" of their own role, and there was a high degree of internal reliability across the two questionnaire responses, the combined results tell us very little about the individual teacher's pedagogical and philosophical orientation. Indeed, if taken at face value, the results may lead to simplistic generalizations about the nature of the teacher's role. Put simply, the aggregated responses merely confirm the serious limitations of a postal questionnaire in eliciting trustworthy data on teachers' pedagogical beliefs. Despite Ravitz, Becker and Wong's (2000) attempt to establish the validity of survey measures, the follow up interview left no doubt that a grounded approach offers a far better research strategy for investigating the idiosyncratic nature of how teachers define and understand their own role. It was obvious from the interview, for example, that different teachers had selected the same metaphor but for very different reasons, as demonstrated by widely divergent interpretations of the term "Guide". Thus, asking teachers to select a single metaphor from a list of alternatives belittles the depth and complexity of the pedagogical process—it falls back into the trap of a technical rationality approach. The challenge is to gather the kind of data that goes beyond crude taxonomical classification by revealing the life histories and rich experiences that shape the uniquely individual nature of the teacher's role.

False Dichotomy

Beyond the shortcomings of single metaphor responses, there are good reasons to question the binary nature of the popular distinction between teachers as managers of instruction as opposed to facilitators of learning. The implicit assumption that teachers have fixed positions along an instructional continuum from teacher-centred to learner-centred pedagogy needs to be challenged. In the first place, learner-centred pedagogy based on constructivism is just one interpretation of the literature, as outlined in the Literature Review, and in most circles constructivism is a learning theory or epistemological worldview rather than a deeply conceptualized pedagogical theory. In short, it is not a theory of teaching.

More importantly, there is strong evidence from Phase Two to suggest that the relationship between a teacher's philosophy, and the way this is lived on a daily basis in their classroom practice, is fluid and far more complex than conveyed within the two contrasting teaching scenarios adapted from Becker and Anderson (1998). As the interviews show, the instructional context and work culture play a key role in mediating the teacher's specific pedagogical approach. Not surprisingly, teachers described their educational philosophy in accordance with a range of instructional techniques that generally spanned the aforementioned continuum. Few, if any, teachers neatly fell within the bifurcation of *guide on the side* or *sage on the stage* as often promoted by popular mythology within the professional discourse. It is a myth, therefore, to perpetuate a false dichotomy between traditional teacher-centred and so-called contemporary learner-centred instructional methods, despite such a distinction in ERO's (2001) framework for evaluating schools' ICT performance. A closer inspection of the findings of the Apple Classrooms of Tomorrow (ACOT) Project reveals that:

> *The greatest student advances were claimed to occur in classes where teachers were beginning to achieve a balance between the appropriate use of direct instruction strategies and collaborative, inquiry-driven knowledge construction strategies (Dwyer, 1994, p.9).*

Put simply, there is little empirical support for such a dichotomy. It is also important to remember that the "new ways" of teaching based on learner-centred pedagogy are quite old. There is a long history of learner-centred pedagogical reform dating back to the progressive movement and the work of John Dewey. Predictions that computers in schools will bring about changes from whole class to small group instruction, from lecture and recitation to coaching, and from a competitive to a cooperative social structure (Warschauer, 2000) must be understood in the wider political context of educational reform. It is overly simplistic to draw a linear axis between two main pedagogical orientations when what is taught in the classroom is part of a deeper ideological struggle over the nature of the curriculum itself. No

teacher is an island and teaching methods are always constrained by what is possible under the circumstances.

This socio-historical perspective explains, in part, the eclectic response from teachers' as they are required to continually juggle their instructional approach with the shifting political and pedagogical requirements of the day. In this sense, the apparent paradox where teachers report that pupils prefer learner-centred approaches, whereas they perceived students learnt more by following teacher-centred pedagogy is entirely consistent with the new politics of assessment. Teachers may, for example, revert to teacher-centred approaches when required to meet predetermined learning outcomes without lessening commitment in their hearts and minds to a different instructional philosophy. Thus, the distinction between constructivist and traditional models of teaching is far murkier than currently envisaged from either the *outside looking in* or the *inside looking out*. Interestingly, even Ravitz, Becker and Wong (2000) acknowledge that:

> *No two teachers are perfectly alike in how they practice their craft and in their beliefs about teaching and learning that underlie those practices. Most teachers are eclectic, choosing from a large repertoire of teaching strategies as the particular situation warrants (p.1).*

The problem is that bipolar metaphors potentially reify folk theory about the nature of good teaching, both with and without new educational technologies. These metaphors are not just descriptive; they shape teaching practice and, arguably, over the years have become uncritically enshrined throughout the professional discourse. In this regard, the findings from Phase Two help to expose the risks of promulgating a superficial adoption of these metaphors throughout ICT-related teacher education. There is a real danger of locating the Internet within such a binary conceptualization of learning and teaching, especially when most popular metaphors ignore the ethical, moral and political dimensions of critical pedagogy. As Sfard (1998) argues, the devotion to a single metaphor may lead to theoretical distortions and undesirable practices. It is naïve to think that one best method exists (Mellon, 1999). Yet, the language of a single metaphor—namely, constructivism—dominates the pedagogical discourse surrounding the Internet. At the national level, this is reflected in the learner-centred rhetoric of the ICT Strategy (Ministry of Education, 1998a). Beyond New Zealand, the strong emphasis on constructivist-compatible instruction as opposed to traditional-transmission instruction is epitomized in the work of Becker (2000b) and many of his colleagues. There is a need to move beyond binary positions, which attribute too much weight to a single theoretical perspective in understanding the Internet as a social, economic and educational phenomenon.

Competing Conceptions of Accomplishment

Another bifurcation that requires further consideration is the distinction between teaching as a practical craft and leamed profession (Snook, 2000). Although teachers' perceptions of accomplishment loosely fitted within these two broad schools of thought, the classification of individual attributes under these headings has little or no validity in the wider research literature. This theoretical distinction has yet to be measured empirically in teachers' work. Having said that, the interview data offered a degree of grounded support for this dichotomy as two competing conceptions of accomplishment stood out when teachers described their personal conceptions of good pedagogy. In a general sense, there was a broad distinction between teachers with an intrinsic as opposed to extrinsic definition of accomplishment. Those with an extrinsic orientation trended to draw on existing measures of accomplishment in the professional discourse—for instance, the requirements of teacher registration and the newly developed professional standards, which may well reflect a senior management perspective. Whereas, an intrinsic orientation to the definition of good teaching drew on less tangible personal attributes and qualities that together combined with experience to create an "X factor" in the individual teacher. These teachers stood out from their colleagues in terms of flair, intelligence, passion, philosophy, capacity for critical reflection, wisdom, and so forth.

The key point is that even amongst teachers with an orientation towards professional collaboration there are widely divergent views of what constitutes accomplished teaching practice. This brings into question the utility and validity of Becker's (1999) distinction between "private practice" teachers and those oriented towards "professional leadership". As the Literature Review established, there is more to the definition of good teachers than those who engage in frequent interactions with their colleagues both within and beyond the school environment. Indeed, teacher collaboration can be conformist; it can suppress individuality and lead to "groupthink" (Hargreaves, 1995). Such collaboration may even promote anti intellectualism and Snook's practical craft orientation to teachers work. Sadly, few teachers value an understanding of the wider socio-political context of education, which one would expect of professional leaders in the field. It needs to be remembered that Preskill (1998) claims no teacher can be fully accomplished without the ability to engage in critique wider social practices.

On a positive note, there was initial consensus amongst teachers of the relative unimportance of computer and Internet skills. It was noteworthy that teachers themselves ranked other attributes as more important in the mix of what makes a good teacher. The ability to use ICT was not at the forefront of their definitions of accomplishment.

Of course, this raises the question: Why then is ICT such a dominant focus of recent teacher professional development? Who is really behind the drive to wire New Zealand schools? Currently, it is taken-for-granted that schools should be using ICT and that all teachers should be learning how to use multimedia and the Internet as an invaluable educational resource. While the follow up interview uncovered a reasonable number of teachers who support this position, arguably the emphasis on ICT has served to redefine the nature of professional competence at a time when teachers could, and probably should, be learning other things. To date, few people have had the moral courage to challenge the assumptions implicit within Becker, Ravitz and Wong's (1999) claim that teachers involved in "hi end" software applications:

> *... constitute the standard for exemplary instructional computer use, and their numbers are likely to increase in the near future (p.49).*

The danger is that the aforementioned definition of exemplary teaching becomes self-fulfilling, as there is a tendency to measure what is valued. This problem remains the major flaw of the research on good computer and internet-using teachers including the present study. That said, this research is framed within a critical perspective where the growing emphasis on ICT in professional development is viewed as part of the general erosion of teachers' work from moral responsibility to narrow technical competence (Goodson, 1995). From this perspective, the type of stated and unstated technology standards which teachers are expected to aspire to is part of a larger meta-narrative. This narrative seeks to depoliticize teaching and to turn the classroom practitioner into an educational worker rather than a trusted professional (Codd, 1998). Set within this context, not unexpectedly, few teachers maintained a truly critical perspective towards professional competence anchored by a strong sense of social justice. Arguably, the vast majority of internet-using teachers were silenced by, or unwitting victims of, a kind of creeping hegemonic discourse which broadly defines good teaching as a practical craft rather than an idiosyncratic, emotionally charged, ethical, moral and political endeavour.

8.4 CHANGES TO TEACHING PRACTICE AND WORK CULTURE

This section interprets the results that relate to the research question: What changes to their practice and work culture do teachers report from using the Internet for learning and teaching? It reflects specifically on: (a) the level of change, (b) the different stages and categories of Internet adoption, (c) the increased workload and tension between colleagues, and (d) the emergence of teachers with a global outlook toward their work.

Level of Change

In keeping with Phase One, few teachers reported that the Internet had greatly changed their educational philosophy or the repertoire of instructional approaches they use in the classroom. This response is consistent with the claim by Becker (2000c) that 'teachers generally see computers as helping them implement changes to their pedagogy that they wanted to accomplish but which they had previously been unable to accomplish' (p.4). While there is evidence that the Internet may have affected younger teachers more than veteran teachers, this remains inconclusive. It needs to be noted that the level of self-reported change does not take into account the teacher's philosophy *per se* or their pre-existing use of different instructional techniques. As the interview revealed, the use of groups, project-based work, student-centred learning, and real-world problem solving was already common practice. Similarly, many teachers perceived they were already creative and inventive, critical and reflective, complex and challenging, and authentic and interdisciplinary in their pedagogical approach. Thus, it is not surprising that teachers report the Internet has had little impact on these measures of pedagogical change.

Although further statistical analysis may help to establish a better baseline pedagogical measure from which to compare instructional changes, the follow up interview confirmed the fluid and idiosyncratic nature of individual responses. Several participants commented how their philosophy was continually evolving from year-to-year based on continuous and ongoing reflection, thereby underscoring the dynamic nature of teachers' work. There was little evidence to support the hypothesis that older teachers possessed entrenched philosophies impervious to change, as some of the most thoughtful responses came from the more experienced practitioners. On the other hand, teachers with the least experience were somewhat more pragmatic. Broadly speaking, they were far more positive about the Internet's effect on their teaching, accepted as almost inevitable the need for ICT-related school reform, and generally reported a greater technical dimension to their job. Thus, there is evidence to tentatively suggest that involvement in ICT may be steering these younger teachers towards a less critical, ideological, and politicised conception of teaching.

The paradox remained, nevertheless, that most teachers were confident and enthusiastic about the Internet, but few—mostly the aforementioned group of younger teachers—believed it had positively affected their teaching. Despite this, it was apparent that subtle changes had obviously taken place in teachers' practice and work culture without their knowledge. While it was common for teachers to report that the Internet had simply complemented existing practice rather than led to fundamental changes in the way they taught, this assimilation hypothesis underestimates the incremental effects of the technology on their teaching. A number of previously understated changes took on greater significance during the follow up

interview, which are described in more detail in the sections below. These unnoticed changes bring into question the capacity of teachers during a time of such rapid technological change to accurately recall the impact of the Internet on their teaching—for better and worse. The potential level of false consciousness highlights the limitations of phenomenological research that relies heavily on teachers' perceptions.

Stages of Adoption Revisited

Notwithstanding the above remark, there is little or no support from a phenomenological perspective for the stages of technology adoption that are popular throughout the professional literature (e.g., Rogers, 2000). Indeed, there is evidence that some teachers have a pre-existing disposition towards innovation in the first place, which most developmental stage models—culminating in creative and inventive application of technology to new contexts—fail to acknowledge, as first posited in Chapter Six. This is borne out by the high proportion of teachers who identified with the Invention Stage derived from the ACOT Project and the number of participants who classified themselves as Committed Innovators despite their limited Internet experience and minimal use of new computer technology for learning and teaching purposes.

A mêlée of individual responses to the different stages and categories of adoption, amplified by the follow up interview, confirmed the limited value of further statistical analysis. It was clear that people interpreted these categories based on their own idiosyncratic and deeply subjective conceptions of teaching, evidenced by the three contrasting accounts of why teachers identified with the Inventor Stage of technology adoption. Again, this offers an important lesson on the ecological validity of traditional survey research in this area, which historically treats teachers' perceptions as stable and unproblematic. Put bluntly, teachers (and principals) are not predictable clones who all behave and think alike. They are rational beings who make their own choices—albeit sometimes irrational and charged with emotion—about the adoption of a new educational technology.

While Rogers' (1995) well-known theory of "Individual Innovativeness" acknowledges that different people respond to technology in different ways, and some teachers are predisposed to the adoption of an innovation earlier than others, this is yet another sequential model of how teachers mediate the change process. According to Rogers (1995), adopters of technology fall into one of five categories: (a) innovators, (b) early adopters, (c) early majority, (d) late majority, and (e) laggards. He argues that Innovators are eager to try new ideas and are at the forefront of technology use (cited in Fabry & Higgs, 1997). Harris (1998b) describes Early Adopters as those who follow the Innovators and generally make successful use of technology. They often serve as role models for others. Those in the Early Majority are people who wait to see how successful the technology is before they themselves

use it. This group is deliberate and cautious in their adoption of technology. Similarly, Late Majority users wait until they are pressured into using technology or are finally persuaded of the benefits. Laggards are the last to adopt technology.

Despite the logic of stage theory, Rogers (1995) presents an overly deterministic view of technological innovation. Like most stage theories, this linear, sequential and highly individualistic model is stronger on description than on explanation (Desforges, 1995). It ignores the mechanisms of change and mounting evidence that teachers mediate the change process in neither logical nor predictable directions. Moreover, technological innovation occurs on a social plane within a learning organization (Anderson & Dexter, 2000). Thus, crude stage models of technology adoption should be treated with caution, especially those (a) described in the *Learning Technologies Planning Guide* (Ministry of Education, 1998c), (b) proposed by ERO (2000) in their evaluation of ICT in schools, and (c) operationalized by Fink-Jensen, McLennan and Dickinson (2001) in their survey of teachers' technology adoption. Arguably, these are part of a narrow managerialist discourse that looks upon teachers as technicians and uncritical servants of government policy. In Foucault's (1977; cited in Smyth & Shacklock, 1998) imagery, teachers are presented as "docile bodies" expected to accept unquestioningly the subordination of classroom practice to overarching economic goals—namely, the creation of a skilled workforce for the new Knowledge Economy. Such an instrumentalist conception of teaching is implicit in the following statement from ERO (2000) where teachers are seen as workers to be "upskilled" rather than thinking professionals capable of resisting technological innovation on valuable, well reasoned, alternative points of view:

> *The implementation of ICT in schools can be seen as a continuum, beginning with access to computers, progressing through access to the Internet and networking, upskilling teachers and students, and ending with the full integration of ICT into teaching and learning (p.22).*

Evidence that not all teachers accept the goal of curriculum integration appears in the response to the four broad schools of thought proposed by Bigum and Kenway (1998). As the follow up interview revealed, many Deschoolers held strong views about the future of learning and teaching and the need to redefine schools as we know them today. They displayed a strong propensity toward pedagogical innovation in a way that challenged the traditional framework of the curriculum. Interestingly, the Deschoolers also embraced the catechism of school reform in the guise of an economic imperative more than any other group. The vast majority of teachers identified themselves as Boosters who broadly speaking supported the ICT movement. This is hardly surprising given the teachers' innovator and earlier adopter status and the relative embryonic nature of the Internet as an educational innovation.

While the above framework helped to identify a couple of Critics, as defined by Bigum (1995), it is debatable whether this typology correctly classifies the vast majority of teachers who, arguably, would be better known as "Toolsters". That is, the large number of Boosters who had embraced the tool metaphor by conceptualizing ICT as just another resource in their professional toolbox. In this sense, the Toolster was not a technophile or true champion of ICT, but rather a group of teachers who had accepted the pedagogical rationale and/or were resigned to the inevitability of the ICT-related school reform movement. In Cuban's (1993b) terms, they were a combination of preservationists and cautious optimists who "selectively welcomed' (Dawes, 1999; cited in Mumtaz, 2000) ICT as educational innovation. It follows that a pragmatic, value-neutral, Toolster perspective stood out as the dominant response to the Internet as a social, economic and educational phenomenon.

Teacher Workload

The Internet was clearly having an impact on the nature of teachers' work. Irrespective of the lack of perceived change and the frequency of *it's just a tool* response, the increased workload associated with ICT and the introduction of the Internet, in particular, was a recurring theme. As noted previously, even the most enthusiastic teachers admitted that the emphasis on ICT had led to extra demands on their time. Consequently, they were sometimes struggling to keep on top of their work. In some instances, the additional workload required teachers to work evenings, weekends and even holiday breaks, which potentially hides the true extent of their job. How long can these teachers sustain this additional work? The concern is that increased workload may ultimately contribute to higher levels of teacher burnout.

A related theme was the increased tension reported between colleagues who were not only busy with their own work, but having to cope with the additional requirements of ICT, the Internet, and school wide networking generally. It was noteworthy that the perceived accomplished internet-using teachers reported a new kind of friction in their professional and interpersonal relationships. Teachers appeared to vent their frustration due to technical and pedagogical difficulties towards those people most closely associated with its implementation—that is, the innovators and early adopters. A number of teachers, in turn, were frustrated by their colleagues' inertia in light of the new pedagogical and technological developments. In this sense, the source of tension was a kind of "reciprocal frustration" as problems arising from the adoption and implementation of this latest educational technology wave exasperated both groups—albeit that this observation is based on an interpretation of teachers' perceptions of their colleagues' perceptions. The key point is that teachers do not just experience the Internet; they reshape and reframe it based on their beliefs and values and this affects how it is experienced by their students and colleagues.

While the gap and tension between colleagues is almost inevitable when teachers are working to implement a new technology under pressure, these are not the conditions for sustainable innovation and institutionalized school-wide change. Brown and Ralph (1992) found that poor collegial relationships, including personality differences, limited social interaction between staff groupings, and uneven distribution of workloads, were all causes of stress that led to dissatisfaction and low teacher morale. If the implementation gap continues to grow and potential hostility between colleagues is left to fester, this may develop into a deeper rift that erodes collegial relationships along with work culture. That said, it is hardly surprising that teachers perceive a gradual increase in stress and intensity of work, as their workload has steadily increased over the past decade (Harker et al., 1998). This point reminds us that ICT does not exist in a policy vacuum and it must be understood within the backdrop of social and curricula reforms over the past decade.

The lesson from a methodological point of view is that while teachers report few pedagogical changes, when probed they acknowledge important changes to their day-to-day rituals and professional routines. Thus, what teachers say is not always an accurate reflection of what teachers do. A possible explanation for the level of false consciousness is that teachers themselves may not be in the best position to judge the effect of the Internet on their pedagogy in a period of such rapid change. Arguably, they are too close to the innovation itself. Although this explanation is controversial—it questions of validity of research that limits itself to reporting teachers' perceptions—there is convincing evidence that subtle and significant changes have taken place, and continue to do so, without the participants knowledge or conscious reflection. Put another way, the teachers may have subconsciously automatized a number of pedagogical changes making it difficult to recall, let alone articulate, how the Internet has impacted upon the nature of their work. It was only after further probing that they became more aware of these subtle changes. The interview, therefore, initiated a dialogue that served to raise teachers' awareness of false consciousness, which generated, in turn, a deeper level of self-reflection with an emancipatory flavour.

In sum, the true extent of changes to teaching practice and work culture has yet to be documented sufficiently—let alone fully understood. There is a preoccupation in the literature with the proximal effects *with* technology. That is, more immediate changes to what teachers do, how well they do it, and when it is done (Salomon, 1998). While the importance of these changes should not be underestimated, more attention needs to be devoted to what Salomon (1998) describes as the "distal effects" *of* the Internet on teachers work. These are less tangible, more profound, and potentially long-range changes of a cultural, sociological, and psychological nature. Although it is too early to accurately predict these effects, the Internet is clearly having a significant effect on teachers' work. Equally, teachers themselves have affected the Internet——and they will no doubt continue to mediate the way it is institutionalized within schools and experienced by students and colleagues.

Thinking Global

A potential distal effect that stood out during Phase Two was the tendency of teachers to frame their work within the complicated cultural, economic and political movement known as globalization. The majority of the perceived accomplished internet-using teachers displayed a propensity to "think global", which set them apart from many of their colleagues. As the results show, the teachers were well-informed of international developments and they were sourcing Web-based resources and online professional materials from overseas on an increasingly regular basis. There is compelling evidence that the Internet has contributed to new-found knowledge by supporting formal and informal professional learning. At the same time, the way teachers have "read" the wealth of new electronic information has not always been of a critical nature, as evidenced by the unquestioning acceptance of professional readings on topics such as constructivism, learning styles, multiple intelligences and so forth. The advent of the Internet has expanded teachers' horizons, nevertheless, beyond the traditional local focus, as many of them now see themselves as part of a much wider national and international community.

This shift in gaze toward a global community of teachers may have far reaching implications but it has yet to translate into local action of a reconceptualist nature. On the contrary, most Internet use by teachers fits within the content metaphor. There is very little genuine participation in online communities of practice. The results suggest, therefore, that despite the language of reform and perception of global participation, an uncritical information-banking view of education is still the dominant pedagogical force shaping the use of the Internet in schools. This is evident in the way that teachers themselves have tended to borrow ideas, theories and resources from other parts of the world, and apply these, with little regard for the deeply contested educational and socio-political context in which they were developed. Instead, teachers have generally treated online professional resources as apolitical and value free, as reflected by the use of skill checklists from other countries for assessing students' ICT capabilities.

In the future, greater critique is required of the long-term effects associated with sharing and disseminating educational resources across national boundaries. Although many of the participants had welcomed this phenomenon, the availability of new resources on a global scale is not a good thing necessarily. There is a danger that these resource banks may encourage a greater recipe approach where teachers develop less original material, and make greater use of downloadable worksheets and prepackaged Webquests. Paradoxically, greater access to these global resource banks may require teachers to think less and teach more using already pre-packaged instructional materials. The concern is that powerful forces are behind efforts to redefine teachers' work and the gradual development of an international curriculum may indirectly exert greater control over what is taught in a rapidly globalizing economy

(Smyth et al., 2000). From this perspective, teachers' work is in the middle a social, economic and political maelstrom known as globalization where simultaneous processes of "global integration" and "national fragmentation" are reshaping the New Zealand educational landscape. The lesson is that a number of unanticipated distal effects on teachers' work are likely to emerge within the dramatically unfolding era of globalization.

8.5 HOW THE INTERNET SUPPORTS LEARNING AND TEACHING

This section interprets the results that relate to the research question: What perceptions do teachers have of how the Internet supports the learning and teaching process? It reflects on: (a) the perceived pedagogical value of the Internet, and (b) the active support, resigned acceptance and tacit acknowledgement of future overarching social and economic benefits associated with the ICT-related school reform movement.

Pedagogical Value

The pedagogical value that teachers place on ICT for learning and teaching goes beyond measures of access, usage, frequency and type of Internet use. After all, what teachers' use in the process of doing their work does not always match with what they value. Teachers often teach under imperfect conditions of inadequate resources and limited preparation time (Bryson & de Castell, 1998a). In the case of the Internet, teachers are also constrained by lack of access. Thus, teaching with technology is an act of compromise. Teachers have to weigh up the constraints of limited hardware and software and continually undertake a cost-benefit analysis. The need to constantly balance scarce resources against a number of competing demands explains why many teachers are likely to value the importance of the computer at higher levels than the frequency of its use.

In Phase Two, the gap between perceived value and instructional use was mainly confined to email where teachers rank this application ahead of educational games even though student use is relatively infrequent. Notably, the value teachers assign to the Web is now more closely aligned with the proportion of time devoted to this application in the classroom programme (see Figure 7.5). The obvious explanation for the closing of the "use-value" gap is that teachers are making greater use of the Web due to better levels of Internet access since Phase One.

On a comparative basis, changes in perceived value provide further evidence of the rise of the Internet at the expense of traditional software applications with one notable exception. The inclusion of multimedia presentations had the effect of dropping the Web in rank from second in Phase One to third in Phase Two. This suggests that multimedia presentations have been a major factor in the displacement of perceived value, if not use, of traditional applications and

the instructional context of multimedia in all its forms— embellished documents, linear slide shows, and hypermedia constructions—clearly requires further investigation. Likewise, a number of important questions need to be asked given the perception that the Internet's growth has been at the expense of using traditional computer applications. What are the long-term implications? What are the displacement costs associated with Internet use in schools? It is of concern that many teachers believe an emphasis on the Internet has negatively affected other educational innovations. Again, the potential distal effects of the Internet on teachers' work have yet to be fully investigated in the research literature.

There is no doubt that in teachers' minds, word processing remains the *bread and butter* of educational computing as found by Ryba and Brown (2000). However, the use of computers in the writing process is now supported by multimedia and supplemented by the Internet. In a short space of time, the Internet has established a strong foothold in the life of the classroom programme. Although Internet use is likely to continue to rise as infrastructure expands, at this stage it does not threaten the status of word processing as the most valued computer application. Although speculative, this suggests that teachers are unlikely to adopt the Internet in ways that jeopardize the place of word processing in their classroom. The lesson is that despite recent technical developments, writing and word processing still dominates computer use and thereby remains an under-researched aspect of classroom culture.

For the moment, the three aforementioned applications along with the addition of educational games appear to form the cornerstone of teachers' computer use, held together by the perception that the main pedagogical value of educational technology relates to higher levels of student motivation. Above all else, teachers perceive that the Internet has generated a new level of excitement for the learning process rather than directly contributed to new knowledge or higher levels of student achievement. This finding contrasts with the results from SITES where principals list motivation as the second most significant gain for students behind improved skill/knowledge (Pelgrum & Anderson, 2001). Of course, a strong emphasis on the development of students' technical skills may have influenced the principals' response.

Besides motivation, the perceived accomplished internet-using teachers reported that the most valuable use of email and the Web is the ability to access up-to-date information on a current topic. Not surprisingly, what they value closely matches what most teachers are familiar with in their own personal and professional Internet use. Outside of the classroom, few teachers use the Internet to establish new professional relationships, which explains, in part, why connecting with an expert and membership of an online community are not highly valued. The implication is that teachers need to engage in these activities for themselves before they utilize a wider range of internet-related learning activities with their students. On the other hand, it is probably no coincidence that the most valued activities are those requiring the least

disruption to the regular classroom programme. Therefore, greater personal experience may not automatically lead to more diverse and frequent Internet use as a number of other factors come into play.

While teachers ranked the development of thinking and problem solving skills as having the most educational significance, more than any other factor, when probed, few participants were able to identify specific cognitive benefits associated with Internet use. Instead, the novelty of the Internet itself and the products that students had so far produced were thought to have created a great deal of enthusiasm, which was conducive to higher levels of social interaction and student-teacher collaboration. On the whole, teachers tended to identify affective and instructional benefits or the development of ICT skills rather than specific cognitive advantages linked to the Internet. The inability of teachers to articulate specific cognitive benefits gives further weight to ERO's (2000) conclusion that:

> *In many schools ICT is not well integrated into the curriculum, and there are few demonstrable ways in which it has improved teaching and learning (other than in ways related to the use of the technology itself) (p.22).*

This conclusion is consistent with the situation in the UK where The Office for Standards in Education (OFSTED) (2001) reported that 'good practice remains uncommon' (p.3.). Although ERO (2001) provided a more positive report on the level of curriculum integration in their follow up study, in their own words the findings must be interpreted with caution, as there was considerable variation between schools and they are based solely on Review Officers judgements. Accordingly, ERO (2001) point out that:

> *Many schools did not have information on the use of ICT in specific curriculum areas and were unable to show evidence to support their statements about the integration of ICT into the curriculum (p.10).*

The lack of evidence is consistent with the finding in Phase Two that few teachers perceive they have been successful at integrating the Internet into the curriculum. It follows that a minority of teachers report the Internet is making major improvements to the quality of curriculum delivery. The lack of perceived improvement is of potential concern especially when combined with the finding that less than 50% of principals believe ICT has resulted in improved curriculum quality within their school (Fink-Jensen, McLennan & Dickinson, 2001). This finding requires further monitoring in light of the claim that one of the biggest motivating factors for teachers in sustaining an educational change is the belief that the effort they are making will help them to become better teachers (Kennewell, Parkinson & Tanner, 2000).

An emphasis on learning to use the technology itself rather than enhancing the curriculum *per se* is consistent with the high proportion of teachers who continue to value the "development of basic skills and computer literacy", along with "skills for future employment and meeting parental expectations". Of course, schools are subject to many external pressures and given the high status of ICT in society, the vocational rationale remains predictably a strong factor in technology adoption even within a sample of perceived accomplished internet-using teachers. Then again, the follow up interview revealed that the vocational rationale is only one of a number of competing and coexistent discourses—that is, languages of persuasion—shaping teachers' thinking about the potential of the Internet in education. The vocational and pedagogical rationales appear to be deeply intertwined with the perceived social and economic benefits of the ICT-related school reform movement, which is inextricably linked to new conceptions of the connected society.

Future Social and Economic Benefits

The different positions and perspectives reflected within the sample share a common interest in the future. It was through this mutual interest that teachers began to reveal a number of assumptions and deeply seated beliefs about the social and economic benefits related to Internet use in education. There was a widespread perception that the Internet's real contribution to education was preparing students for life in a rapidly changing world. This view was common amongst men and younger teachers, many of whom classified themselves as Deschoolers. From this perspective, the curriculum was perceived to be obsolete and schools had become increasingly removed from the real-world. On the surface, the deschooling perspective suggests a commitment to a new type of education system which is more responsive to the changes that are taking place in society. However, Burbules and Torres (2000) point out that the deschooling movement is consistent with neo-liberal policies of increasing school choice and privatization where the state has withdrawn from its responsibility to promote social justice. In this sense, the orientation towards deschooling may be part of a deeper ideological discourse linked to the forces of globalization and the dominance of a new world order.

At this point, the term globalization and the principles of neo-liberalism associated with the so-called new world order require further explanation. Put simply, globalization refers to a complicated set of factors that signify the diminishing of economic boundaries and the simultaneous increase in international exchange and transnational interactions where individuals and nation-states experience greater cultural, economic and political interdependence (Gough, 1999; McChesney, 1998; Wells et al., 1998). As Hurrell and Woods claim, this interdependence leads, ultimately, to:

> *... global enmeshment, as money, people, images, values, and ideas flow ever more swiftly and smoothly across national boundaries (cited in Wells et al., 1998, p.323).*

Despite conflicting interpretations of how global enmeshment is shaping and constraining the world, the salient point is that media and new ICTs are central to, and an important byproduct of, the emergence of globalization. From this perspective, technology is an important enabler of social and economic wellbeing (Ministry of Commerce, 1999b). The Internet, therefore, must be understood in a wider social practice that goes hand-in-hand with global economic restructuring and the pursuit of neo-liberal policies.

In the face of these global forces, there was a sense of inevitably amongst the sample that New Zealand has no option but to invest in ICT if we are to participate, keep ahead and remain competitive with our trading partners. Whereas the Boosters unashamedly espoused the social, cultural and economic advantages of embracing new technologies in the era of globalization, the majority of teachers, arguably Toolsters, were less forthcoming. Overall, they tended to prefer the comfort of the pedagogical rationale and were generally suspicious of the commercial interests associated with ICT in education. However, when probed, even the Toolsters acknowledged that internet skills would be required for good jobs. Moreover, they did not dismiss the importance of ICT to the future success of New Zealand's so-called Knowledge Economy. Thus, by their silence, with one or two notable exceptions, the perceived accomplished internet-using teachers essentially gave passive support to ICT as the solution to many social, economic and educational problems. In light of this, arguably, the catechisms of metacognition, constructivism, learning styles, multiple intelligences, information literacy, life-long learning, and so forth, under the umbrella of the pedagogical rationale, are enmeshed within neo-liberalism and the overarching social and economic agenda of globalization.

The lesson is that the pedagogical rationale cannot be removed from the political economy of the Internet. A good example of this is the way in which almost without exception teachers viewed technology as progress. Besides the computer as tool, this was the dominant metaphor for the Internet. Across the sample there was a mix of active support, resigned acceptance and tacit acknowledgment of the Internet as the next giant step forward in technology, thereby heralding a whole new era in business, education and global relations—a new epoch in human civilization. Only a handful of teachers conveyed a truly critical appreciation of the wider social practice of technology. Instead, most teachers were still grapping to fully conceptualize the potential of the Internet drawing on a number of competing and coexisting rationales simultaneously.

At a meta level, the overriding impression was that the Internet is a modern version of the printing press, which like it or not will inevitably have a profound impact on all aspects of society. The only point of difference in the sample was whether the Internet itself will cause dramatic changes to society or whether the scale of change was dependent upon how people end up using the technology. The latter stance was consistent with the adoption of a Toolster perspective. Broadly speaking, the sample was polarised towards a social/cultural deterministic or technological deterministic perspective of the relationship between technology and society. The tool and technology as progress metaphors arguably concealed and paradoxically unified two dialectically competing orientations towards the Internet as a social, economic and educational phenomenon.

8.6 FACTORS THAT INHIBIT / ENABLE INTERNET USE

This section interprets the results that relate to the research question: What factors do teachers believe inhibit and/or enable the use of the Internet for learning and teaching? In keeping with Phase One, greater emphasis is placed on obstacles rather than enablers of technology adoption by consideration of: (a) external barriers, (b) internal barriers, and (c) meta-barriers, including cultural, historical and political factors working against the effective pedagogical use of the Internet.

External Barriers

The focus to begin with is the barriers to Internet use from external sources consistent with the distinction adopted in Phase One. There is an initial reflection on the cost of equipment, lack of resources, inadequate infrastructure, and so forth, drawing on the work of Rogers (2000) who coincidently makes a similar distinction between internal and external obstacles to successful technology adoption. In her recent work, Rogers (2000) defines the main external barriers as:

> *The availability and accessibility of necessary hardware and software, the presence of technical personnel and institutional support, and a program for staff development and skill building (p.459).*

In addition, Rogers (2000) points out that there are a number of "cross" internal and external sources of barriers, including lack of time and funding, and institutional culture. The assumption is that the aforementioned barriers operate at a number of levels. Therefore, the distinction between the two main types of barriers is slightly more fluid than originally presented in Phase One. According to Rogers (2000), external barriers can be categorized under three general headings: (a) availability and accessibility, (b) technical and institutional support, and (c) stakeholder development.

The availability and accessibility category includes limited or poor access 'to useful, relevant, and appropriate hardware and software' (Rogers, 2000, p.459). Teachers have consistently reported this category of barrier in the study of technology adoption (e.g., Brown, 1995b; Ely, 1999; Fabry & Higgs, 1997; Mumtaz, 2000). Thus, not surprisingly, the perceived accomplished internet-using teachers ranked highly both cost and availability of equipment as the main barrier. The response is consistent with the results from SITES where at the primary level both New Zealand principals and technical respondents—that is, technology co-ordinators—reported that an insufficient number of computers was the major obstacle in realizing the school's ICT-related objectives (Pelgrum & Anderson, 2001). In SITES, the technology co-ordinators also ranked the lack of enough computers with simultaneous access to the Internet as a major barrier, along with insufficient peripherals and outdated school networks. Across all countries, Pelgrum (2001) reports that the three main obstacles affecting the use of ICT in schools were (a) insufficient numbers of computers, (b) teachers' lack of skill/knowledge, and (c) the difficulty of integrating into instruction.

Although Rogers (2000) groups technical and institutional support as another important barrier, few of the perceived accomplished internet-using teachers identified cost and availability of technical assistance as a major obstacle. Yet, ERO (2001) reports a substantial increase since 1999/2000 in the percentage of schools who lack technical expertise. They suggest that the advent of networking has placed greater demands on the technical expertise within schools. This might explain why the New Zealand technology co-ordinators ranked lack of technical assistance as the third major barrier to ICT integration in SITES (Pelgrum & Anderson, 2001). It was also one of the top ten barriers overall from the list of 38 obstacles identified across participating countries (Pelgrum, 2001).

Despite considerable variation between countries, lack of institutional support was not highly ranked as a major obstacle in the aggregated list of responses (Pelgrum & Anderson, 2001). Although in Phase Two the level of institutional support was not provided as an explicit option as a potential barrier, a previous question showed that most teachers felt reasonably well supported by their board and senior management. This response is consistent with the results from ITAG (1998b) and SITES where less than three percent of New Zealand principals identified lack of support and understanding of school board as an obstacle to realizing ICT-related objectives. Thus, predictably ERO (2001) does not identify lack of leadership as a major barrier to successful ICT use in schools. Then again, boards, principals and senior management are unlikely to raise this problem with Review Officers as it may reflect poorly on the quality of their own governance.

In a similar vein, the support of the principal and Board of Trustees is not the same as adopting the Internet in a culture of distributed leadership where technological innovations are systematically planned and strategically implemented within the concept of a learning organization (Fullan, 1992). There is little or no evidence from the data collected so far of a school-wide approach to pedagogical innovation where ICT has been woven into the fabric of the curriculum following a democratic process of change. Instead, the impression is of a thinly spread leadership structure with a handful of leaders only whom other teachers are expected to follow. This observation, admittedly, is highly speculative and no doubt influenced by the research methodology with its focus on individual teachers' experiences, perceptions and practices. The key point, nevertheless, is that even the most inspiring ICT-using teacher will struggle to engender team spirit and a sense of ownership of decisions made unless they are part of a culture empowering others for the development of the organization (Kennewell, Parkinson & Tanner, 2000).

Beyond their own institution, teachers were critical of the lack of leadership of central government. A number of teachers were critical of the "lead school" concept because of the perceived elitism and competitive nature of the initiative. At the national level, other teachers complained about the lack of explicit assessment guidelines in the ICT area. Few teachers perceived that *Interactive Education* (Ministry of Education, 1998a), the national ICT Strategy, has been effective in overcoming problems of access and infrastructure. Interestingly, the development of Te Kete Ipurangi (TKI) was perceived to have had little positive impact on teaching practice. Indeed, some teachers were extremely uncomplimentary towards this Web-based resource. While TKI and the other strategy initiatives are relatively new, it was interesting to learn that ICT was perceived to have a relatively low status amongst the general population of teachers. Then again, few teachers outside of those with reputations as users of new educational technologies were consulted in the development of the original ICT Strategy. And, of course, *Interactive Education* has no official status in the context of the *New Zealand Curriculum Framework* (Ministry of Education, 1993a).

Apart from the high profile of ICT in the Education Gazette, and commercial advertising targeted at schools (Dawes & Selwyn, 1999), there is no reason to expect teachers to be familiar with the goals of the Strategy—at either a policy or implementation level. After all, there was little opportunity for teachers to comment on the original ICT Strategy. If the perceived accomplished internet-using teachers are right, that their colleagues' priorities reside elsewhere, then despite greater consultation, the draft revised ICT Strategy (Ministry of Education, 2001b) may be another example of a top down policy initiative removed from the realities of the chalk-face. There still appears to be a need to listen to the day-to-day concerns of regular teachers. As Schwahn and Spady (1998) state:

Values, missions, outcomes, and visions have the shelf life of a ripe banana: They must immediately become part of all significant decisions and actions, or you can forget it (p.45).

Based on what the teachers *have to say*, the ICT Strategy has failed to permeate to the level of the decisions teachers make on a daily basis. So, there is a danger of confusing policy talk, with policy action and policy implementation (Tyack & Cuban, 1995). On the other hand, lack of teacher interest did not rank highly as a major barrier despite limited perceived collegial support; nor do New Zealand principals in SITES identify it as an important obstacle to ICT-related curriculum innovation (Pelgrum & Anderson, 2001). Consequently, this suggests that teachers are not disinterested in ICT but rather they may be busy with other issues and have different priorities in terms of their students' education. Although speculative, a lack of time combined with the demands of implementing a host of other curriculum reforms may have led to a culture of half-hearted compliance rather than genuine commitment. If this is the case, there are clear implications for the life of the ICT Strategy and the need for teachers to be more involved in future changes to learning, teaching and school administration resulting from new developments in educational technology.

Using Rogers' (2000) framework, the failure of the ICT Strategy to become a living document within the hearts and minds of the teaching profession could be interpreted as lack of stakeholder development. This last category of external barriers involves building leadership capacity and appropriate levels of professional development to support teachers' technology adoption. While professional development was not singled-out as an explicit barrier amongst the list of options, it was clearly a matter of concern to the perceived accomplished internet-using teachers. Not surprisingly, principals share this concern as they reported in SITES that lack of suitable training opportunities and lack of teachers' skill/knowledge are important barriers (Pelgrum, 2001). Similarly, technology co-ordinators perceived that the quality of teacher training is still too low (Pelgrum & Anderson, 2001). ERO (2001) adds its weight to concern over the lack of professional development by claiming that teachers' skills and confidence are major barriers. This claim is corroborated by the barriers reported to the Ministry of Education in applications for ICT professional development funding (Murray & Campbell, 2000). Despite the consensus on the need for more teacher education, Fink-Jensen, McLennan and Dickinson (2001) report that spending on professional development in New Zealand schools accounts for less than 10% of schools' ICT expenditure.

Following on from this, even if additional money was available there is the question of what type and/or method of professional development is desirable. The answer to this question remains unresolved in the academic literature. Although the majority of the perceived

accomplished internet-using teachers favour the development of ICT skills in the regular workplace, not everyone agrees with such an instrumentalist approach. More professional development is not necessarily better (Lai, 1999). As one astute teacher points out, this approach fails to empower people with strategic knowledge of the bigger picture. Accordingly, the identification of teacher skill/knowledge as an important external barrier tells only part of the story. What is missing from traditional research generating ranked lists of major obstacles to ICT use in schools, is what availability and accessibility, technical and institutional support, and lack of stakeholder development actually means from an insiders' perspective. Without an understanding of teachers' idiosyncratic interpretation of these barriers, the external factors that constrain ICT integration—beyond what is currently possible—have little explanatory value.

At a deeper level, these obstacles potentially overstate the degree to which a set of external barriers shape and mold teachers' work. An overemphasis on external barriers conveys the impression of teachers enslaved by the conditions they face and thereby limits and underestimates what is possible. Arguably, if external barriers become the focus of attention they close down other options and deflect attention away from critical debate of the reasons driving the innovation in the first place. In this sense, the barriers conceal a number of social, economic and political assumptions that conspire to limit the choices available. The danger is that elimination of external barriers is used to justify further investment in educational technology as natural, normal, and inevitable. There is a tendency to believe that current efforts to overcome the major external barriers are an investment on teachers' behalf, when they themselves may not perceive these as significant obstacles to their work.

Internal Barriers

Attention now shifts to internal barriers that come into play during the adoption of new teaching methods and technologies. Remember, internal barriers are the conflicts and tensions that are intrinsic to teachers and the places they work (Ertmer et al., 1999). This perspective recognizes that schools are complex and diverse workplaces in which teachers carry out a wide range of tasks often with limited resources, all the while successfully contending with the demands and expectations of several types of interest groups (Bryson & De Castell, 1998a). The above definition well goes beyond Rogers (2000) conception of internal barriers as merely teachers' attitudes or perceptions of educational technology and their individual competency levels. It encompasses the human side of change (Evans, 1996) along with the micro politics of schools, drawing on a wider ecological perspective. From this viewpoint, the internal barriers include emotional, psychological and socio-political factors that shape and influence teachers' beliefs about teaching, beliefs about technology, established classroom practices, institutionalized routines, social and interpersonal relationships, and ability and willingness to change.

The nature of change is very deep. It creates doubt about our purposes, sense of identity, and self-concept, which explains teachers' unpredictable and idiosyncratic response to technology adoption. The change process strikes at the core of who individuals are and what they know including their values and beliefs (Fullan, 2001a). It follows that when considering internal barriers 'emotions cannot be separated from reason, nor can judgment be set aside from feelings' (Hargreaves, 1997 p. 15). Consequently, teachers develop their own individual narratives of an educational innovation, which vary and change direction depending on the circumstances. The crucial difference at a paradigmatic level from major surveys of external barriers to ICT implementation is that:

> *Teachers are never dupes, never simply the passive puppets that structural models would have us believe (Apple & Jungck, 1998, p.154).*

In the past, where initiatives in educational technology have fallen over, they have generally done so because the proponents of the innovation have failed to win over the hearts and minds of the regular classroom teacher (Proctor, 1987; cited in Kennewell, Parkinson & Tanner, 2000, p.34). Despite this, researchers have generally failed to listen to and learn from teachers' individual narratives. Arguably, little progress will occur until there is understanding of the sources of resistance from an insiders' point of view and recognition that teachers must see some benefit in it for themselves and their students. In recent years there has been more of an understanding of some of the factors which have contributed to ICT use by teachers including: making lessons more interesting, easier, more fun for them and their students, more diverse, more motivating and more enjoyable (Cox, Preston & Cox, 1999). There remain, however, considerable gaps in our knowledge of the intrinsic reasons why so many teachers appear to resist the ICT-related school reform movement.

The lesson from history is that the personal costs of trying innovations are often high and seldom is there any indication the technology is worth the investment (House, 1974 cited in Fullan & Stiegelbauer, 1991, p.34). Too often technological innovations are acts of faith requiring people to invest time and energy without the hope of an immediate return, as illustrated by the statement in Chapter One from the Stevenson Report (Stevenson, 1997). There is rarely any guarantee that the personal cost and investment will ultimately bear fruit. According to Harvey and Purnell this leads to the "17% problem"—that is:

> *The technicians and visionaries who make up 17 percent of the population "see" a potential for technology and begin using it. But the majority are not interested until they see some practical benefits (cited in Rogers, 2000, p.459).*

Although this explanation is a little too simplistic, it partly explains why lack of teacher understanding about the educational value of the Internet was a recurring theme during the follow up interview. Remember, teachers reported that many people have been left behind by the deepening chasm between the world of the traditional classroom and the real world of the twenty-first century. As far as many of the perceived accomplished internet-using teachers were concerned, a major internal barrier to ICT-related curriculum innovation was the reluctance of their colleagues to embrace change and prepare students for a very different kind of the future. The challenge for some of the "high flyers" was to convince their colleagues of the benefits of ICT-related school reform. Then again, this is contrary to a democratic model of educational change and ignores the underlying tension between further investment in ICT over and above other innovations and curriculum resources. It makes light of a much deeper conflict between teachers in terms of the fundamental goals of the curriculum. In this regard, it needs to be kept in mind that doing nothing is a form of action itself (Apple & Jungck, 1998). Teachers' inaction may be a conscious decision after thoughtful reasoning, rather than an irrational self-protective strategy aimed at preserving the status quo in the face of the threat of rapid social and technological change.

The key point is that the way individual teachers "read" an innovation and the level of involvement they have in shaping its direction can amplify or reduce the significance of particular barriers. In other words, teachers' actions, beliefs and relationships have a crucial role in mediating the extent to which external barriers actually inhibit and constrain their teaching practice. The best example of this is how teachers with different goals interpreted lack of access and insufficient time as either minor or major barriers to what they wanted to achieve with the Internet in their classroom programme. For those teachers who wished to use the Internet in the manner envisioned by its ardent proponents following the principles of active and meaningful learning, a number of external barriers severely constrained their ability to translate theory into practice. These barriers created a lot more work for teachers, limited what students could feasibly do and introduced another layer to the challenge of classroom management. In the face of these barriers, the goal of curriculum integration was much harder than currently envisaged in the professional literature.

In contrast, lack of access was a minor barrier to teachers who had little or no intention of using the Web with students due to concerns over Internet safety—both public and private. Notably, these teachers were influenced not only by their own ethical convictions but also by the wider moral panic concerning inappropriate Internet access. Similarly, lack of time for ICT-related innovation was less of a concern to teachers who perceived the Internet was too closely associated with popular forms of entertainment. Put bluntly, the Internet was tainted by a deep-seated belief that watching television and playing video games had little or no educational value. The failure of educational technology to live up to expectations was yet

another historical suspicion that influenced the way teachers read the Internet. Arguably, it was partly responsible for a culture of resistance, which remains in teachers' collective psyche from one generation to the next. Suffice to say the overselling of the Internet evoked a cautious response from many teachers and was counter-productive to its wider adoption by the teaching profession.

The salient lesson to emerge from these lesser-known intrinsic barriers is that resistance to innovation is almost inevitable. In the past, rational models of change that emphasize external barriers have underestimated the level of resistance or treated it as a problem. It is known that conflict and disagreement are not only inevitable but also fundamental to successful planned change (Fullan, 1993b). Accordingly, teachers must be given the opportunity to debate the merits of a new educational technology before it is thrust upon schools. Otherwise, the tendency is for teachers to assimilate anything new and threatening in a manner that causes the least disturbance (Cuban, 2001). If resistance is not treated with respect, then teacher communities can easily turn into incestuous and protectionist ones (Hargreaves, 1997). Cuban (cited in O'Neil, 2000) argues that the structure and organization of the teaching profession breeds conservative practice. While teachers themselves are not necessarily conservative, they '... exist in schools, in communities of practice and organizations that consciously and unconsciously support and resist innovation' (Stratford, 2000, p.11). To harness this resistance, there is a need to ask: What are the obstacles that critics and resisters of ICT-related innovation see as preventing the introduction of a more reconceptualist curriculum? The response to this question might uncover some of the real barriers that educational policy-makers need to address to truly transform schools for the better.

In sum, it is impossible to separate external barriers from internal barriers. Quite simply, greater Internet access, infrastructure and teacher release time does not overcome the deeply rooted internal barriers identified in Phase Two. The lesson from the way the participants mediate change through their own subjective realities is that perceived accomplished internet-using teachers are neither all the same, nor all different. While they share a common thread, there is a rich tapestry of colors and textures in the way teachers have responded to the Internet. It is useful to think of teachers as having constructed their individual narratives in a number of concentric circles—with the innermost one the self and their classroom and the outermost one the wider school community—all of which interact with each other. In this sense, life is a hermeneutic construction where teachers constantly re-create their own narratives (Syrjala & Estola, 1999). This conception of teachers' lives neatly fuses with Fullan's (2001a) multi-dimensional definition of educational change where the change process varies within the same person as well as within groups. It consists of a dynamic, interlocking and none-too-clear relationship between one's sense of self, occupational identity, social and interpersonal relationships, institutional culture and so forth.

Meta Barriers

An interpretation of the obstacles to Internet use would not be complete without consideration of a third type of barrier. These are meta-barriers of a cultural, historical and political nature, which conspire against teachers' use of the Internet in a reconceptualist manner. As first posited in Chapter Six, this group of barriers acknowledges that teachers' work is enmeshed in a much wider social practice. Meta-barriers to Internet adoption go well beyond the constraints of infrastructure and restriction of individual pedagogical beliefs assumed by Ely (1999). They involve powerful social, economic and ideological forces that have become increasingly pervasive throughout Western society including most education systems. Arguably, the education system itself is one of the leading sources of barriers to the creative integration of the Internet on a wider scale in the way envisaged by contemporary educational theory.

In the last decade the New Zealand education system has been devolved to encourage local governance, greater community participation, and increased competition and diversity between schools. This devolution movement began with the reforms of *Tomorrow's Schools* following the free market principles of neo-liberalism. On the surface, the market model has increased the potential for school-based innovation by promoting an "enterprise culture" (Symth, 2001). That is, an environment where there is a liberating language of greater teacher autonomy and where students are encouraged to collaborate and produce meaningful work (Smyth et al., 2000). Amidst this environment, education has become a valuable commodity and the nature of the curriculum has been gradually vocationalized as commercial interests have infected schools. The results suggest that most teachers have not been immune to these changes. Yet, under the same market reforms, teachers are more accountable than ever, as schools are expected to deliver on promises of quality and excellence. Arguably, teachers have become "unequal partners" in an environment of "indirect rule" (Ozga, 1986; cited in Smyth et al., 2000). There is danger of a new framework of centralised surveillance (Delbridge et al., 1992; cited in Smyth et al., 2000), which is counter-productive to pedagogical innovation of a reconceptualist nature. While it is important to acknowledge that some schools may have flourished in this environment (e.g., ICT Lead Schools), the market may be delivering an education system where the state has withdrawn from its responsibility to create a fair, socially just, and egalitarian society.

At a policy level, for example, there has been little or no effort by central government to better understand, let alone address, the deeply race and gendered biased nature of the IT industry, and the potentially differentiated pattern of computer and Internet use in the teaching profession. Historically men have dominated the IT sector and many women, arguably, continue to be "hosts" in a male enterprise (Elkjaer, 1992). Although there is a danger of exaggerating the problem, the known inequities in the IT industry along the lines of race and

gender flag some important meta-barriers to the Internet's wider adoption (Volman & Eck van, 2001). After all, these inequities go beyond the area of technology and appear throughout New Zealand society. The so-called digital divide is nothing new; it even exists within the teaching profession, as revealed in Phase Two. While teachers may not be fully aware of these inequities, there is evidence in the literature to suggest that some women perceive males deliberately withhold technological expertise as a way of maintaining their privileged status. As one teacher reports:

> *It's almost like we're being controlled in how much we can learn about technology, because if teachers know too much, that would muddy the waters about who is the computer expert in the school (Bryson & De Castell, 1998a, p.558).*

In another study, Cox, Preston and Cox (1999) report from a sample skewed toward men that a high proportion of teachers believe using IT enhances their career prospects. Indeed, less than 10% of the teachers disagreed with the relevant statement. Similarly, most teachers reported that computers give them more power and prestige in their school, which is an issue first raised in the New Zealand context by Web Research (2000). While Cox, Preston and Cox (1999) offer insight into a number of additional internal barriers (and notably enablers of technology adoption), they also remind of the way in which technology is revered in society. Of course, the status of technology is part of a wider social practice that strikes at the core of Western life (Bowers, 2000). This point recalls attention to capitalism, the rise of globalization and so forth, and shows that an important meta-barrier is the response to technology from people and groups who have a deep philosophical objection to current social, cultural and economic reforms.

In conclusion, the ICT movement evokes a deep response. Arguably, the most significant outcome of the research is the emergence of a small group of experienced internet-using teachers who possess a critical, non-neutral and socially responsible view of technology. They are not technophobes or technophiles; rather teachers driven by the need to prepare good citizens as opposed to good workers. The research shows that early adopters and those teachers committed to pedagogical innovation possess a myriad of experiences, perceptions and beliefs that shape their use of educational technology. At an individual level, the study has revealed the existence of competing and coexisting worldviews that are a microcosm of a wider debate over the relationship between technology and society. The nature of this relationship is more complex than previously described and it is overly simplistic to envisage technology as either hero or villain. An understanding of the barriers to, and enablers of, Internet adoption in schools must be framed within a more sophisticated socio-cultural discussion (De Vaney, 1998). There are multiple layers to how teachers have read and responded to the Internet as a social, economic and educational phenomenon.

8.7 SYNTHESIS OF EMERGENT THEMES

This section provides a synthesis of the emergent themes from the second phase of the research. It reports the key findings to emerge from an analysis and interpretation of questionnaire and interview data in accordance with the main research questions. Although many points and issues are worthy of further consideration, the major research findings are synthesized in the following emergent themes:

1. Many responses continue to follow a differential gender pattern. The sample is skewed toward a group of older, veteran, male teachers with better access and personal Internet experience. There is some evidence that the experience "gap" between men and women has closed over time but this needs to be viewed in the context of deeper structural gender differences within the teaching profession.

2. While potential gender differences require further investigation in future national surveys of ICT use in schools, a number of mutually nested covariates are likely to influence internet-using teachers' experiences, perceptions and practices. Gender alone is not the determinant factor as age, teaching level, professional experience and so forth were also important variables in shaping teachers' responses.

3. The perceived accomplished internet-using teachers were avid consumers of professional literature from a variety of print and electronic sources. All teachers were using the Internet in some professional capacity on an increasingly regular basis, and collectively they displayed a strong desire to keep abreast of contemporary educational developments. It follows that there was a strong international influence shaping and informing their professional knowledge.

4. Without exception, teachers maintain a professional orientation to their work. They were orientated towards leadership tasks and most teachers engaged in sustained professional support of their colleagues. There were no "private practice" teachers. The perceived accomplished internet-using teachers represented a group of dedicated professionals many of whom were centrally involved in the day-to-day management of ICT in their schools. Some teachers also participated in leadership activities beyond their own school.

5. A number of teachers found it difficult to juggle the demands placed on them due to the rapid growth of ICT in schools. The position of ICT Co-ordinator was perceived to be a demanding and sometimes thankless job. It was often at the centre of considerable friction and frustration between colleagues. Many teachers admitted that they were overworked and feeling the strain of leading change during a period of such rapid technological innovation.

6. The Internet is most prevalent at the senior school level. Data follows international trends with Internet access more common as students progress through the school system. The level of Internet access and to some degree frequency of use has improved at each sub level since Phase One. While classroom use is becoming more commonplace, the Internet generally remains the domain of teachers working with senior students in dedicated labs and technology-rich settings. The rise of labs and computer suites was a standout feature of the schools and teachers involved in the research.

7. To date, the Internet is not dominating the classroom use of computers. Comparatively few students at all levels use email or the Web at school on a frequent basis. That said, students have better access and are making more frequent use of the Internet than in Phase One. There remains, however, a lack of depth and diversity in student Internet use. Despite the relatively superficial adoption of the Internet, the growth of computer labs, networking and multimedia is gradually displacing a number of more traditional software applications, which have historically been commonplace in computer-related curriculum activities.

8. Across the board, word processing was the most frequently used and highly valued computer application by teachers. Although teachers made comparatively limited use of the email and the Web with students, they placed a high value on the Internet. Generally, the perceived value still outstrips the level of access, usage and frequency of use by students. This suggests that as teachers acquire greater Internet access they are likely to more frequently use it in their classroom programme. However, there is no guarantee that overall students will be more frequently using ICT in the learning process. The Internet may simply displace previously used computer applications and there is evidence that new labs have lead to ICT being separated from the curriculum as a standalone subject.

9. Most teachers have assimilated the Internet within their teaching based on its potential as an information resource rather than a vehicle for self-expression and building new relationships with people. However, there is no single approach to Internet use. The use of the Internet in schools as an innovation has evoked a diverse range of pedagogical responses, which reflect a complex interplay of factors, including: level of access, conditions of use, technical know-how, pedagogical beliefs, pre-existing methods of teaching, collegial relationships and school culture. It follows that teacher experiences, perceptions and practices must always be interpreted in the wider ecological context of their work.

10. Teacher beliefs cannot be classified along a pedagogical continuum from manager of instruction to facilitator of learning. The relationship between teacher beliefs and the way these are lived-out in classroom practice is highly fluid and far more complex than previously acknowledged in the professional literature. Clearly, instructional context and school culture play a key role in mediating a teacher's specific pedagogical approach. The crude distinction between learner-centred and teacher-centred teaching perpetuates a false dichotomy and ignores the ethical, moral and political dimensions of good pedagogy.

11. Teachers possess divergent views of what constitutes accomplished teaching practice. On the whole, two competing conceptions of accomplishment stood out, which loosely follow the distinction between teaching as a practical craft as distinct from teaching as a learned profession. There was a degree of consensus over the relative unimportance of computer and internet skills although few teachers highly valued an understanding of the wider socio-political context of education. Thus, only a handful of teachers shared a truly strategic view of the Internet anchored by a strong sense of social justice.

12. Although teachers were generally confident and enthusiastic toward the Internet, to date it had not had a major impact on their pedagogical approach; nor had the Internet with the exception of less experienced younger teachers greatly changed their teaching philosophy or repertoire of instructional strategies. However, attempts to determine the level of change based on key indicators of instruction are problematic without comparative baseline information. The lack of self-reported change may be an outcome of teachers already making extensive use of groups, interdisciplinary content, project-based work and so forth.

13. There is little or no support for the so-called stages of technology adoption. Indeed, the adoption process is far more complex, reflexive and idiosyncratic than currently envisaged in the professional literature. Teachers are not docile bodies following one another in logical and predictable directions. The gestation period of professional growth is unique to each individual and teachers mediate the Internet as an educational innovation in different ways based on their own worldviews. That said, the largest group of teachers can be described as pragmatic, value-neutral "Toolsters" who have simply added the Internet to their professional toolbox with the least disturbance.

14. The Internet is clearly having an impact on teachers' work despite their perceptions of limited pedagogical change. The level of teacher workload was a recurring theme and the lack of perceived support and growing tension between colleagues is another noticeable upshot of the current emphasis on ICT in schools. This suggests that teachers suffer from a degree of false consciousness in terms of the Internet's effect on their work. It is important to remember that ICT has not occurred in a policy vacuum and the distal effects of the Internet must be located within the context of wider curricula and workplace reforms of the past decade.

15. Teachers have framed their work within the backdrop of globalization. It follows that teachers are thinking more globally. The advent of the Internet has expanded teachers' horizons beyond their traditional gaze but there has been little or no local action of a reconceptualist nature. Despite the language of reform, an uncritical information banking view of education is the dominant force shaping the use of the Internet in schools. In the context of globalization, teachers' work is in the middle a social, economic and political maelstrom where simultaneous processes of "global integration" and "national fragmentation" are reshaping the educational landscape.

16. Above all else, the motivational potential of educational technology was identified as the main pedagogical value of the Internet. Few teachers were able to identify specific cognitive benefits associated with Internet use. It follows that a high proportion of teachers perceived that the Internet has yet to lead to major improvements to the quality of curriculum delivery. Thus, even in a purposive sample of early technology adopters and highly committed teachers, the level of success at integrating the Internet within the curriculum continues to be poor.

17. The vocational rationale remains at the forefront of the mix of factors influencing teachers' technology adoption. However, the pedagogical and vocational rationales are deeply intertwined with the perceived social and economic benefits of the ICT-related school reform movement. With few exceptions, the teachers displayed either zealous enthusiasm or passive acceptance of the need to invest in ICT to better prepare students for the future. They also accepted or promoted the view that New Zealand must invest in ICT to remain competitive in the global economy. Consequently, "technology as progress" was the dominant metaphor.

18. The catechisms of recent developments in cognitive theory cannot be separated from the political economy of the Internet. A number of competing and coexisting discourses are simultaneously influencing the way teachers have read and responded to the Internet as a social, economic and educational phenomenon. The socio-cognitive language of the ICT-related school reform movement is enmeshed within, and infected by, a powerful ideological discourse linked to the imperative for global economic restructuring and the dominance of a new world order. In short, the Internet inhabits the terrain of neo-liberalism and globalization, which compete against the role of schools promoting the goals of learning, equality, fairness and social justice.

19. The use of ICT is perceived to have a low status amongst the wider population of teachers. Outside of early adopters and those people already committed to technological innovation, few teachers are believed to highly prioritize ICT in comparison to their other curriculum and professional interests. While the bulk of the teaching profession is not necessarily opposed to the use of new educational technologies, there is a perception that the ICT Strategy has failed to win teachers hearts and minds. There is a perceived lack of ownership of recent policy initiatives and the overriding impression is that ICT is being implemented by a thinly spread leadership structure. From what teachers have to say, there is little or no evidence of ICT having been woven into the curriculum following a democratic process of change.

20. A deeper level of analysis of the traditional barriers to technology adoption is required. The barriers are neither all the same, nor all different. Teachers do not just experience the Internet; they reshape and reframe it

based on deep-seated beliefs and this affects how it is experienced by their students and colleagues. There is a need to look beyond traditional categories of the external barriers, such as access, infrastructure and stakeholder development. Teachers construct their own individual narratives of the barriers, which can differ remarkably from one teacher to another. There is still a need to listen and learn from these narratives to better understand the intrinsic reasons why teachers resist and/or embrace ICT-related school reform. Teacher resistance should not be dismissed as groundless because it may provide insight into the "real" source of the barriers to technology adoption.

21. The education system itself is one of the major barriers to the reconceptualist integration of the Internet on a wider scale. Over the last decade the education system has been devolved to encourage greater competition between schools in keeping with the free market principles of neo-liberalism. On the surface, the new "enterprise culture" has created the conditions for increased school-based innovation. However, the market model has also led to an environment where teachers are more accountable than ever and to where schools are subject to greater centralised surveillance. In this environment, there are important meta-barriers to technological innovation which is socially responsible and ecologically sustainable. It follows that the emergence of a group of experienced internet-using teachers with a critical orientation to educational technology is probably the most significant outcome of the research.

Finally, it needs to be noted that comparisons between and within phases are potentially misleading, as data analysis does not disaggregate those teachers continuing to participate in the study from the original sample. Despite this, there appears to remain a large gap between rhetoric and reality in terms of what teachers actually do with the Internet. The Internet is having an impact on teaching although teachers themselves continue to mediate the way educational technology is used for pedagogical purposes. Thus, there is still much to learn from the pedagogical wisdom embodied in the experiences, perceptions and practices of our most talented internet-using teachers. As a group, however, the teachers were not all zealots or technophiles as one might predict of early technology adopters. Instead, the majority of teachers were trying to incorporate the Internet into their professional lives in a practical manner they perceive best enhances learning and teaching with the least possible disruption. As few teachers were aware of the "bigger picture" problems and issues associated with the rapid growth of ICT in education, it is valuable to study those teachers who have adopted a critical stance to the Internet as a social, economic and educational phenomenon.

8.8 SUMMARY

This chapter has interpreted the results for Phase Two. It considered the main findings as they relate to each of the research questions and endeavours to make sense of these in relation to a rapidly expanding body of research. The chapter initially took a closer look at the background characteristics of the perceived accomplished internet-using teachers. It then examined their access, usage and frequency of Internet use for learning and teaching in comparison to the emerging research literature. An interpretation of the teachers' perceptions and beliefs about learning and teaching was presented, followed by consideration of perceived changes to teaching practice and work culture. Then there was reflection on teachers' perceptions of how the Internet supports better learning and teaching as a new educational innovation. The last section weighed up factors that inhibit (and enable) the pedagogical use of the Internet in schools from a number of perspectives. Finally, a brief synthesis of the emergent themes provided an overall summary of the key findings for Phase Two.

The following chapter presents the results of the research for the third phase—that is, the biographical narrative and micro ethnographic case study.

CHAPTER NINE

Results: Phase Three

'A story is never just a story – it is a statement of belief and of morality...' (Goodson, 1995, p 56).

9.0 INTRODUCTION

This chapter presents the results for Phase Three of the research. It describes narrative-biographical and micro ethnographic case study material on the beliefs, perceptions and practices of three experienced internet-using teachers, under the pseudonyms of Andrea, Barry and Catherine. Two mutually compatible research methods combine to disentangle the teachers' pedagogical beliefs and lived experiences through a multi-layered narrative. First, a portrait of each teacher is depicted from an aggregation of previous survey data coupled with newly gathered information. Then, a deeper level of insight is offered through a metaphorical window into the teachers' classroom based on the researcher's personal observation. After this there is an opportunity to listen to the teachers' voices, as they respond to questions about their teaching and use of the Internet for pedagogical purposes. This section is followed by the teachers' stories in which they reflect on their work, theories of practice and deeply rooted knowledge of education in their own words. Finally, an interpretative summary and synthesis of emergent themes brings together the different layers of data like a kaleidoscope, which provides an overall picture of how teachers are experiencing and reshaping the Internet as a social, economic and educational phenomenon.

9.1 PORTRAIT OF ANDREA

Andrea was an experienced internet-using teacher of Year 4, 5 and 6 students in a small primary school (Decile 5). She was a Scale A teacher of European descent. Andrea had been teaching for seven years and was well-qualified with a Bachelor of Education (BEd), which included several educational technology related courses. She had owned a home computer for more than seven years, had personal Internet access for the last three years, and claimed to have considerable experience using a range of software applications for both personal and educational purposes. A technical profile of Andrea in terms of personal ICT capability is presented in Figure 9.1. Self-report data triangulate evidence from Phase Two that Andrea was highly capable in terms of computer use. The results of the ICT Capability Schedule indicate that on a five point scale, in which one represents novice, and five expert, she had particular expertise in word processing and was accomplished at basic computer operations along with a number of different software applications.

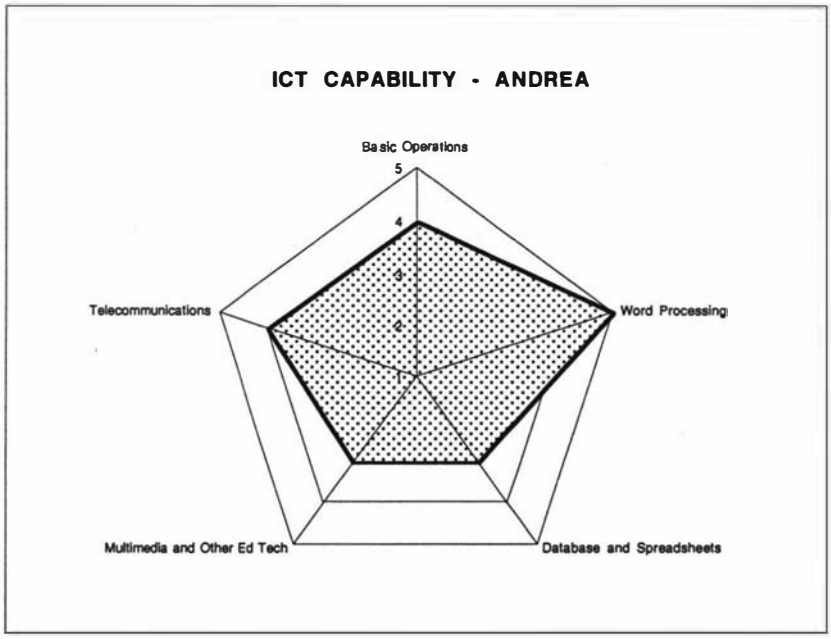

Figure 9.1 Technical profile of Andrea in terms of personal ICT capability

At the time of the research, Andrea had specific responsibility for the use of computers within her school. She was the ICT co-ordinator. In this role, Andrea had been proactive in establishing the school network and teaching other staff about the Internet. She had been involved in several ICT-related professional development initiatives and had recently given a presentation to the staff and Board of Trustees on the benefits and dangers of using the Internet for education. This presentation was based on some of her study toward a postgraduate ICT-related qualification.

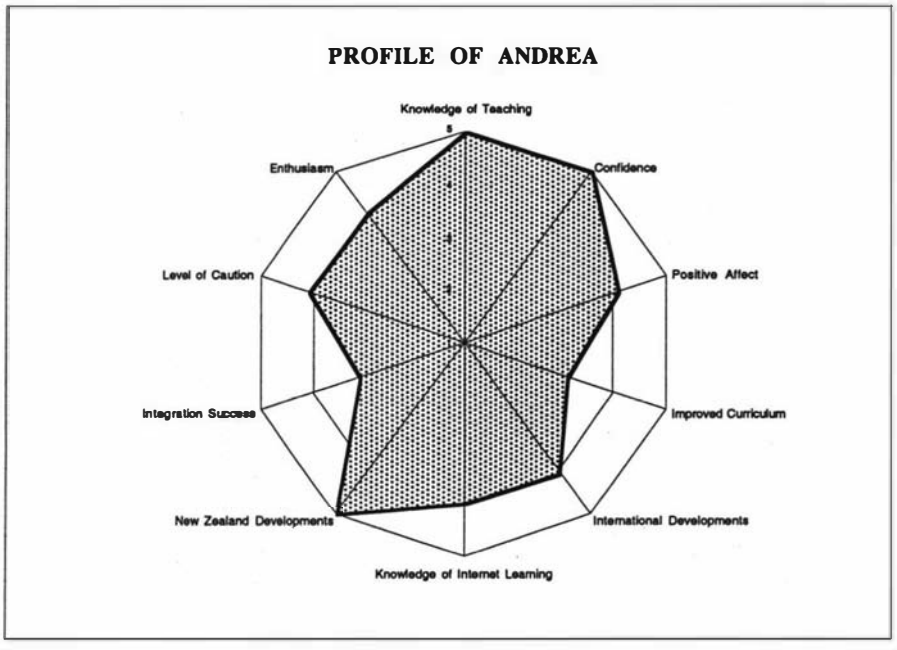

Figure 9.2 Pedagogical profile of Andrea based on aggregated data from Phase Two

A pedagogical profile of Andrea based on aggregated data from Phase Two is presented in Figure 9.2. The diagram plots 10 different variables on a five point scale in which one represents the weakest response and five the strongest response. It shows that Andrea was knowledgeable about teaching and the potential of the Internet to support the learning process. She was confident and enthusiastic about using ICT to enhance her teaching but perceived herself to be less successful at integrating the Internet within her classroom. Moreover, Andrea did not yet believe the Internet was making major improvements to the quality of the curriculum. Hence, she endorsed a cautious response to the use of the Internet in schools. Despite this, Andrea possessed an advanced knowledge of recent ICT developments and perceived the Internet had positively affected her teaching.

In Phase Two, Andrea described herself as a "coach" with a preference for learner-centred teaching methodologies. However, the advent of the Internet had not greatly changed her teaching philosophy, which placed a strong emphasis on higher-order thinking skills and education for life-long learning. In keeping with her overall philosophy, Andrea was a "cautious integrator" who claimed to be at the "adaptation stage" of Internet adoption. Her mixed success, nevertheless, at integrating the unique capabilities of the Internet within the regular classroom meant that she was becoming increasingly critical of the push to wire New Zealand schools. Andrea was particularly concerned about workload issues and the constraints on innovative teaching within an already crowded curriculum. She was also deeply conscious of equity issues and troubled by the increasing digital divide; her concern extended beyond national boundaries. Andrea was one of the few teachers who perceived that a strong social conscience and understanding of socio-political issues was an important attribute of teachers. It followed that Andrea claimed to be a "critic" in terms of the different categories of response to the Internet as a social, economic and educational phenomenon.

9.2 A WINDOW INTO ANDREA'S CLASSROOM

This section presents data from the researcher's period of observation in Andrea's classroom. It offers a metaphorical window into the physical learning environment, the nature of Andrea's teaching with computers and the Internet, and the overall pedagogical design of the classroom programme.

Learning Environment

In recent years, the school had purchased sufficient computers for two in each classroom. Andrea was fortunate enough, however, to have access to three computers. This was a reflection of her status and reputation in the ICT area within the school. In addition to these computers, Andrea (and other teachers) had access to a pod of five machines in a resource area attached to the Library. This "mini lab" and a single computer in the two senior classrooms were the only Internet enabled machines connected to a central server.

The physical arrangement of Andrea's classroom was characterized by its busy utilization of space. There were no free areas, as every part of the classroom was filled with furniture or some type of aesthetic educational resource (e.g., large fish tank). The furniture was arranged into six clusters of desks, which formed six separate student groups. These groups were known by Maori names and the seating arrangements were such that there was an even distribution of boys and girls throughout the classroom. Two additional table and chairs were positioned at the back of the classroom as a quiet area for individual work. Notably, a formal teacher's table was absent from the classroom. Andrea often used, nonetheless, an old chair and small coffee table, located at the front of the classroom beside the main chalkboard. There was a "mat area" to one side of this chair where small groups of students frequently conferenced with Andrea about their work.

A special table was located at the entrance to the classroom, which contained books and display materials relating to the current theme (e.g., pollution). On another table in the front left hand corner was a near new Compaq computer with Internet access and a large 17 inch monitor. There were two small chairs beside this computer. On the left hand wall, toward the middle of the classroom, there were two older style 486 computers and a single printer. The computers were partially blocked from the nearby desks by a low screen, which contained an array of display material. This area was known as the Computer Learning Centre. It was adorned with a mix of computer instructions and various displays of student word processed and desktop published work. At the rear of the classroom, there was a sink unit and stainless steel bench along with a large storage cupboard. There was no additional storage or resource room attached to the classroom.

In sum, the classroom was decorated lavishly from the walls to the ceiling with a range of student work samples. These samples, and the general arrangement of the classroom, left the impression that this was a lively and vibrant learning environment supported by Andrea's thoughtful and compassionate teaching approach.

Computers and the Internet

The two older stand-alone computers contained a range of pre-installed educational software—for example, *KidPix, Creative Writer, HyperStudio, MathBlaster, Sim City* and *Storybook Weaver*. There was sufficient evidence to suggest from the teacher that most of the aforementioned software packages were frequently used in the classroom. In addition to this software, a selection of CD-ROMs was available, including *Encarta, Living Books, The Incredible Machine, The Logical Adventures of the Zoombinis* and *Where in the World is Carmen San Diego*. However, with the exception of *Encarta*, it appeared that Andrea made judicious use of this software. Indeed, she emphasized that these and other CD-ROM packages were available for "intentional learning" rather than recreational use.

The single Internet enabled computer was equipped with *Microsoft Office,* which included the standard software bundle of *Word, Excel* and *PowerPoint.* It also had installed some of the aforementioned educational software along with *Microsoft Explorer* as an Internet browser and *Microsoft Outlook* as an email package. Despite access to *Outlook,* due to an unresolved technical problem with the school's network, email was only accessible though a class *Hotmail* account. The restricted access to email meant there was an ongoing problem of unsolicited *Hotmail* messages that were not only inappropriate for children but also technical barrier to the wider use of the Internet.

In terms of Web access in the classroom, Andrea did not tightly restrict the use of *Explorer* for Internet browsing. Rather, student use was guided by their written Internet code of practice. This was a simple wall chart developed by Andrea in consultation with her students. She took the view that the students themselves must own the code. Consequently, it was a negotiated policy written in a language that children could understand. Andrea was somewhat dismissive of schools that have downloaded a pre-existing code for satisfying Board of Trustee requirements. In her view, the process of talking about the *ground rules* for Internet access was far more important than any official policy itself.

The code of practice in Andrea's classroom was based on promoting individual and collective responsibility in keeping with the already agreed expectations of good behaviour—that is, consideration, honesty, and respect. It was noteworthy that part of the code involved a procedure for how students should typically respond to inappropriate online material. In other words, Andrea had taught students what they should do when, and if, a member of the class by chance accessed an inappropriate Website. This involved confiding in a friend and talking in confidence with either the teacher or the principal in the first instance. At the time of the study, the school was not using any internet filtering software.

Largely, the classroom use of the Internet was determined by the relevance of web-based resources to the current topic of study, evidenced by the range of Websites listed as "favorites" within the browser. These sites were typically clustered together or organized under folders that related to a particular theme—for example, when the students were interested in water conservation as part of a unit entitled "Water the Essence of Life" they accessed amongst other things the following web resources:

EcoWater Solutions
www.ecowater.co.nz

Water Safety New Zealand
www.watersafety.org.nz

Department of Conservation
www.doc.govt.nz

The logical organization of the list of favourites was further evidence that Andrea was technically competent at using an Internet browser. Another distinguishing feature of this computer was the individually named folders for each student in the class, which provided a "personal space" for the storage of work. This was a strategy developed by Andrea to minimize the accidental loss of electronic files between students. Other classroom management strategies included the use of an oven timer to monitor the length of Internet access by students, although by all accounts Andrea seldom used this. Instead, the natural breaks between activities tended to coincide with the end of computer time. On a rotating basis, each term, two students (a boy and girl) were allocated the role of maintaining the computer equipment and when required, helping other students with technical problems.

The configuration of the five computers in the mini computer suite was similar to the stand-alone Internet enabled machine. These computers were purchased at the same time. A timetable provided access to the computer suite for classes in the middle and senior school on a weekly basis. Typically, access for most classes was scheduled to coincide with their weekly library time. Not all teachers made use of this time as Andrea reported that it often clashed with regular library activities. Moreover, it would seem the mini suite required teachers to develop a number of "new" management techniques for its potential to be exploited. According to Andrea, this had posed some challenges for staff and the suite was used less by students as a learning resource and more by teachers for lesson preparation and professional development purposes.

This observation was supported by an analysis of the Websites listed as "favorites" on each machine. These were not arranged in any particular order and included many teacher-related Web sites, as opposed to student resources, which is demonstrated in Table 9.1 by the list of commonly bookmarked sites.

Table 9.1
Sample of Websites Listed as Favorites - Andrea

Website	URL Address
Sunshine Books	http://www.sunshine.co.nz
Te Papa	http://www.tepapa.govt.nz
Teachers@Work	http://www.teachers@work.co.nz
University of Otago	http://education.otago.ac.nz/
Ministry of Education	http://www.moe.govt.nz
The Smithsonian	http://www.si/edu
Kidsdomain	http://www.kidsdomain.com
The Official Lego Site	http://lego.com
Compassion International	http://compassion.com
English Online	http://www.english.uniteschnology.ac.nz

Classroom Programme

The pedagogical design of the classroom programme appeared to emphasize both academic and social skills. This was in keeping with the school's mission statement of providing a balanced education for life-long learning. In this context, a real feature of the classroom was the degree of pastoral care and the spirit of collaboration between students and the teacher. The teacher was proactive in facilitating social interaction and group work throughout the week. This meant that throughout the observation period the classroom was a very social and friendly place.

At the same time, Andrea frequently adopted a teacher-centred approach when this was deemed appropriate. There were a number of occasions where the students were expected to listen to the teacher and respond to her questions in a whole class setting for extended periods. On the one hand, the curriculum was highly structured in accordance with so-called traditional teaching methods, whereas on the other it was open-ended and spontaneous following a more learner-centred approach. Thus, during the course of an ordinary day the learning environment was neither student nor teacher centred; rather, it reflected a dynamic combination of different pedagogical strategies that were far more subtle and sophisticated than anticipated by the researcher, and implied by the aforementioned dichotomy.

Overall, the classroom programme was characterised by a strong sense of community and positive interdependence. An enduring impression was the wide range of activities that occurred within a given day and the lack of time that was available for integrating the computer, let alone the Internet, into the regular curriculum. While students used computers for writing and desktop publishing activities most days, there was limited use of the Web and no use of email. Access to the Internet was constrained by the number of students in the class and the range of curriculum objectives and topics covered in the course of the week. In sum, Andrea's classroom was an extremely busy place and the Internet was simply one of many resources available to the teacher and the students within the demanding schedule of the week.

9.3 LISTENING TO ANDREA'S VOICE

This section presents data from the biographical life-story and post observation informant interview. It describes Andrea's response to five main themes: (a) why I became a teacher; (b) what teaching means to me; (c) what the Internet means to me; (d) how my teaching and use of educational technology has changed over the years; and, (e) the most significant outcomes of Internet use—both good and bad.

Why I became a Teacher

Andrea gave two main reasons for becoming a teacher. First, she wanted to make a difference as evident in the following statement:

> *I think I was always going to become a teacher. It's a moral profession... I have a clear sense of right and wrong... that comes from my faith. To me teaching is one area where you can make a difference... That's why I'm here. If we all contributed something back to society then the world would be a much better place.*

Second, Andrea believed that young children were our future and we had a responsibility to prepare them for the enormous challenges facing the world. This is how she described her motivation to become a teacher:

> *I know this sounds a bit... self righteous but teaching is a noble profession. I've always admired... [teachers] and to be honest a few had such a huge impact on me. I always remember that especially on my bad days. It's a huge responsibility... But without teachers the world would be a worse place. It's a scary world and I worry about the future... These kids are the future... I thought it would be rewarding knowing that you can contribute to their future.*

What Teaching Means to Me

To Andrea teaching was not just a job. It had a much wider significance in her life from a moral and spiritual perspective. This was apparent throughout the interviews and was demonstrated aptly in the following comment:

> *As I said it's far more than a job to me. It's my life. It's who I am... Teaching is just one dimension of me but it's also everything I stand for... I can't imagine anything other than being a teacher. It fits my Christian faith... I think we're all teachers in one way or another. This is how I choose to live my faith and remain true to myself... I know this will sound idealistic... but I firmly believe that teaching is the means of creating a better society.*

Andrea went on to say that with all of the 'politics in schools' it was becoming far more difficult to make a difference. In her view, it was even more important than ever for teachers to stand up for what they believed.

What the Internet Means to Me

Andrea had mixed feelings about the Internet as a social, economic and educational phenomenon. In her personal life the Internet allowed Andrea to keep in touch with family overseas. It had also played an important role in her postgraduate study making it possible to collaborate and communicate with fellow students undertaking similar work. Moreover, the Internet was perceived to be a valuable source of online teaching materials and an expanding reservoir of official information. It was far less important to Andrea as a student resource, which is reflected in the following observation:

> *In many ways I couldn't live without the Internet. It's fairly important you could say to me. It has been great for my study in I don't feel so isolated... On the other side, it can be a pain. I hate being a slave to the technology... I don't check my email all the time like some others. Actually, it's nice to detox from the technology from time to time... I think the kids have so much of it that we shouldn't be so concerned about having to use the Internet with them... A lot of the information is too detailed... from my experience the project stuff is overrated, especially given the time delays and all the extra work.*

At a deeper level, Andrea was concerned about the way the Internet was at the forefront of what she perceived was the deliberate erosion of the egalitarian basis of New Zealand society. The promotion of e-commerce was part of what she described as the "Warehouse Generation" where people were far more interested in getting a quick bargain rather than paying a littler extra to maintain everyone's quality of life. To Andrea, the current appetite for new technology including cellphones and video games represented the worst features of global consumerism and symbolized the continuing Americanization of Aotearoa/New Zealand. This is how she described her growing concerns:

> *It's like the growth of Halloween. Again we have The Warehouse to blame for that... With TV, video games and now the Internet it's almost impossible to fight against. Part of me thinks it's simply progress but on the other side technology has a lot to answer for... Look at the third world. Look closer to home at our own society... Has the technology solved any of the problems we face? Is the Internet the great saviour? You know my response... I know I'm sounding very conservative but I'm not really. I just don't think we should accept all of this technology without questioning the longer term consequences.*

How My Teaching and Use of Technology has Changed

Andrea did not think that her teaching philosophy had changed greatly over the years. This was consistent with her earlier response. Notably, she claims to have begun her teaching career with a very clear 'rule book' for life (e.g., The Bible). While Andrea generally endorsed the use of learner-centred models of teaching, she considered the message to be far more important than the teaching methodology. This is how she described her teaching philosophy:

> *I have no problem with being the teacher. Isn't that my job... Sure the children have an important part to play in their own learning. I try to recognize this. But on the other side I'm their teacher... You know there's more to learning than having fun... I want them to care about each other and to one day become good people. That's my message. You can't do this and promote this type of attitude without being the teacher.*

It followed that her use of educational technology was in keeping with this philosophy. Andrea claimed to have always used computers in the classroom with this intention, as demonstrated by her participation in World Vision's online project. So, while the Internet was perceived to bring the world into the classroom, this merely served to underscore Andrea's view that what the world needed most was more caring and critically informed citizens. If anything Andrea perceived she was becoming far more critical about the use of ICT in schools. She stated:

> *Since I've been involved in this research I've become increasingly suspicious about the Ministry's push to introduce ICT. I've done a lot of thinking about it... and I'm struggling to resolve a personal dilemma. I'm strong on promoting the 3Rs... I also know that my computer skills have contributed to my own education. The problem is whether more computer literacy will ultimately make a difference to these kids. If everyone is computer literate how will that change what we've got... I think there's still a lot of naïve thinking about what the Internet will do for us.*

The Most Significant Outcomes of Internet Use

Finally, Andrea was asked to describe the three most significant outcomes of Internet use—both good and bad—thus far. Her response to this question confirmed some of the Internet's potential and elaborated on previously known barriers to computer integration. In addition, Andrea revealed a number of unanticipated outcomes, which provide deeper insight into the risk and rewards of Internet use.

On a positive note, Andrea talked about the way in which the Internet had brought the outside world into the classroom. It helped to make learning experiences more "real" and provided students with visually appealing information related to their interests. This was information that would not have otherwise been accessed or even known about. Furthermore, the Internet had contributed to a higher level and wider range of computer skills. Teachers now perceived the Internet to be an invaluable source of information for lesson preparation and professional development. Paradoxically, the Internet had helped to make the world both a smaller and larger place. This is how Andrea described some of the positive outcomes to arise from the Internet:

> *It's given the kids a handle on the outside world. They seem to respond to the images and the ability to follow their interest... It has introduced children to a host of new information on real topics of interest... They've greatly expanded their computer skills as well. They use more applications... I think the major benefit has been my own access. For teaching. It has really opened up a whole new world. It's a bit overwhelming because there's so much available... You realize the world is a huge place but then with the Web you're not so isolated anymore.*

Conversely, there were a number of disadvantages related to Internet use. First, when students browsed the Web they tended to gravitate toward entertainment sites (e.g., favourite movies and television programmes). In this sense, Andrea reported that students "read" the Internet as just another form of popular media, which adversely affected how they interacted with educational Websites. A related problem was that visual images dominated webpages and students were reluctant to engage with plain text. This information usually contained the most useful material but it was disorganized and rarely took account of different reading ages. Lastly, technical problems with the Internet, including unreliable access and slow download times, had increased workload and led to frustrating experiences for students and teachers alike. As a consequence, there was a residual and increasing anti-Internet sentiment perceived within the school. As Andrea stated:

> *They respond in the same way to educational games... It's just a toy to them. You have get them to look past the flash pictures to focus on the information... It's not easy because half the time the information is buried by the graphics... Then you have to get them to read it. That's if they can which is a major problem in some cases... The technical difficulties are by far the biggest draw back in our school... You can waste hours. It's got to the point where we don't bother in the middle of the day. I think the Internet is becoming a real turn off for many people.*

9.4 ANDREA'S STORY

This section presents Andrea's autobiographical story expressing in her own words insights and thoughts on different aspects of learning and teaching and the use of educational technologies in schools. Given the deeply personal nature of this story, the narrative is presented as a whole without interpretative comment.

I want to start by acknowledging that I'm a Christian and my faith is very important to me. It always has been and God is very real to me. I take comfort in the knowledge that Jesus was a teacher. I think teaching is a fabulous gift where you have the opportunity to help shape the children who will one day inherit the world we leave them. With God's help they may even create a better world.

My identity as a teacher is very much defined by my Christian values. While religion is at the root of many of the world's problems, I advocate tolerance and understanding. This is why education is so important to me. I think ignorance is our enemy and we have to strive to create a better educated society. A better informed person will by nature be more tolerant and respectful of other people. I think the future of the human race is dependent on teachers who promote these values.

Ok, I am an idealist. I like to think of myself as a philanthropist at heart with an idealistic philosophy. But I have great faith in our ability to overcome what appear insurmountable problems such as increasing conflict throughout the world and now the growing gap between rich and poor. As one of the rich nations we have a chance to address some of these problems. We do not have to follow the others as we can truly lead the world. First I would like to see us begin here at home. My classroom is a living example of the cost of New Zealand's economic and social reforms over the past decade. I believe today's children face an uncertain future.

I would say this belief has strongly influenced my identity as a teacher. At the same time, the teacher who was killed in the Space Shuttle is a continuing source of inspiration. She once said I touch the future, I teach. Or something like it. She was not afraid of new technology as she wanted to explore how we could make better use of it. I share her interest. Of course she was killed by the technology. You could say she paid the ultimate price of being an evangelist!. A bit like Jesus!

The point to remember is that Jesus was not afraid to expose his students to danger. Being a Christian is not easy. A good teacher has to take risks if they want to make a difference. Using the computer in the classroom requires a risk especially if you want to integrate it within your whole way of teaching. The good thing is that you learn from your mistakes. In many ways this has been the most valuable lesson to arise from my use of technology. The mistakes force you to critically reflect on your own teaching.

Probably the most influential person on my teaching and my philosophy has been Professor Ivan Snook. I learnt a lot about education from him in my degree and I still carry this with me today. He challenged me to really think about education and the values that I hold dear in my role as a teacher. At the end of his course I realized that it was impossible for the teacher to be neutral. I was even more convinced after this of the need for teachers with a strong moral conscience. You have to be prepared to stand up for your convictions and defend these in the face of strong opposition. This is why I voice my opinion and why I strongly disagree with the direction that schools are heading at the moment.

All this hype about the Internet is distracting teachers and the public from the crisis facing our schools. In my opinion the Internet is a sideshow until we address the moral decay that is rampant in our society. Take Internet gambling for example. Why would I teach children to use the Internet when I know that some of them come from homes where they have no money for their school lunch on race days. They have enough money for Sky and a cellphone but their children come well down the list of priorities. I really object to the way that computers and the Internet is being marketed as an educational advantage to parents when the real motive is to sell more computers.

There is a whole industry associated with the Internet and for most people its gobbledygook. The technical jargon is beyond them and you end up having to pay extra for things no one told you about. I know the extra money our school has spent on getting the network running and it still causes problems. There is a lot to be said for word processing on our old PC in the days before we went hi tech.

The introduction of the Internet in our school has greatly increased my workload. Because of my technology skills, I have been responsible for a number of new initiatives. These require many more hours of work than most people would appreciate. That is the nature of technology. You get little reward although ICT has got a lot more status in our school recently. The workload is too high however and I doubt you will find many teachers willing to invest this amount of time on a long-term basis. When I get the chance I will be happy to hand this on to someone else.

My lesson for others is that spending hours playing with technology is not why I became a teacher. If there is one message that I would like to send to principals, boards and the Ministry of Education then that would have to be it. There is only so much satisfaction to be gained from replacing lost mice and fixing broken keyboards. I would like people to know that the time I spend on ICT is the less time I have for improving my teaching in all of the other essential areas.

9.5 INTERPRETATIVE SUMMARY OF ANDREA

Andrea was an accomplished computer-using teacher respected for her skill and knowledge in this area. She was an articulate teacher with a clear philosophy of education. In her own words, Andrea was a "philanthropist at heart with an idealistic philosophy". Her philosophy was influenced deeply by a personal religious conviction and well-informed by prior knowledge of educational theory. There was every indication that Andrea's philosophy was translated into practice, as the researcher's observations were generally consistent with the described pedagogical approach. In practice, Andrea adopted an eclectic approach to teaching drawing on a range of instructional techniques. She encouraged students to accept responsibility for their own learning and valued high levels of student-student interaction. On the other hand, Andrea was equally comfortable with adopting a teacher-centred approach, as she described herself as "the teacher". In the classroom, students displayed a high level of cooperation and respect for one another, and demonstrated a genuine interest in other people's work. It was a particularly harmonious learning environment. The computer was used mainly as a word processor and presentation tool. Despite few students using either email or the Web during the period of the case study, there was evidence that Andrea personally made regular use of the Internet. At the time of the study, Andrea had a love-hate relationship with educational technology and felt overworked in her role as the ICT Co-ordinator. In sum, Andrea was a religious humanitarian who was cautious and increasingly critical of the Internet as a social, economic and educational phenomenon.

9.6 PORTRAIT OF BARRY

Barry was a Senior Teacher of year 5 and 6 students with 19 years of teaching experience. He was employed in a large primary school within a mid to high socio-economic community (Decile 7). Barry was of European descent. He held a Diploma of Teaching and had recently returned to study in order to complete his Bachelor of Education degree. As part of his study, Barry had participated in an online course on the use of ICT in education. Before this, he had attended a number of conferences and presented workshops at various educational computing events. Barry had owned a home computer for more than 16 years and reported personal Internet access for at least five years. He claimed to have considerable experience using a variety of educational software for learning purposes. A technical profile of Barry in terms of personal ICT capability is presented in Figure 9.3. Self-report data triangulate evidence from Phase Two that Barry was highly capable in terms of computer use. The results of the ICT Capability Schedule indicate that on a five point scale, in which one represents novice, and five expert, he was expert at basic computer operations and highly accomplished in his ability to use a number of different software applications.

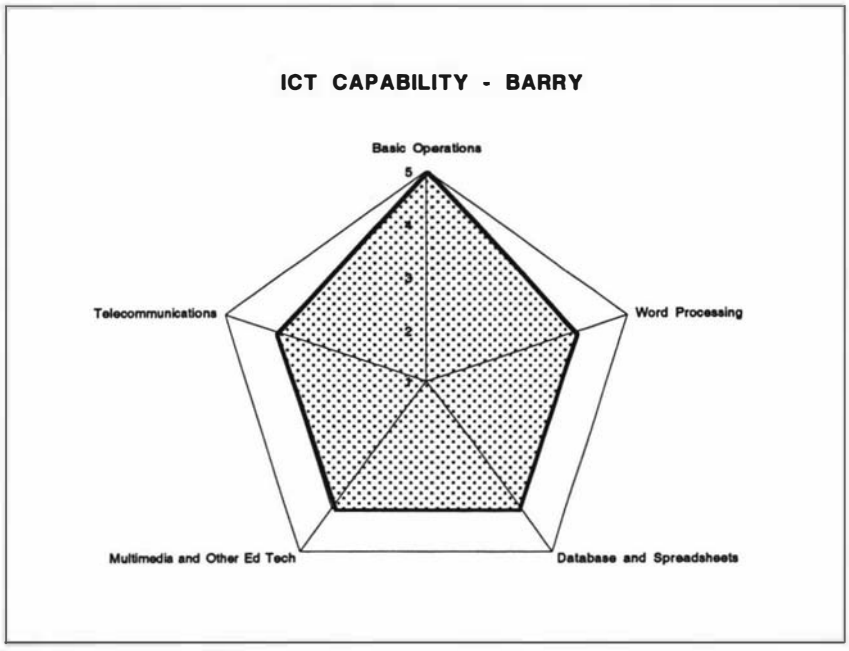

Figure 9.3 Technical profile of Barry in terms of personal ICT capability

At the time of the research, Barry was the ICT co-ordinator. This meant that he had a leadership role in the school, which was well-known for its use of computers in education—for example, it was one of the first schools in the region to publish its own Website. In the last few years, Barry had invested considerable effort in helping to establish the new Computer Suite as part of an extension to the library. Generally, he enjoyed working with computers and considered "IT" as one of his personal hobbies.

A pedagogical profile of Barry based on aggregated data from Phase Two is presented in Figure 9.4. The diagram plots 10 different variables on a five point scale in which one represents the weakest response and five the strongest response. It shows that Barry claimed to be knowledgeable about learning both with and without the Internet, and he was highly confident of his ability to use ICT in the classroom. He was cautious but also enthusiastic about the use of the Internet in schools. Barry perceived that the Internet had positively affected his teaching and claimed to be reasonably successful at integrating ICT into the learning and teaching process. Notably, Barry did not believe the Internet was making major improvements to the quality of the curriculum. Like Andrea, he reported an advanced knowledge of both national and international developments in the area of educational technologies.

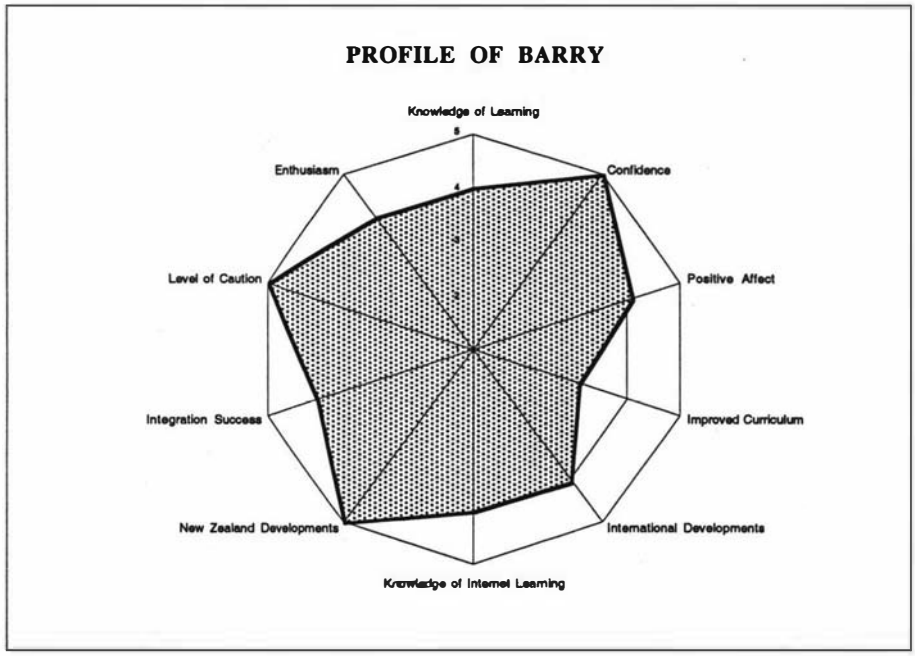

Figure 9.4 Pedagogical profile of Barry based on aggregated data from Phase Two

In Phase Two, Barry described himself as a "facilitator" with an affinity for both learner-centred and teacher-centred teaching methodologies. He claimed that it would be 'silly' to adopt just one method of teaching as one's pedagogical approach depends on the context. The growth of the Internet had not greatly changed his teaching philosophy, which placed a strong emphasis on creativity, flair and imagination; he wanted his students to have fun. In keeping with his philosophy, Barry was a "Committed Innovator" who claimed to be at the "Invention Stage" of Internet adoption. Ironically, his success at integrating ICT into the regular classroom meant that he was becoming less enthusiastic about his role as the school's resident computer expert. Indeed, Barry reported a greatly increased workload since the introduction of the Internet and he expressed real concern that other teachers were relying too heavily upon his expertise, which was counter-productive to technology integration.

At the same time, Barry was highly critical of the official curriculum, as he perceived this was yet another form of social control. He was no conformist. Rather, he had become increasingly uneasy with the Government and the Ministry of Education's attempt to "sell" the use of ICT to New Zealand schools. It followed that Barry claimed to be a "deschooler" in terms of the different categories of response to the Internet as a social, economic and educational phenomenon.

9.7 A WINDOW INTO BARRY'S CLASSROOM

This section presents data from the researcher's period of observation in Barry's classroom. It offers a metaphorical window into the physical learning environment, the nature of Barry's teaching with computers and the Internet, and the overall pedagogical design of the classroom programme.

Learning Environment

For the past three years, Barry had enjoyed the luxury of two network capable computers in his classroom. This was quite common across the school although some of these computers were older machines. In 1997, the school had built a small Computer Suite with 10-networked computers as part of an extension to their library. More recently, Internet access had been extended to most of the classrooms including a number of computers in the school Administration Block.

The physical arrangement of Barry's classroom was characterised by its innovative design and somewhat cluttered appearance. A number of individual desks were positioned around the outer walls and three larger tables with matching chairs dominated the middle space of the classroom. The class consisted of five permanent groups, but the seating pattern often changed according to each activity. Some pupils even worked in a small resource room attached to the classroom, which gave the impression that students were always on the move. It was typical, however, for "whole class" discussion to take place while students were sitting at their home desks. The teacher's table was located at the right front of the classroom alongside a small display unit of library books. There was no mat area as such but on occasions a number of students worked on the floor at the front of the classroom. The two IBM computers were located toward the rear of the classroom in an area known as the Media Centre. This area was screened partially from the nearby desks by a hanging divide consisting of a large sheet of decorated cardboard. The hardware included a colour printer and scanner, which were located nearby on a small shelf. Other items of equipment available to the students included a digital camera and a large tape deck, along with a range of electronic puzzles and games.

In sum, the lasting impression was one of a busy classroom that was crowded with a combination of people, furniture and equipment. Together this mix, along with the display of numerous student work samples, contributed to a dynamic and exciting learning environment augmented by Barry's enthusiastic teaching style.

Computers and the Internet

The two classroom PCs had pre-installed the standard *Microsoft Office* software bundle including *Word, Excel* and *PowerPoint*. In addition, students could access *MS Works, MS Publisher, Creative Writer, Fine Artist* and *KidPix* as generic tool software. By all accounts, this was a standardized package across the school although few, if any, teachers utilized the full range of software. Furthermore, Barry preferred not to use Microsoft products in his personal computer use, as he held strong views on their dominance and perceived monopoly of the software industry.

There was a range of other pre-installed educational software on the PCs in Barry's classroom—for example, *HyperStudio, Sim City, The Hog Stand, Thinking Things, Treasure MathStorm,* and *The Logical Adventures of the Zoombinis.* Some of this software operated off a CD-ROM, which in some cases was a copy of the original disk. There was an extensive collection of CDs available to students including *Encarta, Encyclopedia Britannica* and both the *Living Books* and *Magic School Bus* series to name a few. In general, the researcher was satisfied that students used most of these software packages on different occasions throughout the year. This conclusion was corroborated by the fact that students frequently used the computers to play games before and after school and at lunchtime. Barry was quite relaxed about the recreational use of computers as he believed that it was better for the technology to be used than sit idle—unlike some of the other classrooms.

In terms of email, the students could send and receive electronic messages using a default class address in *Microsoft Explorer.* From time to time Barry had experimented with individual *Hotmail* accounts but with little success, as the students either forgot their username and/or password, and often received too much junk mail. His view was that students could create *Hotmail* accounts on their own computers, which a high percentage possessed. In the past, email had been used to follow the journey of a travel buddy throughout the United States over a number of weeks. This involved regular correspondence with another teacher's relative and use of the digital camera for sending photographs as attachments. Email was used also with mixed success to make contact with NASA experts when the students were working on their "Lost in Space" project. According to Barry the most successful use of email was when students exchanged jokes for two weeks with the adjoining class.

In terms of Web access, Barry did not restrict students from browsing the Internet. He was philosophically opposed to the use of filtering software and believed that there was little point having the Internet and then not being allowed to use it. Yet, during the period of the case study few students freely browsed the Internet with the exception of the "neopets.com" Website. This site had been very popular but the novelty of creating virtual pets and buying and selling rewards was apparently beginning to wear off. The only occasion on which Internet was seen to be used for a curriculum-related activity was when a student accessed a Website from the list of "favorites" to find information for the project she was supposed to have completed on the Olympic Games. A number of Olympic Websites had been saved as "favorites" for future reference (e.g., http://www.olympic.org.nz).

There was no particular organization to the Websites listed as "favorites" although the menu bar was customized to include a number of direct links. This included a link to the school's own Website, along with an online dictionary and thesaurus, several daily newspapers and Television New Zealand. The history of Websites in *Microsoft Explorer* indicated that of these customized links, the school's homepage was the only Internet site accessed during the week. On occasions, Barry looked at the browser's history to check what Websites were being accessed and because this feature was common knowledge amongst the class, he regarded it as a good deterrent to inappropriate use.

In general, students used the Internet on a need only basis depending on the current topic of study. There was no formal booking system for the computer as Barry left the students to work this out for themselves. He had experimented with several methods over the years and found it was better to encourage the students to manage their own access by booking to use the computer when required for as long as they needed to complete their work. Under this system, the two computers were in continuous use but mainly for word processing and related publishing tasks during the regular timetable. Notably, it appeared the Web was sometimes used as a source of "clip art" to enhance students' more traditional work.

A feature of the computer use was that students frequently worked in pairs or small groups. Even when a pupil was working on an individual task it was common for other students to come and talk to this person and thereby view the monitor. Thus, the Media Centre was a very social place. As Barry encouraged students to ask a classmate if, and when, they encountered problems, this type of social interaction was considered a normal part of classroom computer use. Another distinguishing feature of the student-student interaction was the regular use of cross-age tutors between classrooms. This involved two or three pupils from Barry's class going to another classroom to help train other students and/or to act as a general troubleshooter. This was a strategy developed by Barry to promote more diverse and frequent use of computers by other teachers.

This system also operated on occasions in the Computer Suite. The "lab" was timetabled for classes throughout the school at all levels on a weekly basis. Typically, the 10 computers were used with smaller groups, as the lab was both too small and too hot for whole class teaching. Despite being seldom occupied by students at the time of the case study, there was evidence to show the Computer Suite was used on a regular basis. According to Barry, the lab went through spurts of activity with intensive periods of use (e.g., when students were making a HyperStudio project) followed by longer periods of inactivity. Thus, it was likely the Computer Suite was in a period of inactivity coinciding with the closing stages of the school year. While the occupancy of the Computer Suite was quite low during the regular timetable, a number of teachers used it throughout the week before and after school. The Websites saved as "favorites" suggested that the Internet was an important resource for lesson preparation and professional learning, as demonstrated by the selection of teacher-related sites in Table 9.2.

Table 9.2
Sample of Websites Listed as Favorites - Barry

Website	URL Address
TKI	http://www.tki.org.nz
ACED	http://www.aced.org
EdWeb	http://www.edweb.org
Hillary Commission	http://www.hillarysport.org.nz
TheSchoolQuarterly	http://www.theschoolquarterly.com
Yahoo Education	http://www.yahoo.com/education
Teachers@Work	http://www.teachers@work.co.nz
Telcom Southern Cross Cables	http://www2.telecom.co.nz/cable/index.html
Learnz	http://www.learnz.org.nz/2k
English Online	http://www.english.unitechnology.ac.nz
Classroom Connect	http://www.classroom.com
Assessment Resource Banks NZCER	http://www.nzcer.org.nz
New Zealand Education Web	http://www.cwa.co.nz
Education Gazette	http://www.edgazette.govt.nz

Classroom Programme

The pedagogical design of the classroom programme encouraged a high level of student autonomy and the development of self-management skills. This was consistent with the goal of teaching students to learn how to learn, which was a core value reflected in both the ICT Policy and the school's recently adopted Vision. There was a strong ethos throughout the school on the need to prepare students for the future. This was particularly evident in Barry's classroom through the *matter of fact* use of a range of technologies including computers, calculators, digital cameras, electronic games, music CDs and spell checkers albeit often outside of the regular teaching programme.

In practice, a real feature of the classroom was the amount of social interaction and the free movement of students within and around the school environment. The class was not dependent upon the teacher and this meant that at times the classroom appeared to be a noisy and somewhat chaotic place. The noise level was amplified in the afternoon when students were able to listen to music while they completed some of their work. Despite the apparent relaxed and student-centred nature of the classroom programme, there were times when Barry adopted a more authoritarian approach especially during short periods of whole class instruction. In this regard, it was evident throughout the observation period that Barry did not tolerate misbehaviour. Indeed, the teacher was clearly the "boss".

In sum, the classroom programme was characterised by the independence given to students and the thematic approach to classroom activities. An enduring impression was the rich level of student dialogue and the seamless use of technology within the social milieu of the classroom. That said, there was minimal use of the Internet by students in the regular curriculum. At the time of the study, it was used predominantly for edutainment purposes in keeping with the range of game type software in the classroom. Nevertheless, both computers were used extensively throughout the day but mainly for writing, desktop publishing and presentation activities. In sum, Barry's classroom was a remarkably full and bustling place where the Internet was treated as just one of many resources freely available to the students in the course of an ordinary week.

9.8 LISTENING TO BARRY'S VOICE

This section presents data from the biographical life-story and post observation informant interview. It describes Barry's response to five main themes: (a) why I became a teacher; (b) what teaching means to me; (c) what the Internet means to me; (d) how my teaching and use of technology has changed over the years; and, (e) the most significant outcomes of Internet use—both good and bad.

Why I became a Teacher

Barry gave three reasons for becoming a teacher. First, he thought teaching would be a fun and stimulating career; it would keep his mind young. He wanted to maintain a youthful outlook on life as evident in the following remark:

> *I'd hate to get old and conservative. I like to think that I'm... up with the times... you know with it. Teaching keeps you on your toes... the kids are always pushing you. I enjoy that side of things... I wanted a job where I could be myself and have some fun. I'm not the sort who likes to be boxed in and teaching gives me the freedom I enjoy... well most of the time.*

Second, Barry believed that teaching was an underestimated and undervalued profession and that as a male teacher in the primary sector he could make a positive contribution to students' and teachers' learning alike. This is how Barry explained his decision to choose teaching as a career:

> *I suppose... yeah I thought this looks ok. There aren't many men and my skills would be valuable... The kids need male role models. At the time teaching... well it still is... not really promoted as a male thing. I sort of knew that I could become... a valuable member of school. You know with my sports and the technology has been an important thing.*

Third, Barry acknowledged that he regarded teaching as a personally gratifying career move because it provided good conditions, good prospects, good holidays, and reasonable money, as apparent in the following comment:

> *I'll be honest and say... there was a lot going for teaching. In my day I got some money to train... The holidays can't be overlooked... and the money's ok. There were good prospects back then and... I guess overall teaching offered a good mix of lifestyle. It still does.*

What Teaching Means to Me

To Barry teaching was a way of "leaving his mark" by passing on his positive attitude to life. He maintained that life should be enjoyed as there was too much misery in the world. For this reason he always strived to ensure that students had fun in his class. Through teaching, Barry was able to express his sense of humour and develop his creative side, which he perceived was appreciated by others. Teaching was, therefore, an important outlet for Barry, as indicated in the following comment:

> *I think of teaching as a real art. You've got to be creative if you want to keep... things interesting... I surprise myself at times. You can do some silly things with the kids... and I get a kick out of their reaction... I'm always on the look for new ideas. That's one reason why I enjoy computers... So teaching is my creative release. I get it out of my system... I'd hate to have a boring office job. No fun in that.*

This last comment explains, in part, Barry's intense dislike of the increasing bureaucracy in teaching. He perceived that schools were overly subject to political intervention, citing new assessment requirements as interfering with his ability to be a good teacher. According to Barry, good teachers should be left to do their job and the parents, politicians and academics would be better to debate the purpose of school in the first place. In his opinion:

It's politics! They all want to check what we teach... They want to make us more efficient and accountable... Then the parents expect you to perform miracles... You know there's no reason for kids to attend school anymore. The thing is out-of-date. The Internet makes it redundant... They'd [the politicians] be better off starting from scratch. It's a dog's breakfast... We need to change things for the future – not for political expediency.

What the Internet Means to Me

Barry had used the Internet for a number of years and he expressed strong opinions about the growth of the Internet based on his early experience. As an early adopter, he was highly critical of the commercial takeover of the Web and bemoaned how the free spirit of the Internet was being lost as it becomes popularized. Indeed, Barry perceived the Web would eventually become just like television—an advertising dump and user pay service. This is how Barry mused over the changes to the Internet since the early days.

In the early days there was none of the crap. The advertising and that... It was exciting back then. There was a real wow factor. You had a sense of adventure as... you surfed the information superhighway. I enjoyed the anarchy that was the Internet... It was a more intimate experience. The hype these days has lost that. It's becoming just another form of entertainment for the kids. Another form of television and money... Yeah, the novelty has worn off... I'm a lot more... well ho hum about it.

Despite his cynicism, Barry believed the Internet was a major revolution that would transform society. He admitted to spending a considerable amount of time using the Internet for personal and recreational purposes. On the other hand, he regarded the Internet as just the most recent, and by no means the last, iteration of a long line of technological advances in telecommunications. Consequently, it was fair to say that Barry was having second thoughts about the role of the Internet in education even though he had been centrally involved in networking his own school. His growing diffidence toward the Internet in schools was reflected in the following analogy:

Sometimes I think of it like the telephone. I imagine people were amazed... when it was first available. Imagine life without phones... But slowly it became commonplace. Did schools rush to teach phones? No... What's the rush to teach Internet?. Why has the Ministry suddenly started to do something? You've got to ask... I know Telecom and the computer companies are lining up for our business.

Barry's disquiet over the way the Internet was being pushed on schools was partly fueled by his recent experience with the neopets.com Website. Earlier in the year, these virtual pets had been a real craze, as students in his class rushed to earn, buy and sell points in order to win prizes and other rewards. The Website required the students to earn sufficient points to purchase food for their pet by answering questions in promotional puzzles and, if resourceful, allowed them to auction and trade surplus goods for profit. In Barry's view, this was a seductive form of marketing and blatant attempt at inducting young children into the principles of capitalism. This was his reaction:

> *It wasn't until one of the kids complained about their pet dying that I took interest. It was amazingly sophisticated. Real competitive. Sure you could donate points to the needy but what did that teach them. The ultimate goal was to make a profit. Some of the kids had done real well. But I started to wonder what the kids were learning. I'm sure many of them were becoming good little capitalists!*

How My Teaching and Use of Technology has Changed

Barry did not consider that his teaching philosophy had changed significantly over the years. This was in keeping with his earlier response. He claims to have refined and extended his repertoire of teaching skills over the years but essentially his philosophy had remained the same. There were two main lynchpins to Barry's teaching philosophy. First, learning had to be fun. As far as he was concerned, people learn when they enjoy it. Second, he believed that learning should be relevant to the real world. In this regard, he placed strong emphasis on meaningful learning. This is how Barry described his teaching philosophy:

> *Everyone has a different view. I'm laid back. I'm not lazy... but it has to be fun for the kids and for me. I do my best teaching when we're having fun. However I'm not as casual as people think. I can be a mean bastard if I have to and the children know that. They respect it... I suppose the main thing is to make it meaningful. If it's about the real world—not book stuff—the kids can relate to that... They respond to it... much better.*

In general, his use of educational technology was consistent with this philosophy. Barry claimed to have always used computers to enliven the learning and teaching process and bring the world outside of school into the classroom. He cited his use of spreadsheets and the Internet as an example. At the same time, Barry believed that teaching was a real art and teachers had to be wary of turning schools into hamburger factories by adopting the practices of industry. He offered this remark in the context of the school's recently developed vision statement:

To think the Board paid someone to spend time developing our Vision... Next uniforms... You know McDonalds even have their mission statement in the toilets. This is corporate bullshit. Most staff buy into it but we're not McDonalds... Do we want all the kids to be the same. Is that the goal... like hamburgers. Do you blame me for being cynical... You can see why I'm not interested in the DPs job.

The Most Significant Outcomes of Internet Use

Finally, Barry was asked to describe the three most significant outcomes of Internet use—both good and bad—thus far. As you would expect, his response to this question reiterated earlier points and expanded on many well-known barriers to computer integration. Barry also revealed a number of surprising outcomes, which provide deeper insight into the risks and rewards of Internet use.

In a positive light, Barry reported how the Internet had helped to increase student autonomy and motivation in the classroom. The freedom to explore the Internet had brought more fun into the classroom and linked the students to the outside world. As a spin-off, it had also helped to develop the level of computer skills amongst both students and teachers. In particular, the ability of students to master the Internet and quickly assimilate it within their daily routine was a remarkable outcome. Most noteworthy, however, was the use of the Internet by teachers for lesson planning and preparation and the increased level of professional dialogue between colleagues. As Barry stated:

I've got to say first it has added more fun and expanded the kids horizons... Perhaps almost as a byproduct it has lead to a better level of computer skills... Yes including the staff... By now I should expect it but it still amazes me how fast... the kids take to it. They have an insatiable appetite for it... I think the most interesting outcome has been the personal use followed by the increased discussion amongst the staff. They will sometimes take their afternoon tea to the suite... You hear a lot of talk and laughter coming from there at times. Half the time I suspect it has nothing to do with the computers.

Despite these outcomes, the Internet experience was not entirely positive, as demonstrated by the following problems. To begin with, the enthusiasm of teachers to secure an Internet connection was seldom translated into their classroom practice. Barry explained the mismatch between demand and subsequent use by claiming that the real motivation was about obtaining

a better and faster computer—a flow on effect of networking—rather than the Internet per se. According to Barry, a status is attached to the computer and teachers were responding to the Internet in a similar way to the introduction of CD-ROMs. In this sense, teachers competed to possess the best computers as these directly related to their standing in the school. Another perceived negative side effect was the increased use of computers for school administration. In Barry's opinion, teachers were trying to find time to learn how to use an administration package that was purchased when the network was installed. This package and the expectation of using ICT for learning, and the related professional development initiatives had increased everyone's workload. The major outcome relating to students was concern about what they were learning from the Internet. Again, Barry expressed reservations over the "hidden curriculum" that was implicit in some of the popular Websites targeted at young children. He pointed out the negative effects in this way:

> *The Internet has as much to do with... teachers upgrading their computers as it does with learning. If they're honest, the motivation is to get a new computer. It's about keeping up with the Joneses... The same thing happened when we got you know the CD-ROM computers... All the new administration is creating a heap of work... on top of ICT and then there's the extra PD that adds up to work, work. Less time for teaching... Sure they [students] can't get enough of it but there's a hidden side that we've not yet seen... What are they learning? That's something I've recently started thinking about, so it must be significant.*

9.9 BARRY'S STORY

This section presents Barry's autobiographical story expressing in his own words insights and thoughts on different aspects of learning and teaching and the use of educational technologies in schools. Given the deeply personal nature of this story, the narrative is presented as a whole without interpretative comment.

> *I see myself as a doer rather than a follower. Not a leader out front but in terms of thinking. My views are different often from the norm. However, I have no problems with that. Back in the 1980s, I was against the South African tour. That protest experience has always left a strong impression on me, and I think you have to always say and act on what you feel. Then again, it can get you in trouble so wherever possible I try to combine my heart and mind. I have learned from past experience that you are better to develop a logical argument rather than to go with passion alone. I learnt this the hard way when I was much younger.*

In the first few years of teaching I struggled with the silly school regulations. I was still new, it was hard to rock the boat. Beginning teachers are meant to listen and learn. I wonder how much the system has changed since I started teaching. Eventually I began to challenge some of the old ways and I realized that you could change things. That was an important lesson for me. I know the principal was pleased to see the back of me but ever since then I have tried to do things my way. It sounds arrogant but most times I know best. If I have a good reason for teaching a certain thing in a certain way then you should be trusted to make it work. What comes with that is that you have to also admit to your mistakes and learn from them. I believe that is a major part of teaching and I have made heaps of mistakes over the years. Ask my colleagues.

I would have to say that Logo was probably a big one for me. It sort of vindicated the way I taught and showed how you could bring technology alive in the classroom. The first year the children used Logo was probably the most rewarding of my teaching career. We struggled with a handful of computers but it was really amazing what the children could create. On reflection there was far more learning going on back then compared to these days. The children would spend hours developing their procedures and you should have seen the excitement when someone learnt a new procedure and how quickly it spread amongst the class. Those were good days. There are not many teachers using Logo today, which is sad really.

Apart from Logo and Bill Gates (joke) it was probably when we made a video using a couple of M7 cameras when they first came out. At the time I had no idea of video editing and together with the children we made a short documentary on television violence showing bits of cartoons and interviews with various people. In hindsight and in comparison to some of today's computer learning this was innovative really. I think it shows how some of today's technology is a step backwards. Look at webquests. You may as well use a couple of good books.

I would have to say the children are not always as skilled as we think they are. I had an example of that recently. You know the products do not always match the level of skills, time and effort. That is the political side of using computers to show off to parents. A big part of ICT is impressing the parents with what the children can do.

The Internet has made the world feel like a smaller place. You can access information now from anywhere in the world and it makes you feel surreal at times when you know that it takes a few seconds to download an image from a computer on the other side of the world. No one can hide with Internet. I find it incredible to think that you can develop a unit based on someone else's lesson plan developed in the United States. This is both brilliant and bizarre as before you know it all schools will be teaching the same curriculum. But then the Internet makes it possible to change schools as we know them and this part of it excites me. The concept of the virtual school appeals to me a great deal. Probably the major thing is that Internet has made me more aware of how out of touch many teachers are and how there is a real gap in the teaching profession between the activists, pacifists and traditionalists.

Most of my points have to do with the problems. You have to overcome these first before you can make any real progress. It stands to reason that you have to have the equipment and sufficient access to it. We have been lucky in this regard but I consider there is still a lot of short-term thinking. What happens when more and more of the computers breakdown. A computer is a worse liability than a car. There are too many old cars in our schools.

Then you have to have the time to experiment. You can waste hours on a computer and have little to show for your trouble. Where will teachers find the time? You need the motivation and I think many teachers have reached burnout. Look at me. You can do this for only so long. Besides, many of the software packages we use with children like Microsoft are too sophisticated for the children and we need more appropriate software. Microsoft Office is NOT a suitable package for children.

I think children should be able to access the computers when they need them rather than limiting access to a set period or time of the day. What happens is the computer becomes nothing more than a typewriter for the presentation of writing and it has little impact on the quality of the content. It looks good and keeps the parents happy but these children all have printers at home and the presentation is not like it use to be. The buzz is not the same. In fact, some kids now prefer handwritten and their own art because the computer reduces the value.

Finally, there is the problem of professional development. I think this has had as much of a negative impact than positive. It has given the teachers enough confidence and knowledge to use the computers but it has failed to change the way they do things. In some cases it has alienated a group of good teachers and made them feel incompetent. I now believe we are wasting our time and money by focusing on ICT at the expense of real changes in education. The way to change schools is not through technology but by changing the conditions, the curriculum and the whole system we have today. The ICT Strategy is not going to do this as it toys with the problem. I mean learning should be fun and involve as many experiences as possible, not just ICT. For me the real soluton is creating an environment where teachers feel safe to take risks and to be creative. More computer skills will give us more of the same. I would like to see a different approach where we truly develop teachers' talent well beyond technology.

9.10 INTERPRETATIVE SUMMARY OF BARRY

Barry was personally accomplished with a range of computer applications including the Internet and had considerable teaching experience using educational technology in the classroom. His teaching philosophy was based on the need to make learning enjoyable and relevant to the real world. In his own words, he believed that "learning should be fun and involve as many experiences as possible". While this philosophy was not strongly grounded within formalised educational theory, many of his beliefs were in accordance with contemporary views of the learning and teaching process. The researcher's observations were entirely consistent with his described pedagogical approach suggesting that Barry's philosophy was lived in action. In practice, Barry adopted a friendly approach to teaching where he was able to deftly switch between the roles of facilitator of learning and manager of instruction. The classroom was a lively place where students were expected to take considerable responsibility for their own learning. It followed that they had a great deal of independence and students were able to use computers extensively throughout the day. Despite this, the computers were used predominantly in the regular curriculum as a word processing, desktop publishing and presentation tool. At the time of the case study, there was no use of email and limited use of the Web. Barry felt overworked, even burnt out, and had become sceptical of technology's potential to transform education. In sum, Barry was a troubled old-timer with an anti-establishment perspective toward the rapid growth of the Internet as a social, economic and educational phenomenon.

9.11 PORTRAIT OF CATHERINE

Catherine was a Senior Teacher of year 3 and 4 students and was of European descent. She taught in a medium sized primary school within a mid to high socio-economic community (Decile 6). Catherine was highly-qualified with an advanced postgraduate qualification. Although her postgraduate work was completed several years ago, this qualification included a paper devoted to the use of computers in the learning process. Catherine was in the middle stages of her career with 16 years teaching experience. She had owned a home computer for more than six years, had personal Internet access for the last two years, and claimed to have considerable experience using a range of hardware and software for both personal and educational purposes. A technical profile of Andrea in terms of personal ICT capability is presented in Figure 9.5. Self-report data triangulate evidence from Phase Two that Andrea was highly capable in terms of computer use. The results of the ICT Capability Schedule indicate that on a five point scale, in which one represents novice, and five expert, she had particular expertise in word processing and was accomplished with a number of different software applications as well as basic computer operations.

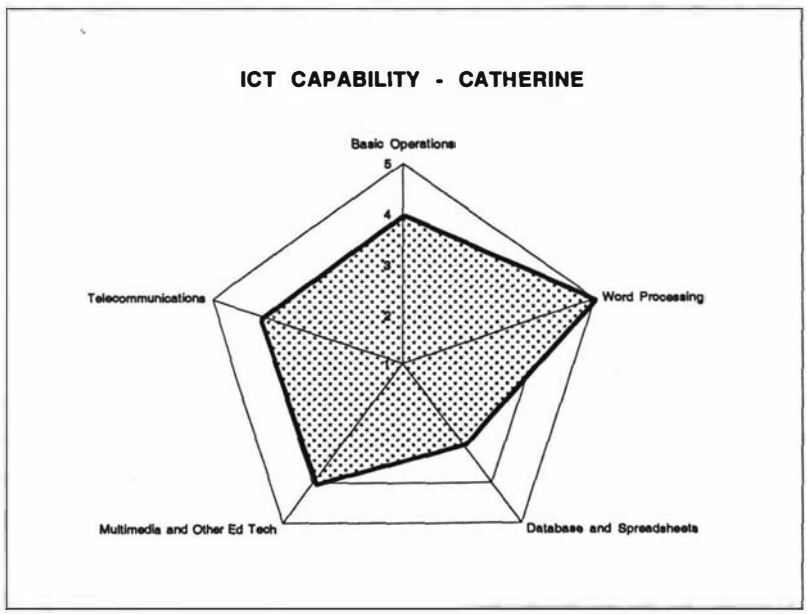

Figure 9.5 Technical profile of Catherine in terms of personal ICT capability

At the time of the research, Catherine did not have specific responsibility for ICT coordination in the school. However, she had previously performed a similar role in another school, which included responsibility for teaching other teachers how to integrate computers into the classroom. Catherine was familiar with publications and recent developments in the ICT area and had previously conducted numerous practical workshops on the benefits of educational computing. At an informal level, she was well connected to the ICT-related teacher education community.

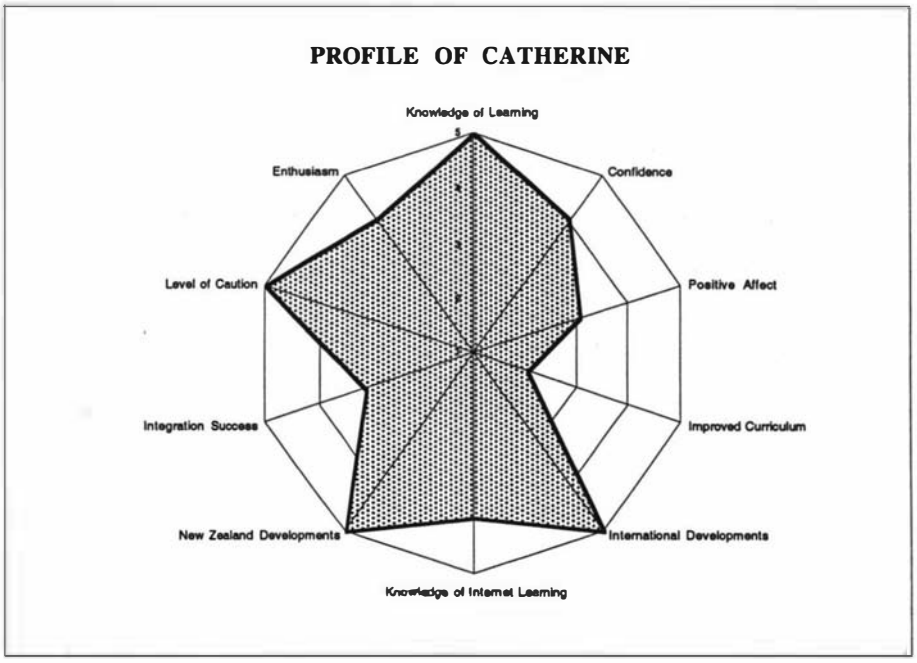

Figure 9.6 Pedagogical profile of Catherine based on aggregated data from Phase Two

A pedagogical profile of Catherine based on aggregated data from Phase Two is presented in Figure 9.6. The diagram plots 10 different variables on a five point scale in which one represents the weakest response and five the strongest response. It shows that Catherine perceived herself to be knowledgeable about teaching and the potential of the Internet to support the learning process. She was reasonably confident and enthusiastic about using ICT to enhance her teaching but was less successful at integrating the Internet within her classroom programme. Catherine was unsure whether the Internet had positively affected her teaching and held the view that it was not yet making major improvements to the quality of the curriculum. Thus, she strongly endorsed a cautious approach to the use of the Internet in education. Lastly, like Andrea and Barry she claimed to possess an advanced knowledge of recent ICT developments.

In Phase Two, Catherine described herself as a "coach" who was highly committed to the teaching profession. She exhibited a preference for learner-centred teaching methodologies and reported to be at the invention stage of Internet adoption. However, Catherine classified herself as a cautious integrator and she did not believe the advent of the Internet had greatly changed her teaching philosophy, which emphasized critical thinking skills and education for citizenry. In keeping with this philosophy, and her limited success at integrating the Internet within the regular classroom, she was highly critical of the hype associated with the drive to network New Zealand schools. Catherine openly questioned the pedagogical rationale associated with ICT and voiced concern about the way in which the Internet was being promoted as a social and economic fix for the ills of New Zealand society. Notably, she was

fervently opposed to globalization and believed a strong social conscience and understanding of socio-political issues was an important attribute of teachers. It followed that Catherine was a "critic" in terms of the different categories of response to the Internet as a social, economic and educational phenomenon.

9.12 A WINDOW INTO CATHERINE'S CLASSROOM

This section presents data from the researcher's period of observation in Catherine's classroom. It offers a metaphorical window into the physical learning environment, the nature of Catherine's teaching with computers and the Internet, and the overall pedagogical design of the classroom programme.

Learning Environment

The school was well equipped in terms of hardware with the majority of classrooms having two computers, albeit that some were quite old (e.g., Apple Classics). There were at least two computers with Internet capability connected to a central server within the middle and senior school. Catherine had one of these computers in her classroom. In addition, the school had a mini Technology Suite, including eight networked computers, which was in its second year of operation. The school also possessed a number of Alpha Smart type keyboards for general classroom use but these mini word processors were incompatible with some of the standalone computers. As part of the school's ICT long-term plan, there was a gradual move toward electronic publishing. With this goal in mind, the ICT Co-ordinator was slowly revising the school Website so that there would be a page for each class to publish material directly on the Internet.

The physical arrangement of Catherine's learning environment was characterised by three distinguishing features: the array of pot plants, the collection of ethnic artifacts from different cultures, and the range of icons and logos hanging on the walls from major international corporations (e.g., Nike). Furniture was positioned to maximize space and to allow groups of students to work together. There were five groups within the class, each with a unique name including an even mix of boys and girls. There was a large mat area at the front of the blackboard, which was used on a regular basis for class discussions. A teacher's table was to one side of the mat and this was where students often talked with Catherine during the day. In the opposite corner of the classroom, there was a special display area with books and materials relating to the current theme. At the rear of the classroom, there was a sink unit and storage area as well as an old chair that formed part of a time out area.

A near new Macintosh G3 computer and printer were located in the rear corner of the classroom beside the network connection. The standard size monitor was partially blocked from the nearby student desks by a small screen, and what was known as the "Computer Corner" was lavishly decorated with displays of computer-generated work. Another older style Apple LCIII computer was located in a small storeroom, situated between the adjoining classrooms.

In sum, the classroom was colourfully furnished throughout with a combination of teacher artifacts and student work samples. Together these left the impression that it was a unique and challenging learning environment in keeping with Catherine's meticulous and socially conscious teaching approach.

Computers and the Internet

The Apple LCIII computer had pre-installed several older productivity tool applications—for example, *ClarisWorks, HyperCard, MS Works, MacDraw* and *MacPaint.* In addition to this software, there was a selection of public domain games, including *Battleship, Hangman, Hot Air Balloon, MacYahtzee, Risk, Solitaire* and *Tetris.* However, with the exception of *ClarisWorks,* it appeared that Catherine made little use of this computer. She reported that students occasionally used it for any overflow of their writing and word processing activities in the same way as the portable Alpha Smarts. By all accounts, the students played the aforementioned games only during wet lunch breaks only when the class was confined to indoors.

The single Internet enabled Macintosh G3 computer was equipped with *ClarisWorks* and *Microsoft Office,* which included the standard software bundle of *Word, Excel* and *PowerPoint.* It also had installed *KidPix, Inspiration* and *StoryBook Weaver* as generic tool software. According to Catherine, few students utilized the full range of readily available tool software and generally *ClarisWorks* was the package of preference for most presentation and publishing work. That said, the students created *HyperStudio* projects, usually in small groups, whenever there was a topic that lent itself toward this type of hyperlinked electronic presentation, which was typically two or three times per year. A feature of these presentations was the extensive use of the digital camera as an alternative portable scanner for incorporating images and photographs in the body of the work.

With regard to content software, there were several packages installed on the computer or available as CD-ROMs including, *Encarta, Sim City, Oregon Trail, PM Books, The Magic School Bus* and *The Logical Adventures of the Zoombinis.* Despite the availability of this software, there was little evidence to suggest that students made regular use of it during the year. This observation was probably consistent with Catherine's view that most of the

instructional software was of dubious educational value. In her opinion, this type of software conveys many false and potentially dangerous assumptions and has limited place in the classroom programme.

In terms of email, students could send and receive electronic messages using Catherine's allocated school address in *Eudora*. Before this, *Hotmail* accounts had been used as a solution to the problem of student email. However, this had proved to be unsatisfactory because of the time it took to access *Hotmail* and the cost of being online using the Web. The use of the teacher's email address was not ideal as this meant that students could potentially access personal messages intended for the teacher. A solution to this problem was a dedicated email address for each class, which the school planned to introduce within the next six months. In the past, email had been used to gather first hand information on topics of study. Earlier in the year, for example, the students had used email to investigate the living conditions in Indonesia where they formulated and then asked questions of pupils attending an international school. This took place over four weeks and involved a rotating arrangement where each day a different student pair was responsible for checking and responding to email.

In a related theme study, entitled "The Logos", email was used by the students to gather information and send messages of concern to a large multi-national corporation on their documented use of child labour. Despite the lack of response from Nike, this had been the most successful use of email to-date. According to Catherine, the students not only wrote lengthy and well-reasoned messages of complaint based on their research, but took the opportunity to send email attachments of photographs of their alternative logos and anti-child labour posters using the digital camera. Thus, the students genuinely perceived a real audience for their work. The lack of response from Nike was not seen by Catherine to detract from the value of the task, as was often the case with previous email exchanges.

In terms of Web access, Catherine did not tightly restrict students from browsing the Internet with *Netscape*. She described student use as under "loose supervision" where there was always a specific focus to the information gathering. While Catherine maintained a reasonably open approach to Internet access in her classroom, she acknowledged this was a matter of considerable debate amongst the staff and Board of Trustees. According to Catherine, there was a far more restrictive regime elsewhere in the school and the other teachers were either unaware of her practice or respected her view that the classroom was her space where she was responsible for setting the rules. At the time of the study, the school had an Internet safety policy but they were not using any filtering software to block potentially inappropriate Websites.

Mostly, students used the Internet to access and disseminate information relating to the current topic of study, as evidenced by the organization of bookmarks, which utilized a separate folder for each topic. This was further evidence that Catherine was technically competent at using an Internet browser. Often Websites were saved in advance as bookmarks prior to student use, which was more efficient and minimized the potential for off task behaviour. The following Websites, for example, were bookmarked by Catherine in advance of the aforementioned theme study:

Nike
http://www.nike.com

Reebok
http://www.reobok.com

MacDonalds
http://www.macdonalds.com

A feature of computer and Internet access was that students frequently worked in pairs or small groups following an established schedule. The schedule was displayed for everyone to read on a chart beside the computer. Although the system was revised from time-to-time, the basic method involved each group being allocated one day on the computer for each week of the term. The groups were then responsible for deciding whose turn it was to access the computer at a given time on their allocated day. This required the students to negotiate amongst themselves and provided some flexibility in that individuals and small groups could often continue to work until they had finished rather than stop and wait for another turn the following week. Even with this system, throughout the period of observation, there was never enough time to satisfy the demand for the computer.

Another distinguishing feature of the management system for computer and Internet access was the use of student assistants. Each group had a designated assistant responsible for helping other students with any problems they encountered. The role of the assistant was explicit in the three rules that covered computer use—namely, 'be sensible, share with others, and seek help from the computer assistant'. These assistants acted in a number of capacities including software tutors and technical experts but often their help was not always positive. Catherine identified this problem in her interview response during Phase Two. She expanded on this by pointing out how on occasions the student assistant strategy was a distraction and it prevented some pupils from spending valuable time on their own work. There was evidence, moreover, to suggest that the assistants commanded a lot of power in the classroom. They were observed during the week to show off their technical prowess, which undermined the ability of other students and even challenged the teacher's own skill and knowledge.

The Technology Suite was timetabled for all classes throughout the week and Catherine usually took advantage of her allocated hour on Wednesday afternoon. Typically, access coincided with either a whole team assembly, music or physical education activity. This meant that Catherine, or another teacher, was free to supervise the work undertaken in the Technology Suite. On the other hand, it resulted in the smaller group of students often missing some important activities taking place in the middle and senior school (e.g., rehearsal for the end of year school production). This was a matter of concern to teachers, if only because it posed a number of complications when planning class and team activities. It appeared, therefore, that the Suite was not fully integrated within the mainstream of the curriculum.

Table 9.3
Sample of Websites Listed as Bookmarks - Catherine

Website	URL Address
TKI	http://www.tki.org.nz
Global Net.2000 Summit	http://www.globalnet.org.nz
The Hunger Site	http://www.thehungersite.com
EdWeb	http://www.edweb.org
Teaching Online	http://www.teachingonline.org
Ministry of Education	http://www.moe.govt.nz
World Wide Fund for Nature	http://www.wwf.org.nz
Teachers@Work	http://www.teachers@work.co.nz
Globalschoolhouse	http://www.globalschoolhouse.com
Consumer Kids	http://www.consumerkids.govt.nz
English Online	http://www.english.unitechnology.ac.nz
Reebok	http://www.reobok.com
Antarctic Centre	http://www.iceberg.co.nz
Telecom Encore Programme	http://www.tef.telecom.co.nz
Education Gazette	http://www.edgazette.govt.nz
Nike Corporation	http://www.nike.com
Roger Wagner	http://wwwrogerwagner.com
Child Cycle Safety	http://www.cyclingnz.org.nz

Catherine used the Suite for a range of computer-related activities depending on the current topic or theme study, but the students predominantly spent time on writing and publishing applications within the context of language and social studies. Notably, a range of content software such as *Outnumbered* and *Treasure Mathstorm* was available to teachers, but the noise generated from these packages was prohibitive, especially when another class was using the Library. Although headphones were used to reduce the noise level, only one person could listen to a computer, which meant this technical constraint limited the potential for student-student interaction.

In like manner, the technical features of the network and the nature of the Internet connection often made the use of the Web problematic and unreliable. Apparently, it was impossible without a lengthy delay to simultaneously access the same Website from the eight networked computers. This greatly limited the opportunity for whole group instruction using the same Website, which required teachers to develop backup options and alternative management techniques when using the Internet. These problems meant that Internet access in the Technology Suite was used less by students and more by teachers before and after school for lesson preparation and professional development purposes. The pages saved as "bookmarks" confirmed that the Internet was an important source of information for teachers, as evidenced by the selection of Websites and URL addresses listed in Table 9.3.

Classroom Programme

The pedagogical design of the classroom programme was prioritized for teaching social and critical citizenship skills. It placed strong emphasis on exposing students to real world problems as a way of developing better informed and more enlightened attitude, skill and knowledge. The dominant theme throughout the classroom was that people have to learn how to live together in harmony and more equitably share the world's rapidly diminishing resources. This socially conscious theme went much further than preparing students for the future—a central tenet of the school's mission statement—by attempting to teach children how they can contribute to making a better world. Thus, a real feature of the classroom was the democratic nature of the decision-making processes and the strength of feeling toward many of today's social, economic and environmental problems. This meant that throughout the observation period the classroom was an emotionally charged and highly political environment.

It followed that Catherine expected students to express their opinions and think for themselves. This meant that, in turn, she placed high value on developing competent oral and written communication skills, which was apparent throughout the language and reading programmes. Students were encouraged to debate controversial topics, for example, the significance of Christmas in New Zealand's multicultural society. This debate occurred in the context of the forthcoming school production with a strong Christmas theme. The ensuing discussion evoked a strong reaction, which Catherine carefully managed by ensuring that each student spoke and was listened to by their classmates. Although some people dominated the discussion more than others, it was apparent that everyone had the right to speak and be heard in Catherine's classroom. At the end of this discussion, the class voted on the statement that: Christmas was a commercial rather than religious celebration—the vote was narrowly lost!

While the programme promoted a high level of social interaction where students respected one another's opinion, Catherine managed this carefully. She was without doubt the leader of the classroom. She readily accepted this role, as demonstrated by the system where everyone was accountable for achieving a class, group and individual goal negotiated at the beginning of the week. Each group also had an elected leader who was responsible for the overall functioning of their group. At the end of the week, the group leader reported to the class on how well they had worked together. Despite the sense of collective responsibility, the students still looked to the teacher to facilitate and manage the classroom interaction. Hence, Catherine adopted a dual role in which she attempted to lead by consensus.

Overall, the classroom programme was characterised by an authentic, problem-based curriculum that reflected an egalitarian approach to learning and teaching. An enduring impression was the critical perspective embedded in many of the learning activities with a focus on the world outside of the classroom. In this regard, students made limited but purposeful use of the Internet under Catherine's supervision to investigate, understand and more widely publicize a number of real world problems and issues. Access to the Internet was constrained, however, by the technical limitations of the technology itself, and the lack of time and heavy demand on the computer in the regular classroom. Consequently, the Internet competed with writing, desktop publishing and presentation activities, which dominated computer use. In sum, Catherine's classroom was a well-organized and highly politicized learning environment where the Internet was used strategically to highlight some of the perceived social, economic and environmental problems confronting the world.

9.13 LISTENING TO CATHERINE'S VOICE

This section presents data from the biographical life-story and post observation informant interview. It describes Catherine's response to five main themes: (a) why I became a teacher; (b) what teaching means to me; (c) what the Internet means to me; (d) how my teaching and use of technology has changed over the years; and, (e) the most significant outcomes of Internet use—both good and bad.

Why I became a Teacher

Catherine provided two main reasons for becoming a teacher. First, she believed that the future of humankind depended upon people who were prepared to challenge the unjust and privileged nature of capitalist Western society. She was a committed socialist who regarded education as a basic human right. In her view, teaching was an obvious career for someone who wanted to address the inequitable distribution of power, wealth and resources in Aotearoa/New Zealand. It was clear that Catherine wanted to make a difference as reflected in the following comment:

You can't just accept the way things are... Teaching for me is a way of subverting the system... Don't underestimate the potential of education because it does change the way people think. My own education taught me that... I want my pupils to understand the unjust world in which we live... If we don't educate the children then the entire world will suffer the consequences of global capitalism.

Second, Catherine wanted to continue a family tradition since her mother and grandfather had also been teachers. Her grandfather, in particular, was a strong influence and she vividly recalled some of his experiences in the 1930s as a young teacher and foundation member of Labour Party. This is how Catherine described her calling to become a teacher based on the inspiration of family tradition:

As a young girl I would listen to my grandfather. This was probably the beginning seed for my teaching career. He would talk politics with my uncles and I would listen to the stories... They had such passion back then for democracy... He chose teaching because it was the way out and education was not universal... I think he wanted to bring it to the people... I've always admired his commitment like that. He was my inspiration.

What Teaching Means to Me

To Catherine teaching was inherently political. It was not simply a job. In keeping with her motivation to follow a teaching career, universal education had far wider significance. In short, she regarded education as the vehicle for greater democracy and social mobility offering the potential for a more equitable and egalitarian society. So, teaching was seen as a principled profession with a long and honorable tradition dating back to Aristotle and Socrates. Indeed, Catherine endorsed the Socratic approach and was highly critical of her colleagues who merely implemented the *New Zealand Curriculum Framework,* as evidenced by the following statement:

How would Socrates get on in today's classroom? You can't ignore these issues. Because life is a struggle... It's the only hope they have. We have to teach today's children to be tomorrow's problem solvers. That's why I expose the children to controversial stuff. That is what education is about... I get frustrated when I see other teachers going through the motions. They've accepted the factory model... I won't do that because we owe it to our forefathers... and future generations... to create a better and more sustainable society.

In reflecting on her teaching career, Catherine admitted that most colleagues and senior management totally understood her educational philosophy—moreover, in practice, it was not always well received by parents and caregivers. In her view, a good teacher was always 'challenging young minds to question accepted norms' as long as this was done within accepted boundaries. It followed that she often was perceived to be difficult and even disruptive in the wider context of the school. In her own defense, Catherine did not see teaching as a popularity contest and believed that it was almost evitable she would alienate those people who supported the status quo along with those who advanced "New Right" educational reforms. While outside of the classroom there was always a degree of professional tension, Catherine was thankful that in most schools this was left in the staffroom. This is how she described the sanctity of her own classroom:

> *The thing I enjoy about teaching is the classroom is my space. Because it's where I get to be myself... The children see the real me. No one else tells you how to teach. People respect your right to teach in the way you think best... It's my sanctuary... This is where I can challenge the children. Ok you get the odd hassle but most people don't really know what 's going on... It's a very private place.*

What the Internet Means to Me

Catherine believed the Internet was a seductive technology that on the one hand had tremendous potential to benefit all of humanity. She cited the growth of *SeniorNet* as an example of how the advent of the Internet had built a stronger sense of community and rejuvenated an interest in learning amongst the elderly. On the other hand, it was just as likely to cause a great deal of harm especially if the Internet was used to spread the tentacles of globalization and free market reforms. In this regard, Catherine used a vehicle analogy to explain her misgivings about the Internet:

> *You have to understand the Internet's military origin. Like most new technologies it started with the US military... So you can't take it at face value... I mean most people think cars are a great invention. Did you know they reckon these have killed more people than any war this century... And because look at the pollution and... the impact on the environment in ways that we're only beginning to understand... Do you understand why I'm becoming deeply suspicious of the claims? The Internet is no cure all solution you know.*

This last comment referred to the way in which the Internet itself was seen as a vehicle of the globalization movement. According to Catherine, globalization needed the Internet as much as the Internet depended on globalization. There was a symbiotic relationship. She predicted that it was unlikely the Internet would improve the basic human rights of people throughout the world. Rather, it was far more likely to perpetuate and proliferate the huge gap between the poor majority and the privileged few. This sentiment was reflected strongly in the following comment:

> *The Internet has expanded globalization but it's not responsible for it. It goes much deeper than that because the sweat shops existed before the Internet... Did you know there are over 250 million child labourers working to fill the consumption needs of the West... and despite what they tell you free trade hasn't solved poverty in the West let alone the third world... The problem is that the Internet makes it possible for a new kind of cultural imperialism... You show me how the Internet has improved the basic human rights of these people and I'll be more convinced... Get real they don't even have access to the telephone.*

How My Teaching and Use of Technology has Changed

Catherine testified that her basic teaching philosophy had remained unchanged although with academic study and greater teaching experience she had become more articulate, confident, and self-assured of its theoretical foundation. If anything, the advent of the Internet had accentuated her philosophy, which contained a strong egalitarian ethos and was built on the principle of promoting democratic citizenship. Accordingly, she valued active participation in the learning process, the development of critical thinking skills and a problem-based approach toward teaching. This is how she described her philosophical approach in the classroom:

> *I have strong views... based on a democratic and egalitarian tradition. I think learning has to be real ... I've always tried to be true to my principles. I like to treat the children as equals... They are far more critical than you realize... We need to trust their sense of fairness and use that as strength. This doesn't always work cos... there's always a tension between giving children control of... and then turning around and playing God. The children hate that... I try to resolve this by being democratic and fair myself... They know I'm sincere. I'm on their side... But they're only children and I'm not prepared to accept any crap in my classroom. That's what I'm fighting against.*

Catherine had experimented with a range of educational technologies over her teaching career, and based on this experience she made an important distinction between early attempts at integrating computers in education and the rapid growth of the Internet in schools. In her view, the early years of educational computing relied on a few dedicated teachers who were committed to innovations in learning and teaching. This was a period of grassroots innovation with little central support. In contrast, the Internet was perceived to be a large-scale initiative being promoted in schools for reasons yet to be fully explained. She was wary of the real agenda:

> *I've lived through this. I might be wrong but I think my experience counts for something... In the early days of computing we were far more critical of the learning. Yes, there were the techies but most teachers took little notice... For many years there was no support for educational computing... Hey, I've been using a word processor with my children for most of my teaching career... Now it seems we're being told to embrace the Internet without questioning the rationale behind it. There's a big difference. Because the government is driving this. It's no longer about an old computer in the corner. It's much bigger than that... There are huge implications... It's time to seriously question the agenda and look at the bigger picture.*

The Most Significant Outcomes of Internet Use

Finally, Catherine was asked to describe the three most significant outcomes of Internet use—both good and bad—thus far. Her response to this question lent further weight to the Internet's potential and elaborated on some of the identified barriers to computer integration. In addition, Catherine revealed a number of lesser-known outcomes, which provide deeper insight into the risk and rewards of Internet use.

Speaking positively, Catherine reported the Internet had helped to make learning more authentic by providing a window on the world—albeit that the world outside of the classroom was not a safe place. In this regard, the Internet exposed students to more timely and extensive educational resources that, in turn, helped to challenge their understanding of the world. Similarly, it opened a channel of communication that had increased contact with people from outside of the classroom. In the classroom itself, internet-based learning experiences had fostered a stronger feeling of togetherness. In an ironic way, the Internet had increased Catherine's sense of purpose and strengthened her resolve and educational philosophy. It had also changed the kind and nature of information that teachers were using in their lesson planning and preparation. This is how Catherine described some of the positive outcomes:

I can't deny the Internet has opened up a new window. Because that's good and bad. Our real world isn't what we think it is you know... Still that's allowed me to expose them to some tremendous stuff. Right up to date... And the ability to send email adds another dimension. Because it has put the children in touch with people first hand... The relationships have changed... It's helped me build more togetherness and a healthier atmosphere in the classroom... Personally, for me, the Internet has renewed my passion and purpose for teaching... Strange positive. It makes you realize what we're fighting against... A positive outcome, I think, is the way staff use it in their work. It's having an impact on the type of teacher resources we use.

From Catherine's perspective, there were many potentially damaging outcomes associated with the Internet in schools. The most serious was the social, economic and ideological assumptions relating to globalization that were both inextricably linked to, and promoted aggressively through, the Internet. Catherine repeated her stance that globalization was a deliberate attempt to exploit people in underdeveloped countries and perceived that few teachers understood the long-term costs and implications of embracing this movement. In terms of pedagogy, she warned of the displacement cost of spending so much time on ICT and the Internet over and above other educational initiatives. Catherine pointed out that time was a precious commodity in the classroom. She was particularly critical of the hours of professional development that had been wasted on teaching computer skills—even though this was what teachers wanted. The use of the Technology Suite, or lack of, was another notable outcome. In this regard, Catherine reported that no outcome was perhaps the most significant outcome—that is, the lack of fundamental change to teaching practice in most classrooms. This is what Catherine had to say:

It has to be globalization. Because look at how the Internet has expanded the global market and changed our perception of the world. It's seen as a good thing... We're all chasing the same pot of gold. There will be winners and losers. The real losers will be the third world... Teachers haven't got a clue of what's going on. Where this goes... We will pay the price... It's crazy for us to be spending all this energy on ICT. It doesn't make sense... I'm all for using computers in education but not when it's at the cost of my teaching. We have so little time to devote to computers. Proportionately the amount of PD is ridiculous... I tell them the skills are a waste of time... How often does the Suite get used really? I mean for worthwhile learning. Not the fill ins we've always done. Teachers are still teaching the same way... No change is the same as a change if you know what I mean.

9.14 CATHERINE'S STORY

This section presents Catherine's autobiographical story expressing in her own words insights and thoughts on different aspects of learning and teaching and the use of educational technologies in schools. Given the deeply personal nature of this story, the narrative is presented as a whole without interpretative comment.

There have been three crucial periods and major influences on shaping my identity as a teacher. Firstly, my early years as a child growing up in a very political home laid the foundations to my teaching career. This period taught me to always ask "why". My grandfather never accepted official explanations at face value. People have always said I follow him. I inherited his inquiring mind and social conscience. You could say I have a die hard socialist and latent revolutionist within me trying to change the world.

Also my mother was important because she was a teacher and was successful in her own right. My Mum is an intelligent person and I owe her a great deal for the sacrifices she made for us children. She was a great role model.

The second major period in my life was the last year of Teachers' College and the first couple of years as a beginning teacher. It was in the final year that I realized I was going to be a good teacher. I knew that teaching was definitely for me and after my first year I began to grow in confidence and eventually blossom. Those early years were hard work. However, we had a lot of fun and there was a great sense of comradeship amongst the younger teachers. In hindsight I think it was the blind leading the blind; but we quickly sharpened our senses and I leaned a great deal from pushing the boundaries, and crying over the failures with another beginning teacher. We became great friends and we still keep in touch.

The third period is the time I spent studying toward my masters degree. At first it was a real struggle but to my surprise I found that thinking different was valued in this environment. Toward the end I loved it because the theory seemed to all come together for me. My study helped to provide some of the missing pieces; it equipped me with the knowledge of critical and feminist theory that enables me to better understand the hegemonic forces at play in education. I see the curriculum in a different light and this has helped to better understand my role as a teacher. My study has challenged me to reflect far more deeply on my own teaching.

I recall two key moments that left a lasting impression on my attitude and approach toward educational computing. There are probably others but the first relates to the software SimCity. When my school first purchased this we let some of the older children try it out. Initially I thought this looks like a good piece of software because it contains a people dimension. The children seemed to enjoy, so I took it home for the weekend to check it out for myself. Once I got the hang of it I began to realize the simulation was based on some flawed assumptions. First it rewarded you for keeping the city in the black without any consideration of other priorities, specifically the people. The whole city was based on an economic model that taught children our choices are constrained and limited always by money. It was highly authoritarian and undemocratic even though the goal was to be reelected the mayor. Actually, the way the software worked if you wanted to be successful you had to build a police state. For instance, when crime got out of hand you solved this by building more police stations. Otherwise you had to use the bulldozer to try to demolish the buildings and district where crime was getting out of hand. My experience with SimCity alerted me to look more deeply at this software and reminded me that technology comes with its own values.

The other key moment was several years ago when I was attending a conference. This guy was showing off his latest gimmick. He had the audience gasping at what this thing could do. I looked around the room and wondered what I was doing there. It was more like an apostolic church gathering than an educational conference for a group of highly dedicated teachers. This was the new God! Sure, I was impressed by the technology but I decided there and then they were worshipping a false prophet. The conference experience brought it home to me why so many teachers are not prepared to wholeheartedly embrace computers. Few are dumb enough to believe the hype.

My theory is that most teachers have an intuitive resistance and deep suspicion toward efforts to promote social goals of education and equality through technology. It is ingrained in a teacher's psyche. When you have learned about the past failings of computer technology and know that technology can be blamed for war, famine and the destruction of the environment, there is a legacy of resistance built up from one generation to the next.

I would like to acknowledge three people who have significantly contributed to my educational philosophy and therefore understanding of educational computing and now the Internet. Firstly, I would have to acknowledge my admiration for John A. Lee who helped to build the welfare state. He was prepared to stand up for what he believed and pay the price. Here is a quote from one of his many books:

> *'Should the machine socialize man [people] or should man [people] socialize the machine?' (John A. Lee, 1962, p.11).*

The second person is Paulo Freire. The ideas in his book Pedagogy of the Oppressed have always stayed with me, and I would never want to become a teacher who just "banks" information. This is what I see is happening with professional development. We seem to think that by banking more ICT skills then teachers will become more enlightened and therefore use computers for better ends in their classroom. How will this really make a difference in the longer term?

Thirdly, I would like to draw attention to the work of John Pilger. More than anyone Pilger has exposed how the corrupt profit motivated practices of the West are contributing to the uneven distribution of wealth between developed and undeveloped nations. For instance, I wonder how many people know that approximately 34,000 children die everyday and the vast majority of these deaths are the result of malnutrition. It is claimed that for every $1 in overseas aid from first world countries $13 returns in debt repayment. Is this our fault? John Pilger shows that we have to take responsibly when one person in the West contributes more to the destruction of the environment than approximately 70 people in the third world. Our consumption of new technology is part of the problem; so teachers must take action if we are to prepare a generation of more socially responsible citizens.

The Internet has influenced my life and work as a teacher in several ways. Like most technology there is a good and bad side. On the good side the access to information has been great. The World Wide Web has given me a vast reference library at my fingertips. It has given me more importantly the ability to better inform myself and talk with like-minded people. It has been very powerful to find out that other people on the other side of the world share your concerns. This has been great in the classroom.

On the bad side it has meant more work. It has made teaching far too complicated. It has distracted me and I would say other teachers from doing the basics. Is it a good thing for teachers to be working longer hours because we need to learn the ICT skills? Teachers are committed people; at times we keep working when we should stop. When you have the skills you then spend more time finding a lot of relevant (but also useless) information on the Internet. You just keep working until eventually you hit the wall. I was spending far too long on the Internet at school and at night for my own good. You find it invades your private life.

I see the Internet as bringing a new form of exploitation and colonialism that will eat away at our way of life more than any type of other global media. Far more than television. The Internet comes as a modern serpent for the decline of the state, the rise of individualism and the erosion of our culture. Thankfully in the face of e-commerce and euphoria for technology shares, the Internet is helping to mobilize opposition to global capitalism. I see this as the great paradox of globalization. To me the Internet symbolizes everything that is good and bad about Western society.

There are just two final points that I would like to make concerning the use of computers and the Internet in schools.

Firstly, why expect teachers to integrate ICT into the curriculum when the curriculum promotes the status quo. The lack of curriculum integration actually is a good thing. Whilst we need change, teachers should be suspicious of the branding of ICT by the Ministry of Education as an enabler of curriculum reform. Who asked for this reform in the first place? The ICT Strategy is pretence for social, economic and ideological agenda that if realized will work against good teaching and learning. My point is that socially responsible teachers must be critical of these reforms and teachers must have a greater role in shaping policy.

Secondly, we need to stop chasing the rainbow. There is no pot of gold! The search for a technological solution offers false hope; it keeps teachers busy and preoccupied with low-level ICT skills when we face major problems; there are major changes going on that teachers should be informed of. We have a far more important role to play in the scheme of things. Teachers just are not cogs to implement government policy. We need to debate these reforms.

I find it alarming that a growing number of teachers are prepared to follow the Pied Piper. There are people endorsing these changes and even championing them within the teaching profession. It goes beyond ICT. The recent attempt at bulk funding illustrates my point. Think about it, some schools opted for bulk funding probably because they could spend more money on computers. This is an example of the pragmatism that has entered the teaching profession in recent years. We are too easily persuaded by enticements and the false promises of what the technology will do for us. The result is a more fragmented and less principled teaching profession. My point is that teachers need to reclaim their profession if we truly desire a more democratic and egalitarian Aotearoa/New Zealand.

9.15 INTERPRETATIVE SUMMARY OF CATHERINE

Catherine was an accomplished computer-using teacher with a long background in educational computing. She was highly qualified and held strong views on the nature and purpose of teaching. Her teaching philosophy was derived from early personal experiences, her beginning years as a classroom teacher, advanced study of formalised educational theory and deep opposition to the globalization movement. Catherine was ardently opposed to globalization, which profoundly influenced her beliefs, perceptions and practices toward the Internet. In her own words, she was "a die hard socialist and latent revolutionist... trying to change the world". Without doubt, Catherine lived her philosophy in action, as evidenced by the critical nature of the learning experiences and the democratic way in which she organized the classroom. In practice, Catherine adopted a leadership role, which fostered respect, open debate and critical thinking in the backdrop of an uncertain future. The climate of the classroom encouraged genuine interest in the outside world and students were expected to take individual and collective responsibility for their own learning. There were few disruptions to the classroom programme and it was highly organised to maximise learning opportunities. Despite this, there was a lack of time to fully utilize the Internet and computers were used chiefly for word processing, desktop publishing and presentation activities. While there was evidence that Catherine personally used the Internet, during the observation period there was no use of email and limited use of the Web by students. At the time of the case study, Catherine was an agitated teacher extremely wary of the forces behind the use of the Internet in schools. In sum, Catherine was a political activist and passionate thinker in her response to the Internet as a social, economic and educational phenomenon.

9.16 SYNTHESIS OF EMERGENT THEMES

This section provides a synthesis of the emergent themes from the narrative-biographical and micro ethnographic case study material. It reports how the Internet has affected Andrea, Barry and Catherine's experiences, perceptions and practices and, in turn, how the teacher's experiences, perceptions and practices have affected the Internet. Although the participants were each unique and strikingly dissimilar as teachers, they share many beliefs and common traits concerning the rapid growth of the Internet in education. These are synthesized in the following emergent themes:

1. A recurring theme was that teaching—that is, pedagogy—is a deeply emotional and inherently political activity often with subversive intentions. All three teachers mediated the curriculum and the Internet as an educational innovation through their own emotional, political and ideological lens, which led to very different conceptions of learning, teaching and technology integration.

2. Teachers' commitment to teaching as a moral and ethical profession was a common feature. They all wanted to make a difference beyond their own classroom and two of the teachers expressed a particularly strong sense of social justice. The teachers shared a belief that teaching did make a difference and all three were endeavouring in their own way to better prepare students for the future.

3. Mistrust of government reforms and of the Ministry of Education was another notable theme. Teachers were suspicious of hidden agenda and ulterior motives behind the ICT-related school reform movement. This was fuelled by the legacy of previous reforms and the involvement in education of the business sector. Notably, teachers offered thoughtful and well-reasoned explanations for opposing some of the current ICT-related initiatives in schools.

4. A stand out feature of the teachers was their ability to improvise, interchange roles and perform a multitude of tasks depending on the circumstances. In the classroom, all three teachers adopted and skillfully moved between learner and teacher-centred pedagogical approaches. There was no single approach or teaching metaphor for their Internet use. Notably, teachers viewed the classroom as their own private space where they could perform in a manner that best matched their artistry and enacted their educational philosophies and worldviews.

5. There was agreement that the Internet had created opportunities for more authentic learning and helped to bring the outside world into the classroom. It extended the possibilities for real world experiences and each teacher had embraced these in accordance with their educational philosophy. At the same time, the Internet provided an unwelcome window on the troubled world that potentially threatened the safe haven of the classroom.

6. The teachers expressed growing disquiet over what students were learning through ICT. It was noteworthy that the Internet was not "read" by the participants as a neutral tool. While most students had quickly assimilated the Internet into their way of life, all three teachers were uneasy about the negative side effects and the perceived hidden curriculum of capitalism, consumerism and globalization.

7. A consistent trend was the limited use of the Internet by students. The most frequently used computer applications in the three classrooms remained traditional word processing, desktop publishing and presentation tools. An important by-product of using email and the Web was enhanced computer skills, but the "content" metaphor dominated most internet-related learning experiences.

8. The three teachers concurred that to date the Internet was more a source of information for lesson planning and preparation rather than a student tool and classroom resource. It was providing these teachers with access to information and timely resources that had expanded their horizons and changed their conceptions of the world. Despite this, none of the teachers had transformed their teaching because of the Internet and they perceived that ICT was treated an exotic extra by most of their colleagues.

9. Technical problems associated with Internet access were raised on a regular basis. Teachers complained of slow download times and unreliable Internet connections especially at peak hours. This wasted valuable time, constrained what was feasible and required teachers to develop previously unnecessary lab and classroom management strategies. The use of student-helpers for training and troubleshooting was a common strategy but this often created another layer of problems. In short, technical difficulties intruded on the act of teaching.

10. A displacement cost was associated with the use of the Internet in schools. Teachers pointed out how the Internet competed with other computer uses particularly given the limited time for ICT-related activities. Moreover, the advent of computer suites and the allocation of dedicated time for ICT in the classroom programme displaced other curriculum areas. Thus, teachers identified a hidden cost with the introduction of the Internet and ICT generally within schools.

11. There was unanimous agreement that the advent of the Internet and the growth of ICT had contributed to additional teacher workload. All three teachers reported that they were spending more time on computer-related activities and this was sometimes at the expense of other aspects of their work. Consequently, they felt overworked. The participants also understood why other teachers perceived that ICT was too much work for the limited rewards.

12. The perceived deskilling of the teaching profession was another noteworthy theme. A common perception was that ICT-related professional development had distracted teachers from other curriculum initiatives. Although computers skills were personally valued by many people, the participants believed that these did little in the long-term to help teachers understand the bigger picture of education including the ethical and moral purposes of teaching.

In sum, the findings highlight the idiosyncratic nature of teaching and the teacher's subjective realities towards the Internet as an educational innovation. Of particular note is the way the Internet had challenged teachers to reflect on the nature of their own teaching and as a consequence the growing level of resistance toward the discourse of the ICT-related school reform movement. In the past, this type of resistance has been dismissed as nothing more than a neo-Luddite reaction from an inherently conservative teaching profession. This assumption needs to be seriously challenged based on the response of these experienced educators who are clearly innovators and early adopters of the Internet. Broadly speaking, Phase Three has shown how the Internet has affected teaching and also been affected by teachers—for better and worse.

9.17 SUMMARY

This chapter has described the results for the final phase of the research. It presented narrative-biographical and micro ethnographic case study material on the beliefs, perceptions and practices of three experienced internet-using teachers, under the pseudonyms of Andrea, Barry and Catherine. Two mutually compatible research methods combined to disentangle the teachers' pedagogical beliefs and lived experiences through a multi-layered narrative. A portrait of each teacher was constructed from an aggregation of data using a variety of sources. Then, a deeper level of insight was provided through a metaphorical window into the teachers' classroom from the researcher's observation. This was amplified by the teachers' voices, as they responded to questions about their teaching and use of the Internet for pedagogical purposes. The teachers' stories followed where they reflected in their own words on their work, theories of practice and deeply rooted knowledge of education. Finally, an interpretative summary along with a synthesis of emergent themes brought together the different layers of data to understand how teachers are experiencing and reshaping the Internet as a social, economic and educational phenomenon.

The following chapter presents a discussion of the results in relation to the emergent themes from each phase of the study.

CHAPTER TEN

Discussion

'Meaning is radically plural, always open, (...) there is politics in every account' (Bruner, 1993, p.1).

10.0 INTRODUCTION

This chapter presents a synthesis of the main research findings. It discusses the major points to emerge from the study in terms of a duality between how the Internet has affected teachers and how teachers' lives and work culture have affected the Internet—for better and worse. The discussion is centred on 10 main types of effects that give rise to a number of inherent tensions. A rough portrait of the New Zealand educational technology landscape is then sketched from the tensions and individual mindsets embedded in the research sample and the shape of the topography is shown to amplify rival theoretical positions in the literature. At a deeper level, the new digital landscape is claimed to consist of a number of competing and coexisting discourses that share a socio-cognitive language of persuasion to advance their own hegemonic agenda. From a post-technocratic political economy perspective, the discussion endeavours to reframe the teacher's role around critical pedagogy and pedagogical activism in the backdrop of a number of dark clouds looming on the digital horizon. Finally, the chapter reflects on the methodological limitations that need further consideration when judging the quality and trustworthiness of the research.

10.1 HOW THE INTERNET HAS AFFECTED TEACHERS

This section discusses how the Internet has affected teachers' lives and work culture since its rapid introduction as a technical and pedagogical innovation in New Zealand schools. It argues that it is a myth to believe nothing changes when teachers adopt a new educational technology into their classroom practice. On the contrary, the Internet has clearly had an impact on the nature of teachers' work, despite the self-perception of limited pedagogical change by participants. Although many changes are worthy of further discussion, the standout effects of the Internet are reported under the themes of: (a) school organization and classroom management, (b) displacement costs, (c) collegial relationships; (d) workload considerations, and (e) teachers thinking more globally. For convenience, a synthesis of the above themes appears in Table 10.1. The five themes selected for discussion over and above many other points are chosen because they have received little attention in the literature and the related tensions contain significant implications for the teaching profession.

Table 10.1
How the Internet has Affected Teachers' Lives and Work Culture

How the Internet has Affected Teachers		
Effects	Emergent Findings	Tensions
School Organization and Classroom Management	• Ongoing technical problems • Growth of labs and computer suites • Often intrudes on the act of teaching • New challenges to classroom management • Conception of ICT as a standalone subject • Technology does not easily mesh with the classroom • Limited improvements to the quality of the curriculum	Tension between school culture, the social milieu of the classroom and the physical and metaphorical design of new computer technology in the curriculum.
Displacement Costs	• A number of hidden costs • The Internet competes with other computer uses • Gradual displacement of less fashionable software • Growing source of information for lesson planning • Time for ICT has displaced other learning activities • Transfer of pre-existing problems to new contexts • Distracted teachers from other aspects of their work	Tension between the potential value the Internet adds to the curriculum as opposed to what the ICT school reform movement might take away from the regular classroom programme.
Collegial Relationships	• Growing gap between teachers • Lack of support from colleagues • Heightened levels of frustration • Emergence of specialist teachers • Increased friction in collegial relations • High status of ICT leads to new power structures • Passive acceptance/resistance of ICT movement	Tension between connected and disconnected teachers, which is a divisive force in shaping the future direction of the curriculum and the goals of the teaching profession.
Increased Workload	• Never enough time • Too much work for limited rewards • Difficult to juggle competing demands • ICT Co-ordinator is often a thankless job • General intensification of teachers' work • Most teachers perceive they are overworked • Some teachers feeling the strain of leading change	Tension between teachers' commitment to pedagogical innovation and the increased workload associated with the adoption and implementation of ICT in schools.
Teachers Thinking More Globally	• World is both smaller and larger • Outside world has entered the classroom • Has opened a window on the troubled world • Extended possibilities for real world learning • Strong international influence informing practice • Teachers using the Internet in professional capacity • Pedagogy reshaped in the backdrop of globalization	Tension between the ways the Internet promotes a global perspective whilst also bringing more standardization and homogeneity, which contributes to greater local fragmentation.

School Organization and Classroom Management

The Internet has clearly impacted upon school organization and classroom management with both desirable and undesirable effects. Indeed, the same effect can be both positive and negative depending on the individual teacher's perspective and the school environment in which they work. The lesson is that the effects are not uniform or as powerful from one school or teacher to another, as evident from the different responses to the advent of the lab or computer suite. This development is probably the best example of how the shift from standalone PCs to networked machines with Internet access has directly affected upon the day-to-day organization and management of teachers' work.

On the one hand, labs have helped to solve the problem of Internet access and provided teachers with a sufficient number of computers for small group and whole class activities. Some teachers have welcomed this development. At the same time, even these teachers acknowledge that the lab, along with the added sophistication of school networks, has created a host of new technical difficulties often intruding on the act of teaching. It is fair to say that technical failures and immature infrastructure continue to plague the use of new educational technology in schools, as evidenced by the problem of slow and unreliable Internet access. The research on the ICTPD Cluster Programme confirms this, as by the end of three years of sustained professional learning, approximately 90% of the participating teachers reported that equipment breakdown/technical problems were either a concern or significant concern in the use of computers for learning and teaching (Ham et al., 2002).

As a unique teaching space, the lab also adds another layer to the challenge of classroom management that even accomplished teachers find problematic. The shift from the classroom to a dedicated computer learning environment is associated with heightened levels of excitement along with increased student motivation—perhaps a short-term novelty effect. Whatever the source, the rules of engagement in a computer lab are quite distinct from those in the regular classroom. The design constraints of the lab and its physical separation from the classroom means that small groups are sometimes left unsupervised as the teacher attends to other students. During lab time, the level of noise can be a problem especially when the dedicated computer facility is located alongside the library. The potential for off-task behaviour is high as simultaneous Internet access from more than one machine is problematic. Effective use of the lab does not happen by chance. All in all, teachers have needed to adopt and refine a number of new instructional strategies along with a set of explicit rules or clear expectations when they teach in the lab. The lesson is that in trying to integrate the Internet into the regular classroom programme various systems and organizational changes have usually occurred to manage the computer. Hence, the Internet is not just assimilated into existing classroom practice. It shapes and redefines the nature of the classroom programme and is part of a process of mutual adaptation (Knupfer, 1993).

It is also important to note that lack of computer and Internet access was not a major problem in the first place for some teachers. Alternatively, they framed this problem in an entirely different light as illustrated by those teachers who had little or no intention of using the Web with students due to their own or other peoples' concerns over Internet safety. The point is that the advent of the lab or computer suite was not the solution to the educational problems that even a purposive sample of internet-using teachers perceived as most pressing in the crucible of their own classroom. Lai and Pratt (2003) show in their evaluation of the Otago Primary Schools Technology Project that teachers have mixed feelings about labs. In many ways, the rapid growth of computer labs in primary and intermediate schools reflects an institutional response to the ICT movement based on a first order definition of the problem. It assumes that teachers are looking for a solution to the problem of computer and Internet access when many of them may not perceive such a problem exists. The question that has yet to be asked is how many New Zealand teachers actually perceive greater Internet access is central to overcoming the real educational problems they experience on a daily basis in their work. Policy-makers may be surprised by what teachers have to say when the right questions are asked and time is taken to listen to their responses.

In real terms, however, as a physical entity, the lab has inevitably resulted in a number of flow on effects, which have led to important changes to job descriptions, the structure of the classroom programme, and the content and delivery of the curriculum itself. With the creation of labs, coupled with the drive to extend networking and Internet access across the school, the position of the ICT Co-ordinator has taken on new meaning and a host of new responsibilities as Lai and Pratt (2003) describe. In some cases, this has become a dedicated position in which ICT is scheduled in the lab as a standalone subject from the regular classroom programme. The obvious strength of this kind of specialist instruction is that more students can be *doing* ICT on a regular basis. That said, evidence suggests that instruction is sometimes limited to students learning ICT skills, which arguably does little or nothing to advance the goal of promoting active and meaningful learning.

Irrespective of what students actually do in the lab, it is noteworthy that Norris et al. (2003, p.24) report 'lab access must be at least regular and predictable, two or three times per week, before it has a measurable effect' on the curriculum. This claim may be problematic to substantiate but it arises from an alarming finding that 60% of the 3500 teachers involved in a recent United States (US) survey use computers with their students less than 15 minutes per week—that is, equivalent to three minutes per day (Norris et al., 2003). Although international comparisons are problematic, there is remarkable similarity in the pattern of computer access and usage between the US teachers and those in the present study. In contrast, the report on *Aspects of Technology* from the National Education Monitoring Project found that 36% of Year Four students use a computer at school most days (Crooks & Flockton, 2001). Lai and Pratt (2003) also report in their Otago study that on an average day

students claim to use computers for nearly 25 minutes. It should be noted, however, that less than 30% of the Otago teachers reported students use the computer on a daily basis and over half rarely use the Internet at school.

While the Ministry of Education has encouraged the proliferation of labs through initiatives such as the *Financial Assistance Scheme,* a limitation of this centralised top down response is that it does little to encourage rank-and-file teachers integrating ICT within their own classroom. A number of participants identified this problem and spoke of how the lab has served to retrench the level of curriculum integration across the school. Of course, it needs to be noted, the concept of integration is poorly defined in the literature (Earle, 2002). In response to this problem, Ham et al. (2002) propose that there are five main types of integration:

- *curriculum integration—the extent to which an ICT activity relates to appropriate curriculum goals and to the same curriculum content as other learning activities in a given unit of work;*
- *spatial integration—the extent to which the use of ICT is separated in place or location from other learning activities in a given unit of work;*
- *temporal integration—the extent to which an ICT activity relates to other prior, concurrent or subsequent learning activities occurring in the classroom;*
- *pedagogical integration—the extent to which the choice of particular ICTs and the ways in which they are used are consistent with the pedagogical philosophies, orientations and intentions of the teacher, and student learning styles, abilities and motivations;*
- *attitudinal integration—the extent to which teachers and students alike take for granted, regard as routine, and do not see as special or problematic in any way, either the use of any ICT for any given learning task or its technical operation.*

Arguably, the above categories of integration are the most valuable contribution of the research on the ICTPD Cluster Programme. That said, there is still an implicit assumption embedded within these categories that integration is the ultimate goal and they offer no explicit recognition of the need for teachers to go beyond what is currently possible by reconceptualizing the curriculum itself. Putting aside this criticism, there is limited evidence across each research phase to suggest that the sample of internet-using teachers have employed their new computer labs to promote greater curriculum, spatial, temporal, pedagogical or attitudinal integration. This is partly explained by the distinction Zhao et al. (2002) make between "access" and "easy access" and teachers distance from available technological resources, which they posit are key barriers to the integration of new computer technology.

On a positive note, the effects of the lab are not all bad, as some teachers report this facility has opened up a number of new pedagogical opportunities, especially when the curriculum is designed to utilize the computer suite alongside the existing classroom machines. It has also required some teachers to rethink the priority they give to certain curriculum areas as they make provision for time in the computer lab. However, the lab, or indeed school-wide networking, has failed to overcome the spatial separation of computer-related activities from mainstream curriculum tasks, as it would appear the majority of classroom computers are still located in alcoves, adjacent storerooms and the corner of the class. As Ham et al. (2002) observe, there is a tendency to view the computer as an added extra, which is reinforced by the "clash" between the physical constraints of the technology itself and conventional classroom design, along with the way teachers separate the computer by bookcases, makeshift partitions and so on from other curriculum activities. This physical and metaphorical clash illustrates a key difference between teachers' *adoption* and *implementation* of a new educational technology in the social milieu of the classroom.

Paradoxically, on the one hand the lab has opened up greater access to the Internet in schools and potentially increased the amount of time students spend on the computer. On the other hand, it may have had the effect of reinforcing the conception of ICT as an exotic extra or standalone subject requiring specialist instruction. This paradox adds further weight to Selwyn's (1999) claim that the computer does not easily mesh with the everyday culture of the classroom programme. In Demetriadis et al. (2003) terms, school and ICT cultures have different traditions that are initially in tension, which strengthens the argument that the "added value" of ICT is highly dependent upon whole school pedagogical alignment. As Alton-Lee (2003) writes:

> *The principle of alignment explains why 'add-ons' imposed upon curriculum and conflicting interventions can be ineffective or even counterproductive for students (p.72).*

From a learning organization perspective (Senge, 1994), it is questionable whether the current "digital classroom" movement is a truly aligned attempt at integrating new educational technology throughout the school. The concept of the digital classroom—that is, one where students have intensive access to new computer technology including laptops—is almost an admission that ICT is too difficult or problematic within the regular classroom. If the current solution is labs or special classrooms in which certain teachers work with carefully selected students using an array of new computer technology, albeit embedded within active and meaningful tasks, then ICT is doomed to fail as an institutionalised innovation. Arguably, this is another example of tinkering toward utopia (Tyack & Cuban, 1995). The move to introduce digital classrooms fails to accept that the *push* to use ICT does not sit comfortably with some teachers' values as apparent during Phase Three.

When all is said and done, the relatively poor level of integration cannot be ignored as this pattern is consistent throughout the literature. In the United Kingdom (UK), for example, Harrison et al. (2002, p.3) concluded in their recent evaluation that 'the proportion of lessons involving ICT was generally low'. In a similar vein, the research on the ICTPD Cluster Programme in New Zealand found that relatively few teachers:

> *...managed to achieve full integration in the sense of the transparent and almost subconscious absorption of a variety of ICTs into the accepted and unproblematic routine of daily classroom life (Ham et al., 2002, p.118).*

The lack of integration might not be a bad thing if teachers are expected to assimilate computers into their existing work practices. Even from this viewpoint, however, little solid research evidence exists of ICT adding value to the curriculum beyond what happens in a minority of classrooms. In the latest Learning Centre Trust survey of New Zealand primary schools, no more than 63% of principals perceived that ICT is making major improvements to the quality of curriculum delivery (Fink-Jensen, Johnson & Lau, 2003). In addition, less than 60% of principals reported that ICT is making major improvements to the efficiency of the curriculum. Although these data reverse the downward trend in previous responses, this is rather flimsy evidence of the beneficial effects of ICT on the curriculum. Lai and Pratt (2003) present a slightly more optimistic picture, but even so less than one-third of teachers perceived their teaching had improved to a moderate or large degree since using ICT, which hardly instils faith in the huge investment in new computer technology. Sadly, the teaching profession remains vulnerable to a neo-conservative backlash until there is a better understanding of the Internet's effect on school organization and classroom management—for better and worse. When the differed layers are peeled away:

> *Tension: #1*
>
> *A tension exists between school culture, the social milieu of the regular classroom and the physical and metaphorical design of new computer technology within the curriculum.*

Displacement Costs

It is apparent from the present study that the introduction of the Internet has caused an internal disturbance to the normal rituals and routines of school life. Few teachers have been entirely sheltered from the ripple effects of the ICT movement on the traditional structure and delivery of the curriculum. Although the study has provided a glimpse into the potential of the Internet, it has also shown the ICT-related school reform movement has a number of hidden costs that to date few people acknowledge—let alone fully calculate.

Evidence from the study indicates that the Internet competes with other computer uses and since its arrival in the classroom programme there has been a rapid and predictable displacement of less fashionable software. Ham (2001) confirms a significant decline in language-based simulations, as they were virtually absent from the student activities observed in the research on the ICTPD Clusters. The effect of a wider variety of available software is that teachers are not necessarily using more computer applications, more frequently, but they have replaced what they once used with the popular icons of the latest educational technology wave. In particular, the popularity of multimedia presentations and the use of the Web have displaced traditional applications such as interactive fiction. Interestingly, email has been less popular which Lai and Pratt (2003) confirm. Broadly speaking, the displacement of these applications is more marked at the senior level where teachers make greater use of the Internet for pedagogical purposes.

Irrespective of the level, there is a cost associated with the emphasis on ICT in terms of the amount of time and resources assigned to existing curriculum activities. There is only so much time in the press of the classroom and The Arts and Physical Education may have borne the brunt of this cost as there is evidence some teachers have reduced these activities to create more space for ICT in the timetable. Another cost is using students as technical assistants, which has to be measured against what else they could be doing. The hidden cost of ICT has become more apparent since classes are expected to utilize the computer lab on a regular weekly basis. In this sense, access to the lab has merely redefined or transferred the problem of lack of time for computer integration rather than addressed the root cause of the problem. Ironically, this problem now means for some teachers lack of time to get to the lab as opposed to insufficient time to utilize the classroom computers. In the literature, there is a basic failure to recognise that lack of time may be an outcome of an already crowded curriculum and the poor conditions under which teachers often work.

Another important displacement cost has been the attention directed toward ICT at the expense of other pedagogical innovations. Even though in some cases the emphasis has not been on ICT *per se*, a hidden cost exists from privileging hi-tech innovations over and above alternative forms of low-tech curriculum development. The key point is that there are choices of where to focus efforts and the benefits of ICT in schools must be judged against what could potentially be achieved in other areas with the same level of resources. This point has rarely been taken into account, if ever, when researchers and policy-makers attempt to justify and evaluate the beneficial effects of new educational technology. As Brown (2003a) illustrates in a parallel analogy, imagine that instead of ICT there was a concerted and high profile strategy to implement a comprehensive new health, leisure and recreation programme in schools aimed at creating a fitter, healthier and more vibrant society. While the choices we face are not binary, the question is would such a national health strategy with an equivalent level of funding represent a better long-term investment in the future of today's youth?

Following on from this, evidence that teachers are making greater use of the Internet in their lesson planning and preparation is not by itself a point to celebrate. Remember, access delays and the difficulties of simultaneous Web browsing required teachers to develop a backup option and thereby duplicate their planning. Despite the weight placed on this criterion in the policy discourse and ICTPD Cluster research, this measure of uptake is a crude indicator of teachers Internet adoption—let alone implementation. Arguably, the proliferation of Web-based curriculum materials does little or nothing to address the reasons why teachers need these resources in the first place—that is, they have inadequate release and preparation time. Instead this practice merely:

> ... *compensates teachers for their lack of time by providing them with prepackaged curricula rather than changing the basic conditions under which inadequate preparation time exists (Apple & Jungck, 1998, p.152).*

While new digital objects and online resource banks have considerable promise, they also have potential to distract from the process of resource development, which is arguably central to the creative art and applied science of good teaching. What evidence is there that good teachers make frequent use of other peoples' pre-packaged resources? With the proliferation of online lesson plans and idea banks along with a host of new Web-based learning experiences, there is a danger that teachers will spend less time developing their own original materials. Good teachers may not need these resources. As Apple and Jungck (1998) posit, these resources may serve as deprivations because they limit the emotional, intellectual and political dimension of teachers' work. The key point is that the use of the Internet in lesson planning and preparation is good and bad simultaneously and teachers should not lose sight of potential displacement costs.

Putting aside these costs, there is still limited evidence that teachers' adoption and implementation of ICT, and the Internet specifically, has affected the level of student achievement. To date, the research shows that ICT can help produce more standardized outcomes in certain topics and subjects but with few consistent relationships (Harrison et al., 2002). However, the international literature is open to conjecture because much of the research evidence attempts to measure the significance of ICT against prescribed achievement standards. Such research can never demonstrate whether teachers have employed new educational technology to truly develop more creative, innovative and talented students. Arguably, as standards become more precise they stifle students' capacity to think and be creative (Eisner, 2000). Hence, educators need not be too alarmed that after three years of the ICTPD Cluster Programme the majority of New Zealand teachers (73%) do not perceive new educational technologies have led to increased student achievement as measured by formal testing (Ham et al., 2002). Indeed the lack of effect on this measure could be interpreted as positive. Overall the enduring point is that:

Tension: #2

A tension exists between the potential value the Internet adds to the curriculum as opposed to what the ICT-related school reform movement might take away from the regular classroom programme.

Collegial Relationships

In the professional discourse, there is unprecedented support of the Government's attempt to entice teachers into using the latest educational technologies. It is hard to find a politician let alone a teacher who publicly disagrees with the considerable faith the current Labour Government has invested in ICT as part of their attempt to modernise schools and build a new Knowledge Economy. A strong parallel can be drawn with the UK where Selwyn (2002a) claims:

> *The current educational climate has been infused with a sense of technological evangelism, reminiscent of the utopianism prevalent at the beginning of the 1980s (p.8).*

On the surface, this observation rings true in New Zealand. However, at a deeper level the results of the present study suggest that this comparison paints a somewhat misleading impression of the actual level of support from within the teaching profession. After all, Phase Three taught us that even teachers who are early Internet adopters have serious misgivings about the current policy direction of public education. These teachers may not be alone.

While most of the internet-using teachers reported a high level of support from their principals and boards of trustees for the current emphasis on ICT in schools, the lack of perceived collegial support was a standout feature of the study. In Selwyn's (2001) terms, it would appear that a minority of teachers are "switched on" to the latest educational technology wave whilst the vast majority are actually "turned off" or at least relatively passive accepters/resisters of the ICT-related school reform movement. Broadly speaking, ICT has failed to win their hearts and minds. Put another way, the effect of the Internet and the ICT movement generally has been to amplify and/or create a gap between so-called "connected" and "disconnected" teachers. In this regard, there is evidence in the study of an increasing digital divide within the teaching profession. If this is the case, policy-makers need to be careful that the gap between teachers is not viewed from a deficit perspective. There is reason to believe that some teachers have given lip service to the advent of the Internet in schools because they genuinely value other aspects of the curriculum over and above the use of ICT. As Goldstein (cited in Meadows & Leask, 2000) reminds us:

> *Evidence still indicates that the majority of teachers use ICT only occasionally and often under a sense of obligation rather than conviction of its value as an educational medium (p.2).*

This type of half-hearted compliance is understandable when some teachers do not take kindly to *outsiders* promoting the use of ICT in schools. It is generally accepted that schools are highly political institutions where not everyone's voice is heard nor has equal weight in the decision-making process. The lesson is that some teachers may be far more philosophically opposed to the push to use ICT than currently appreciated, as illustrated by those participants who objected to using Microsoft™ software. Policy-makers should not assume that teacher resistance is irrational as it may be morally sound since few top-down changes in education are benign (Crump, 1999). Thus, it is not a simple case of the less connected teachers needing to catch up with more technically advanced colleagues.

A deficit view of teaching treats resistance as a problem when it should be valued as a strength and source of insight. Indeed a better appreciation of the sources of resistance is central to the concept of "social awareness" that Zhao et al. (2002) claim savvy teachers require to successfully implement an educational innovation. Rather than focus on closing the gap between teachers, there is a need to understand why the gap exists in the first place. After all, the durability of any educational technology depends on the creation of an environment where alternative viewpoints are encouraged and valued rather than despised. As Hargreaves and Fullan (1998) point out:

> *We must learn from resistance (...) If we are serious about the moral purposes of empowering and learning from colleagues, then resistance to technology should be treated with respect, as a source of insight and not as a sign of awkwardness and deficiency (p.79).*

Yet, opposition is often apostasy. Instead of respect, the level of resistance to ICT was perceived as an increasing source of conflict and tension between colleagues. A number of participants were frustrated by other teachers failure to embrace the imperative to better prepare students for their technology-induced futures. Thus, rapid developments in new educational technology appear to have helped advance the perception of a deepening chasm between the real world and the sheltered world of the classroom. In a quirky sense, the added friction between teachers puts a different twist on Bigum's (2002) notion of "design sensibility" where the Internet is about relationships rather than information delivery. In terms of collegial relations, there has been a basic failure to recognise:

> *Ensuring that technological change will really benefit student learning depends on it being driven by its critics as much as its most ardent advocates (Hargreaves and Fullan, 1998, p.79).*

The point is that resistance to an innovation is almost inevitable. Evans (1996) argues that change always generates friction between people because it invariably produces winners and losers. Thus, an educational 'change is neither natural nor normal, constant nor common' as it involves a deeper struggle over who will win control of the curriculum (Evans, 1996, p.25). If this struggle is to be taken seriously, teachers must be given the opportunity to debate the relative merits of an innovation before it is thrust upon them. Up until now, there is little evidence of critical debate of alternative viewpoints as the types of concerns expressed by Anne, Barry and Catherine have yet to be acknowledged in the professional discourse. The voice of critics has also been missing from high profile ICT initiatives illustrated by the recent *Knowledge Breakfast*[1] (Television New Zealand, 2002) television series where the "info-commercial spin" arguably promotes a one-sided view of learning through technology (Brown, 2003b). In many ways, this television series was a blatant celebration of what O'Neill (2002) describes as "enterprise technology" in which teachers are expected to build capacity for the new Knowledge Economy. As Dawes and Selwyn (1999) have shown, the messages in the popular media about ICT do not always resonate well with teachers.

The salient lesson is that imposed change and lack of teacher ownership often leads to low morale, dissatisfaction and reduced commitment. As Hargreaves (1997, p.18) posits, if the affective dimensions of educational change are ignored, 'emotions and feelings will only re-enter the change process by the back door'. This might be the unanticipated distal effect of the so-called digital revolution unless teacher resistance is placed at the centre of discussion. After all, trade-offs, mutual adaptation and open debate greatly increase the likelihood that changes to teaching practice will be sustained. In the absence of such debate, Fullan and Hargreaves (1992) identity seven possible consequences when experienced teachers are subjected to imposed change. Teachers might:

- *continue to work as before;*
- *form cliques, factions and enclaves;*
- *leave for another job;*
- *offer general resistance to or even sabotage the change;*
- *shift the balance of their lives to other things;*
- *grasp the opportunity to implement the change; or*
- *use the opportunity to gain promotion and develop a new teaching career.*

[1] This was produced for TVNZ as an eight week pilot series by the independent production company e-Net Limited, with funding and resource support from New Zealand On Air, TVNZ, Microsoft, the University of Auckland, the Ministry of Education, Learning Media Limited, Education Media Australia and CWA New Media. It initially ran from 25 May to 13 July, 2002.

The advent of the Internet has probably evoked all of these responses. Even so, the research suggests that a small proportion of teachers only have embraced the digital revolution—perhaps the 17% in Harvey and Purnell's (cited in Rogers, 2000) terms. The so-called "high flyers" have thrived on technological change, as the need to keep up-to-date and try new things is what these teachers reported to enjoy most about their job. They liked to be at the cutting edge but as Lai and Pratt (2003) allude to this can sometimes lead to resentment amongst other staff. Arguably, the dynamic nature of the Internet has pushed the edge well beyond previous technological innovations, which has not only extended the gap between colleagues but is creating a new breed or category of teacher.

While speculative, it is of concern that the current ICT-related school reform movement may have steered younger inexperienced teachers towards a less critical, ideological, and politicised conception of teaching. Clearly, this trend requires further investigation as it was not an original focus of the study and nor has it been investigated previously in New Zealand. In the future, as schools rush headlong into setting up their hi-tech digital classrooms, the danger is that teachers may end up producing nothing more than low-tech post industrial digital workers for electronic factories of the Knowledge Economy. Without a critical understanding of pedagogy in its wider social, historical, and political context the real casualty of the digital revolution may be the loss of a teacher workforce that is fleet in mind but steady in heart toward the goal of promoting critical thinkers, critical consumers and critical citizens.

It is also of concern that for no fault of their own some teachers may have acquired special status because of their technical skill rather than their pedagogical knowledge. The new technical language associated with the Internet coupled with the added sophistication of school networking has virtually demanded that a handful of teachers acquire specialist ICT skills. As a result, the unintended effect is that a small group of specialist teachers—that is, ICT Co-ordinators—may have acquired their own power structure and relations within the school organizational hierarchy. This observation recognises that the position of the ICT Co-ordinator is not neutral as it confers on teachers a certain degree of power and prestige. There is no denying from the results the Internet has been good for many of the participants; it has given their work a new sense of direction and generally enhanced their career prospects. Not surprisingly, specialist ICT teachers have been found either consciously or subconsciously to withhold expertise as a way of maintaining privileged status (Bryson & de Castell, 1998a). Although there is no direct evidence of domain defending from the teachers involved in the study, researchers need to remember that schools are dynamic sites in which conflicting wills, contradictory purposes, organizational tensions, and opposing agendas play out (Goodson et al., 2002). In the backdrop of the micro politics of schools, the privileged status of the ICT Co-ordinator over and above other positions of responsibility may lead to a less democratic model of educational change. As Hodas (1993) posits:

A technology that reinforces existing lines of power and information is likely to be adopted (a management decision) but may or may not be implemented (a classroom level decision). The divergence of interests between managers and workers, and the potential implementation fissures along these lines is a source of much of the implementation failure of widely-touted "advances" (p.3).

In other words, the emergence and deliberate promotion of a group of teachers who champion the use of ICT along the lines of official policy may be counter-productive to the creation of an environment where alternative views are valued and ultimately the Internet moves from adoption to implementation, and from assimilation to reconceptualist curriculum integration. Although the advent of the Internet has disturbed the equilibrium and led to the restructuring of schools both spatially and managerially, there is little or no evidence in the study of the ICT movement having resulted in the reculturation of teachers' work. On the contrary most of the participants were engaged in a kind of internal conflict where:

Tension: #3

A tension exists between connected and disconnected teachers, which is a potentially divisive force in shaping the future direction of the curriculum and the fundamental goals of the teaching profession.

Workload Considerations

Across the board, teachers report an increased level of workload associated with the implementation of the Internet into schools. Clearly, the position of ICT Co-ordinator has taken on new meaning and a host of new responsibilities. With these responsibilities, some teachers speak of the ICT Co-ordinator as if it were really two jobs rolled into one, which Davidson (2003) confirms in her study of the emergence of the specialist educational technologist. Teachers were expected to keep a watching brief on hardware and software, provide leadership and professional development for their own colleagues, and continue to teach a class of students. Those who complain of insufficient time talk of the difficultly of juggling the competing demands of maintaining an overall watch on ICT while doing justice to their own class. To their credit, the internet-using teachers represented a group of highly dedicated professionals many of whom work exceedingly long hours. For this reason a number of teachers were hesitant about taking on this position, as they perceived it was too much work for the limited rewards, especially when equipment failure and the pressure to adopt ICT was a source of tension between colleagues. In short, most teachers perceived they are overworked and many appear to be feeling the strain of leading change in such a dynamic field of development.

There is no question that effective use of ICT involves extra work on the part of the teacher. Despite this, there is a tendency to believe in the policy discourse that recent efforts to equip schools with new computer technology will make teachers' work easier. While ICT can have a positive effect on reducing workload (Becta, 2003), generally the internet-using teachers do not share this perception. Ham et al. (2002) report, for example, that teachers involved in the ICTPD Cluster Programme perceived increased stress and workload as an outcome of their efforts to introduce more ICT-based activities. Even with the added resources and financial support of the ICT cluster they report:

> *The main perceived effects on teaching of introducing ICT-based activities into classroom learning programmes were to (...) increase teacher stress and workload. Teachers were divided on whether or not incorporating ICT activities made it easier or more difficult to teach their class as a whole, or easier or more difficult to individualise lessons (Ham et al., 2002, p.7).*

There is an important message here for politicians, policy-makers and principals alike. Yet, these groups still expect and encourage teachers to embrace the digital revolution. The so-called revolution is beyond reproach. While teachers do have some control over their own workload, one of the problems is that ICT does not stand still and an endless stream of new technical developments confounds extra work. The lesson is that if effective use of ICT requires a great deal of extra work, including forgoing weekends, holiday breaks, and even working more in the evenings, as Lai and Pratt (2003) tend to confirm, then efforts to institutionalise the innovation may be doomed to fail.

Interestingly, there is evidence from the present study that several of the more experienced teachers have become cynical of the claims or have found the demands of integrating the Internet into the classroom programme unrealistic. On the whole, teachers spent considerable time planning and preparing for ICT-related activities in their classroom. Even so, few teachers perceived they were able to give the commitment to ICT that it really deserved. A lasting impression from the case studies was the lack of time available for using new educational technology in the classroom programme. The point is that there may be potentially unrealistic expectations of what teachers can do with ICT in the regular classroom. Are policy-makers setting teachers up for failure? In one case, the teacher was so worn down by the ongoing demands of the technology and the negative attitude of other staff that he was beginning to question whether computers are worth all the effort. Is this a sign that the novelty of ICT may be wearing off amongst more experienced internet-using teachers? Whatever the conjecture, if researchers analyse the time available to teachers and what they are being asked to do with ICT under their current working conditions, along with other aspects of the job, the sum of the expectations might be greater than what any rank-and-file teacher could possibly fulfil in the normal course of their day.

Of course, it is known from a recent New Zealand Combined Trades Union (NZCTU) (2002) study of changes in work patterns and family and social relationships over the last decade that people are working longer hours, and technology—at least the way computers are used—has substantially blurred the boundaries between home and work. An ethnographic study of 10 different families found that:

> *For many workers, cell phones, text messaging, e-mail and laptops, have forced work into the home in new ways that lengthen working days and intensify work (NZCTU, 2002, p.1).*

Generally, the intensification of work and the blurring of traditional work boundaries is confirmed by the sample of internet-using teachers who all report using the Internet in some professional capacity at home. The dilemma for the teaching profession is that new computer technology has allowed greater flexibility of work but may have also contributed to additional workload and greater demands on time. As Schofield and Davidson (2002) report in their longitudinal study of Internet use in US schools, lack of time was the single most pressing barrier. Buss (2001) also identifies insufficient time as a key obstacle in his Delphi study of critical elements of Internet projects. Thus, the work-flexibility paradox requires further investigation in light of recent initiatives to provide teachers with laptop computers.

At the same time, it is important to acknowledge that ICT is not the sole source of the perceived increase in teacher workload. There is a need to shift attention to the context in which the technology is used if researchers are to avoid the trap of technocentric thinking. In a survey of how schools view educational reform 10 years on from *Tomorrow's Schools,* Wylie (1999) found that teachers' average work-week rose gradually between 1990 and 1996 and jumped noticeably between 1996 and 1999. Seddon (1997; cited in Smyth et al., 2000) summarises the changes occurring to teachers' work in the following way:

> *Teachers' work has intensified as social and organizational demands have increased; teachers feel less valued in the community; teachers' work has become more routinised and subject to accountability; and, as a result of cuts in education funding, teachers work in increasingly poorly resourced workplaces (p.5.).*

As Harker et al. (1998, p.7) observe in the context of the reforms to New Zealand primary schools over the past decade, there has been a dramatic escalation in workload 'with some reports suggesting increases on average of at least six hours per week'. Previously Livingston (1994; cited in Harker et al., 1998) found that New Zealand primary teachers

worked on average 54.5 hours per week. In Livingston's study, when teachers were asked what would make their jobs more worthwhile they reported:

- *smaller classes;*
- *higher salaries and increased recognition for their work;*
- *the amount of paperwork needed to be reduced;*
- *better-phased curriculum innovation;*
- *more non-class-contact time; and*
- *more flexible working hours.*

A notable absence from the above list is the use of new computer technology. It would be interesting to replicate this study given the rapid growth of the Internet and the current move by the Government to fast track broadband Internet access for schools (e.g., Project Probe). The question is what educational problem does broadband Internet access solve and whose solution is it to the real problems teachers face? Undoubtedly, one of the main problems confronting teachers is the high workload, as Whitehead (2001) confirms in a study of burnout and occupational stress in New Zealand primary school teachers. In the face of this evidence, there is a danger of assuming some of the aforementioned initiatives will lead to better teaching and conditions of work when many teachers may view enhanced Internet access as a low priority. The fact is that policy-makers simply do not know what most rank-and-file teachers think of new ICT initiatives; it is time to hear their voice.

The teaching profession may pay a hefty price if the factors contributing to increased teacher workload continue to be ignored including the *push* to introduce new computer technology. For that matter, so might society. After all, inevitably an increased workload is likely to impair performance, lead to greater physical and emotional stress, affect personal health and relationships, and interfere with long term job satisfaction. At the end of the day, teachers can only do so much with the resources and time they have available. Thus, educators need to recognise that embodied within the *push* and the *pull* of the discourse surrounding the growth of the Internet:

Tension: #4

A tension exists between teachers' commitment to pedagogical innovation and the increased workload associated with the adoption and implementation of ICT in schools.

Teachers Thinking More Globally

There is no doubt that the Internet is a major force reshaping the nature of teachers' work. One of the greatest effects of the Internet is internationalising the teachers' gaze. There is strong evidence from the present study that teachers are thinking more globally as they access a wider range of resources and begin to participate within new online communities. Of course, the Internet has also opened a window on the real troubled world beyond the classroom that some teachers find distasteful. That aside, the Internet has also contributed to teachers informal learning and their professional development, evidenced by the number of teachers studying online along with those who report using the Web as a means of keeping abreast of new developments. It is debatable whether these teachers would have been as familiar with recent curriculum developments in Australia, Canada, Europe and so forth before obtaining Internet access. Thus, there is reason to conclude that the Internet is helping to develop a better informed teaching profession at least amongst a group of teachers who are avid consumers of professional literature, which is another factor contributing to their becoming more disconnected from colleagues.

However, the internet-using teachers were really stuck between two worlds—that is, the unplugged world of the traditional curriculum and the recently wired world of the digital classroom. In terms of the latter, the Internet has helped the outside world enter the classroom and extended the possibilities for real world learning. Such learning is apparent by the increasing use of electronic guests, virtual field trips and key/pen pal exchanges—albeit limited. On the other hand, few teachers have been able to seize these opportunities, as the above experiences appear constrained by the traditional habits, rituals and routines of school life. Beyond technical difficulties, the curriculum does not always allow teachers the freedom to explore the potential of the Internet with their students. There is a real sense of two cultures in negotiation as the Internet meets the classroom, which is one of the key lessons Schofield and Davidson (2002) identify in their impressive five-year study of US schools.

It may be an oxymoron but as teachers have begun to think more globally, the world appears both larger and smaller. It is larger because teachers have extended their horizons beyond the walls of the classroom and can now access people and a wealth of information from around the world. That said, the teachers did not always interpret this information from a critical perspective, as they were sometimes guilty of adopting an information banking view of online professional materials. This point is apparent from the way they downloaded ideas, theories and resources from other parts of the world (e.g., skill checklists) and applied these with little critique. Arguably, few teachers appeared to model the critical thinking skills they wanted their students to develop through Web-based investigations. It may sound rather harsh but the teachers may have had insufficient knowledge to fully critique these resources—a basic conceptual flaw in efforts to teach information literacy (Brown 2000).

On the other hand, the world is smaller since the Internet along with other global media has shrunk and broken down traditional economic and nation-state boundaries. It has also promulgated a kind of shared global culture, which is epitomised by the rise of individualism, the celebration of technology consumption, and ecologically destructive culture patterns (Bowers, 2000). In the context of the Internet's use in education, this is most apparent in the emergence of global learning networks and new online projects targeted at students irrespective of culture or geographical location. Arguably, such internet-based activities blur the distinction between "them" and "us" and according to Bowers (2000) promote a form of neo-colonialism, which is even more destructive than was experienced in the 19th century.

A different school of thought presents a more optimistic view of global enmeshment. In the 1960s, Marshall McLuhan adopted the position that new technologies would create a "global village", breaking down barriers of distance and language, bringing people a form of wired socialism (Frechette, 2002). He argued that media and technology were an extension of human consciousness, which McLuhan (1994) popularised in the phrase "the medium is the message". What is not so well known is that McLuhan changed his mind shortly before his death. Instead, he warned that humans might become "servo mechanisms" of a new world order controlled by the few at the expense of the many (Frechette, 2002). He was referring to the extent to which the so-called new media had become the ideological vehicles of globalization and neo-liberalism. Bowers (2000, p.118) argues, in response to the democratising thesis, that the "cyberspace citizen" represents 'the most extreme form of individualism at the heart of Western liberalism'. The point of this discussion is that thinking globally should not be confused with thinking critically, as with one or two notable exceptions the teachers in the present study were oblivious of the above concerns.

The lesson is that communities can be fooled—remember the emperor's new clothes (Walker, 2003). As teachers and policy-makers have borrowed ideas and strategies from overseas there is a tendency to assume that global solutions can be applied to local educational problems. After all, most teachers indicated their approval of, and intention to exploit, the plethora of new internet-based activities and resources. The problem is that as a rule pedagogical solutions are local not universal (Willis, 2001). What works in one context may not work in another. Although there are exceptions to this rule, it has two important implications. First, you cannot create self-contained resources and export or download these intact to other settings without increasing the risk of failure (Willis, 2001). Over the years, policy-makers and educational resource developers have tried to produce "teacher proof" materials that are designed purposely to prevent teachers from misusing them—that is, localising them. Cooley and Johnson (2000; cited in Willis, 2001) claim this problem was common with a lot of pre-packaged educational software where:

> *Early forms of educational technology pre-dating the Internet (e.g., instructional film, radio, and television) were often rejected by teachers because they were incompatible with their philosophy of teaching and the daily realities of the classroom. Those early educational technologies required teachers to give up control of the content and presentation while the technology was running. Teachers needed to stop teaching, and students were generally unable to ask questions or have information repeated during instructional delivery. Because the materials were designed to be teacher-proof (...). The futurists were typically non-teachers, largely unaware of factors that would limit the technologies' successful integration into the curriculum (p.313).*

This observation contains some important lessons in terms of the design and intended purpose of new digital objects. There is a danger that these may prove to be a powerful way of exercising further control over the curriculum (Brown & Murray, 2003). According to Willis (2001), much of the ICT-related school reform movement is tied still to the concept of teacher proofing, which is based on the assumption that teachers cannot be trusted; they are not competent and learned professionals capable of making decisions about *what* should be taught and *how* it should be taught (Willis, 2001). To underscore this point, Willis (2001) forcefully argues:

> *There are no universal solutions, no national standards that can be meaningfully adopted for all children in all schools, no national tests that can measure all the important goals of schooling, and no objective, standardized way of comparing teachers as if they were sides of meat in a packing plant (p.313).*

The second implication of the localization rule relates to how curricula and resources are developed (Willis, 2001). If the local context is so crucial, it follows that local participation must be involved in the planning, development and implementation process in ways that give teachers considerable autonomy and decision-making power over what they teach and how they teach it. Willis (2001) states that the curriculum should be teacher enabling rather than teacher proofed. Thus, even at the local level there is a need to recognise that activities and resources should allow for differences of use from teacher-to-teacher, group-to-group and year-to-year. If novice teachers are inducted into a culture of using other peoples' lesson starters and downloading electronic worksheets then new digital objects and online resource banks may have a detrimental effect on their intellectual ability to design, develop and implement local resources suitable for local contexts.

While thinking globally is not all bad and the value of computer networks as a possible antidote to teachers' chronic isolation is well documented (Schofield & Davidson, 2002), the proliferation of online resource banks may be at the expense of the art, craft and applied science of good pedagogy. They may even lead to a kind of pedagogy of poverty. The danger is that increasing access to a wider range of online resources may promote a recipe approach where teachers instruct by exemplar because they have limited time to create their own original resources. It needs to be borne in mind that Ham et al. (2002) report by the end of the ICTPD Cluster Programme, close to 40% of teachers were routinely using the Web to search for lesson ideas. If this practice becomes commonplace, it may promote further globalization of the teaching profession where an online toolbox and international curriculum makes it increasingly possible for teachers to move seamlessly between countries. This is already happening where teachers are being recruited to fill temporary labour shortages, thereby reducing the high costs of training local staff (Brown & Murray, 2003). Such a practice treats education as not only a commodity but also fragments the local profession by undermining teacher status and the situated nature of teaching expertise.

Overall, the disposition of the internet-using teachers to be thinking more globally is entirely consistent with a set of very definite cultural, economic and technological changes known as globalization. There remain heated disagreements about the nature and extent of this phenomenon. The shape of its significance and future impact are far from determined and it is likely that the influence of globalization upon educational policies and practices will have multiple and conflicting effects. Not all of these will be beneficial or bad as the present study reveals. In other words, thinking globally is a double bind as it encompasses both benefits and drawbacks, the latter of which often go unnoticed (Bowers, 2000). Thus, in the backdrop of globalization:

> *Tension: #5*
>
> *A tension exists between the ways in which the Internet promotes a global perspective whilst also bringing more curriculum standardization and pedagogical homogeneity, which potentially contributes to greater local professional fragmentation.*

In sum, there is no doubt the Internet has affected teachers' lives and work culture with a number of intended as well as unintended consequences. This finding rejects the popular belief (e.g., Kearns, 2002) that ICT by itself does not act as a catalyst for major change. Although many changes are very positive, a number of others have been adopted naively or unknowingly—albeit sincerely—without realising the implications. Polese (cited in Willis, 2001) alerts us to some of the possible unintended consequences of the Internet by comparing it to previous technological developments. She draws a parallel to the:

> *The 14th century development of a foot-pedal that freed the hands of European weavers at their looms. That created a shortage of thread that was solved by the importation of the Chinese spinning wheel, which caused a shortage of wool, which led to the use of flax. That made it possible for people to wear linen, but old linen then turned out to be cheaper material than pulp for paper, which made mass-marketing of books possible. And along the way gave rise to riots by weavers who feared loss of their jobs and protests from the cloisters where manuscripts were no longer unique property (cited in Willis, 2001, p.306).*

The lesson from history is that the computer might be the loom and the Web could be equivalent to the wheel that between them have wrought an enormous shift to business and the ways of doing and knowing, the magnitude of which will inevitably lead to significant gains, losses, and transformations that are political in nature. More than ever, teachers must not capitulate unthinkingly to the powerful forces behind these changes and the ICT-related school reform movement; but they clearly cannot turn away from them either and leave the troubles of the world at the school gate.

10.2 HOW TEACHERS HAVE AFFECTED THE INTERNET

This section discusses how teachers' lives and work culture have affected the rapid deployment of the Internet as a technical and pedagogical innovation in New Zealand schools. It argues that it is a myth to believe teachers simply experience the Internet. On the contrary, they reshape and reframe it based on their beliefs, values, and professional relationships, which affects how the Internet is co-constructed by colleagues and experienced by students within the overall school culture. Although many changes are worthy of further discussion, the standout effects that teachers have had on the Internet are reported under the themes of: (a) differential uptake, (b) limited local action, (c) teaching is messy, (d) computer as tool, and (e) technology as progress. For convenience, a synthesis of the above themes appears in Table 10.2. Once again, the five themes selected for discussion over and above many other points are chosen because they have received little attention in the literature and the related tensions contain significant implications for the teaching profession.

Differential Uptake

An enduring theme was the differential level of teacher Internet uptake in line with deeper structural differences in the teaching profession. While a complex interplay of factors appears to have a bearing on whether teachers adopt and implement the Internet in their teaching practice, the deeply gendered nature of ICT requires further investigation. Although women

Table 10.2
How Teachers' Lives and Work Culture have Affected the Internet

How Teachers Have Affected the Internet		
Effects	Emergent Findings	Tensions
Differential Uptake	• Differential gender pattern • Uptake indicative of structural differences • Teachers construct their own narratives of ICT • Complex interplay of factors influence adoption • Little support for stages of technology adoption • Adoption is complex, reflexive and idiosyncratic • Implementation mediated by teacher's philosophy	Tension between what teachers are able to do with their level of Internet access as distinct from what teachers are willing to do with ICT in their classroom programme.
Limited Local Action	• Adoption at senior levels • Student Internet use is minimal • Infrequent use in the regular classroom • Internet mainly used to look up information • Teacher resource rather than student learning tool • Internet is not dominating classroom computer use • Word processing is most commonly used application	Tension between the rhetoric of what is said about ICT and the Internet and what teachers actually do with new educational technologies in the crucible of their own classroom.
Teaching is Messy	• Not a monolithic innovation • Teacher use is highly situated • No single approach to Internet use • Divergent views of accomplishment • Innovation is a deeply subjective experience • Pedagogy does not fit neatly along a continuum • Fluid relationship between beliefs and practices	Tension between what teachers want to do with ICT in the private space of their own classroom as opposed to what teachers are expected to do and enact in the public sphere of schools.
Computer as Tool	• ICT is a toy • Internet is unsafe • Vital tool for work • Important learning tool • Enhances student motivation • ICT is inherently value laden • Many teachers are pragmatic Toolsters	Tension between teachers' conception of the Internet as a learning tool as opposed to work tool--coupled with concern that ICT is simply a play tool or entertaining toy.
Technology as Progress	• Few critics • Resistance is not neo-Luddite • New epoch in human civilization • Need to prepare students for the future • Technology is central to globalization • High level of technological determinism • Enmeshed in the discourse of neo-liberalism	Tension between active and meaningful learning through the future-focused language of enterprise constructivism whilst upholding the goals of equality, fairness and social justice.

seem to have "caught up" to their male counterparts on a number of measures of Internet access, adoption and implementation, once again, there is a danger of assuming a deficit perspective. Such thinking treats the use of educational technology by male teachers as natural, normal, and inevitable and thereby forecloses on the choices available. Having said that, care needs to be taken not to overstate the significance of gender as the sample in both Phase One and Phase Two was skewed toward a group of men with better Internet access and greater personal experience. So, access and experience may be equally if not more important factors than gender alone in the uptake of the Internet by teachers, especially given the comparative increase in perceived capability of women over the two phases. The key point is that gender was not an independent variable as there are a number of potential covariates in Internet adoption (e.g., age, level and teaching experience).

Despite the mutually nested factors that contribute to differential Internet uptake, the weight of evidence that men have been accessing the Internet for a longer period and make greater use of it in their personal and professional lives cannot be ignored. A similar differential gender pattern appears in the characteristics of the users of TKI where Ham and Wenmoth (2002) report that male teachers significantly make greater use of this online resource. Is this a reflection of the disproportionate number of men in senior management positions, for whom Internet access is a regular feature of their job? Alternatively, does it reflect the relative dominance of male ICT Co-ordinators in New Zealand schools? Lai and Pratt (2003) found that men held 40% of these positions in primary schools in their evaluation of the Otago Technology Project. Moreover, 78% of the ICT-Co-ordinators in secondary schools were male teachers (Lai, Trewern & Pratt, 2002). Then again, it might say something about the Web itself, which is claimed to privilege a masculine gaze (Morahan-Martin, 1999; Yelland & Rubin, 2002). Differential patterns of Internet access may be influenced also by the gendered nature of Internet use in the home (Facer et al., 2003).

Whatever the explanation, it is noteworthy that at the beginning of the ICTPD Cluster Programme women reported significantly less confidence than male colleagues (Ham et al, 2002). At the end of the programme, no significant difference was found between men and women—however, this result needs to be treated with caution. First, at the outset basic demographic data were not incorporated into the so-called "Victoria Survey". By all accounts, this was no fault of the researchers but when these data were gathered in follow up surveys the reported gender distribution does not match the total number of participants, which is unexplained by Ham et al. (2002). Second, the fact that teachers were contractually required to complete the ICT survey, knew their responses would be individually tracked, and data of perceived gains were gathered through retrospective recall, must bring into question the validity of the findings. Third, increased levels of teacher confidence may be short-lived since ICT does not stand still, as evidenced by the current interest in personal digital assistants (PDAs). Lastly, gains in confidence should not be automatically attributed

to the ICTPD as teachers were likely to have acquired greater computer experience regardless of the initiative, especially given the rapid growth of home PCs and personal Internet access over this time. In this regard, Ham et al. (2002) fall into the trap of treating statistical significance as causal—a basic error.

This methodological flaw was underscored in a question where 10% of the participating teachers reported that their increase in ICT for lesson preparation was not attributable to the ICTPD Cluster Programme. In fairness, in the area of school administration, Ham et al. (2002) acknowledge both national and school-based initiatives (e.g., the purchase of new equipment) appear to mingle in and complement each other such that the causative link is less straightforward than with regard to teachers' classroom use. Doubt remains, however, over this distinction given the rapid growth of PCs. As one ICT facilitator reports:

> *In some of the schools this shift would have happened [anyway] but the teachers' ability to cope has been helped by the skills and confidence they have gained through their PD (Ham et al., 2002, p.78).*

The point is that there is still lack of good quality information on the way different teachers have incorporated the Internet into their professional lives. Clearly some teachers have embraced the Internet more than others. However, the level of differential uptake is difficult to establish nationally when the latest Learning Centre Trust survey (Fink-Jensen, Johnson & Lau, 2003) is skewed, again, toward (male) principals' perceptions and other important demographic variables are ignored. On the surface, the results of the present study of internet-using teachers suggests that men have influenced the use of ICT in the schools far more than one would normally expect. That said, the gender imbalance is similar to a quick demographic analysis of the presenters at the much-publicised Navcon2k2 (2002) conference. Moreover, the differential gender pattern is more or less consistent with other structural differences in the teaching profession, which make sweeping generalizations problematic. This reminds us that ICT is not an island from other aspects of education and a finer grain of analysis is required to understand differential patterns of Internet uptake.

Mindful of the above remark, the research shed light on an important aspect of differential uptake—namely the myth of so-called stages of technology adoption. The results strongly challenge the metamorphosis hypothesis that presents a model of teachers' progress through a series of well-defined stages before emerging like a butterfly in their personal and pedagogical computer use. Although stage models of teachers' development have become enshrined in the literature, they are stronger on description than on explanation. Few of the models explain the mechanisms of change and most present teacher learning as linear, sequential and individualistic rather than fragile, situated and idiosyncratic with multiple trajectories of professional growth.

If policy-makers are to learn anything from the biographical narratives, it is that teachers do not mediate the change process in logical or predictable directions. Rather, teachers develop their own individual narratives of an educational innovation, which vary and change direction depending on the circumstances. In the case of Barry, there is a possibility that he may have regressed to an earlier stage measured on one of the traditional models of technology adoption. Although speculative, this observation highlights the rational view of teacher development embodied in stage theory, which treats educational technology as a static target instead of one where teachers will always be located at more than one level simultaneously (Ertmer et al., 1999). Thus, the results of the present study reject the kind of blanket analysis from both Cuban (2001) and Kearns (2002) that ICT adoption follows the pattern of other educational innovations. In the future, if stage models are to have explanatory value they need to acknowledge the cyclic, iterative and reflexive nature of the adoption process in which there is a high level of reciprocity between different phases of implementation.

Given this last statement, it is noteworthy that the model of technology adoption proposed by Knezek and Christensen (1999) is still used in New Zealand as a valid measure of teachers' success at achieving the "creative integration" of ICT into new contexts. In the latest Learning Centre Trust survey, for example, principals report that teachers were more often at the "familiarity and confidence" and "adaptation to other contexts" stages (Fink-Jensen, Johnson & Lau, 2003). This indicates some progress since the previous survey, but the researchers have yet to establish whether teachers agree with principals' assessment of their proficiency. That aside, fewer than nine percent of teachers are described as having reached the final "creative application" stage, which suggests there is still much work to be done. To their credit, Lai and Pratt (2003) gather teachers' self-report data on these stages and they too acknowledge there is still a long way to go if ICT is to be integrated into the curriculum. In the policy discourse, the basic assumption is that with further infrastructure and professional development teachers will eventually progress to the final stage. This assumption requires further scrutiny given the evidence in Phase Two that teachers with limited ICT know-how may have a predisposition towards innovation. Again, this point highlights that stages models offer little insight into the process of teacher development.

The key point is that policy-makers should not expect a uniform response from teachers when they are attempting to implement a new educational technology. After all, not all teachers accepted the ultimate goal of curriculum integration or the Government's desire to wire schools, which was plain to see from Phase Three. Indeed, Anne, Barry and Catherine demonstrated in no uncertain terms that teachers are thinking professionals capable of resisting technological innovation based on valuable, well-reasoned, alternative points of view. The lesson is that linear stage models of technology adoption reflect a practical craft view of teaching as they fail to recognize the intellectual nature of teachers' work and the ethical, moral and political dimensions of critical pedagogy.

Following on from this, the importance of teacher beliefs is another area in which the research offers a finer grain of analysis on the level of differential uptake. In particular, the biographical narratives reveal the extent to which teachers do not just experience the Internet but reshape and reframe it based on their lived experiences and deep-seated pedagogical beliefs. There are multiple layers to these beliefs that when peeled away uncover a deeper level of insight into the intensely emotional, inherently political and often subversive nature of teachers' work. In the case of Catherine, she was ardently opposed to globalization and deeply suspicious of the motives behind the ICT-related school reform movement, which profoundly influenced her beliefs, perceptions and practices. In this regard, the research demonstrates how in the future the study of internet-using teachers beliefs must go beyond a focus on learning and teaching *per se.*

A shift of emphasis to teachers' worldviews is likely to uncover a raft of egalitarian, humanitarian and social justice issues that explain why people resist and/or embrace the drive to use ICT in schools. By treating teachers as thinking professionals who build their own identities and construe their own lives, researchers may learn that it is easy to overestimate the importance of external barriers and the extent to which the ICT movement is likely to mould and shape teachers' work. In the case of Anne, for example, the Internet was filtered by a strong religious conviction, which manifested itself in a cautious and suspicious orientation toward the Internet as a social, economic and educational phenomenon. Hence, the final phase shows that teachers are not all enslaved by new computer technology as through their agency and strategic interventions they have mediated and often subverted the Internet's implementation in their own classroom. As Apple and Jungck (1998) posit, teachers' actions may have contradictory results with elements of good sense and bad sense in juxtaposition but what is important is the fact that they do construct these responses to a new technological phenomenon. In light of this agency, we need to recognise:

> *Tension: #6*
>
> *A tension exists between what teachers are able to do with their level of Internet access as distinct from what teachers are willing to do with ICT in their classroom programme.*

Limited Local Action

The limited local action of teachers in the face of mounting pressure to adopt and implement the Internet was another stand out feature of the study. While teachers appear to be thinking globally, there was little sign that this has led to an *emerging* curriculum that takes students beyond their existing classroom programme. In Ertmer et al. (1999) terms, most teachers had used the Internet to either supplement or support the existing curriculum, which is consistent with the findings of the scoping study conducted by Web Research (2000).

In addition, the use of the Internet was conspicuous by its absence in the lower school as it appears to be largely the domain of teachers working with senior students. In this regard, access data were consistent with international research where the Second Information Technology in Education Study (SITES) showed that students make greater use of the Internet as they progress through the school system (Pelgrum & Anderson, 2001). That said, the level of access and to some degree frequency of Internet use improved at each sub level over the duration of the study. One would predict, therefore, this pattern has subsequently continued but it needs to be noted that between phases the extent to which teachers valued the Web became more closely aligned to their actual practice. This finding tentatively suggests that the Web may have reached equilibrium in terms of its adoption and implementation in the classroom programme.

The key point is that few students use email or the Web at school on a frequent basis at each phase of the study—irrespective of level. Thus, minimal student Internet use especially in the regular classroom was another stand out feature of the research. To some degree Lai and Pratt (2003) confirm this conclusion in their research on the Otago Technology Project as 'half the students reported rarely using the Internet at school' (p.37). It would seem that teachers have taken to the Internet as a teaching resource far more than as a student learning tool. As stated in previous chapters, the relatively low level of Internet use with students is entirely consistent with the international literature (e.g., Becker, 1999). In a more recent "snapshot" survey of US teachers, Norris et al. (2003) found that Internet use lags well behind non-Internet computer use by the 45% of teachers who use the computer with their students less than 15 minutes per week. It needs to be borne in mind that another 14% of teachers made no use of computers whatsoever for learning and teaching purposes (Norris et al., 2003). Accordingly, Norris, et al. (2003) conclude that:

> *Only a tiny fraction of respondents (1.4% of the total) make extensive use of the Internet for instructional purposes, and more than a quarter report making no use of the Internet whatsoever (p.18).*

Indeed, Norris et al. (2003) go on to report that 75% of the teachers made minimal or no use of the Internet with students. In a somewhat tired observation, they explain the reason for this non-use is not the fault of teachers but rather the lack of access to new computer technology *per se*. This is an old argument with no doubt an element of truth, as students must have sufficient opportunity to access educational technology for it to have an impact on their learning. As Norris et al. (2003) put bluntly:

> *The reason that technology has not had an impact on teaching and learning is that students have, for all intents and purposes, not actually used the technology (Norris et al., 2003, p.15).*

On the face of it, lack of computer access is not the problem it once was in New Zealand schools. The latest Learning Centre Trust survey reports that the ratio of computers to pupils is now one for every seven primary school students (Fink-Jensen, Johnson & Lau, 2003). Moreover, the danger remains of concentrating on the level of computer access rather than the usage, frequency, and type of use teachers make of new educational technology. As stated on more than one occasion, access alone is not a good indicator of the extent to which students are making use of ICT in the classroom. So, the "three minutes per day" claim by Norris et al. (2003) makes good headlines but potentially misrepresents the true nature of computer use. Without digressing too far, the results of the present study along with Lai and Pratt's (2003) evaluation of the Otago Technology Project confirm that students often work on computers in pairs or small groups, which could potentially double the time spent on ICT in some calculations. Although Norris et al. (2003) control for this possibility in the wording of their questionnaire, they fail to contextualise the findings by providing limited information on how teachers were actually using computers in their classroom programme.

They are not alone in this regard as the latest Learning Centre Trust survey is full of numbers but light on narrative. In their sole attempt to judge the frequency of computer use, based on a measure of how many schools have 25% or more of students using the Internet in a typical week, no more than 57% were found to fall within this category (Fink-Jensen, Johnson & Lau, 2003). As if these data were not already confusing, Fink-Jensen, Johnson and Lau (2003) compound the problem by failing to seek further information on the type of use students make of the Internet—that is, in terms of the different internet activity structures. Once again, educators are left with data on the proportion of hardware brands in New Zealand schools rather than rich contextual information on the way in which teachers employ new computer technology in their classrooms.

Although there is still a dearth of such information, the study of proficient, accomplished and experienced internet-using teachers shows that neither email nor the Web dominates the classroom use of computers. Instead, word processing remains the most frequently used and highly valued computer application by teachers. Although the Web has quickly displaced less fashionable software and may continue to grow in relative use, Ham et al. (2002) confirm that teachers have students use "static print" applications more than any other combination of software. In a measure of different types of ICT used in The Essential Learning Areas the static print applications—word processing, desktop publishing and graphics packages—accounted for almost 40% of the total range of hardware and software employed across the curriculum (Ham et al., 2002). Interestingly, the Web equated to 18% of the proportion of all ICT used and the combined total was less than 10% for databases, spreadsheets, simulations, problem solving and mind mapping software. This figure from the ICTPD Cluster research provides further evidence of the relative decline of teachers' use of interactive fiction as well as some of the traditional productively tools.

Of particular note is the observation that '... a relatively small list of specific software applications tended to predominate' (Ham et al., 2002, p.96). In one case, Ham et al. (2002) report that an entire year of one teacher's classroom programme revolved around just two software packages—namely, HyperStudio and Internet Explorer. Using the same few applications often took priority over using more (Ham et al., 2002). Becker and Ravitz (1999) found a similar trend where experienced teachers did not always use more types of software more often and more flexibly. Hence, the variety of applications that teachers use is not a good indicator of their level of technology adoption, which again brings into question the assumptions embedded in stage models of teacher development. In the future, researchers need to focus on how *well* rather than how often or how many educational technologies teachers are using (Ham et al., 2002).

It follows that the type of use students make of the Internet is a key element in judging the quality of internet-based learning experiences. At the time of this study, the Internet was used by students predominantly to look up information. In other words, the "content" or "information" metaphor stood out as the main pedagogical use of the Internet. Few teachers had used the Internet with their students as a vehicle for self-expression or for building new relationships with other people—that is, within the "community" or "communication" metaphor. Moreover, when teachers did initiate such activities their success was mixed and often problematic in the hustle and bustle of classroom life. With one or two notable exceptions, there was little evidence of teachers creating customized pedagogical activities in the manner envisaged by Harris (1998a). Overall, the enduring impression was a lack of depth and diversity in student Internet use.

Once again, this image of the Internet in schools is relatively consistent with the international literature. Zhao et al. (2001) found a similar pattern in their portrait of exemplary technology-using teachers—that is, 92 teachers who were recipients of a Michigan State competitive grant aimed at supporting innovative technology uses. Somewhat controversially, they report that not everyone agreed the Web was '... a much better source of information for students than textbooks' (Zhao et al., 2001, p.31). In a similar vein, the so-called exemplary technology-using teachers were ambivalent about allowing students too much control over the Web. Very few teachers engaged students in listserv, discussion group or chat room activities. Kozma (2003), in his analysis of the 174 case studies of teachers innovative practice using educational technology from the 28 countries participating in SITES (Module Two), found only 26% of the cases reported that students collaborated with people outside the classroom. Although it may be too early to expect significant changes to traditional patterns of classroom interaction, such findings provide further ammunition to the neo-conservatives who continue to claim that 'children are the experimental subjects in a massive national experiment' (Corde & Miller, 2000, p.40).

In one of the most thorough investigations of Internet adoption in the literature to date, Schofield and Davidson (2002) report that under favourable conditions students engaged in many kinds of activities and these varied greatly in nature and scope. From an analysis of the different activities they found the following common patterns of student Internet use: (a) one time use, which gave students a brief introduction to the Internet as they carried out some relatively limited activity; (b) augmental project use, which involved students sporadically in internet-based activities throughout the school year; (c) curriculum enhancement use, which employed the Internet briefly but quite regularly to complement students' ongoing classroom activities; (d), major project use, which involved students with the Internet for extensive amounts of time; and, (e) integrated curriculum use, which made intensive Internet use a regular and important part of the curriculum (Schofield & Davidson, 2002).

Although Schofield and Davidson (2002) fail to disaggregate data by level in the seven schools they studied, 18% of internet-based activities documented fell within the one time use category. Another 19% was classified as augmental project use with the largest category (29%) involving activities that enhance or supplement the curriculum. Less than 11% of the internet-based activities were truly integrated as a core part of the curriculum, which is consistent with the ICTPD Cluster Programme and the results of the present study. In order to analyse the specific internet-based learning experiences, Schofield and Davidson (2002) adopted the following six categories: (a) doing archival research at Web sites, (b) contacting others online in order to gather information, (c) interacting with others in order to exchange information, (d) getting sustained help online from an adult or other expert, (e) producing material online for others, and (f) acquiring technical training online. In many instances, a single internet-based activity involved several of these categories. By far the most common activity, nevertheless, was research at Web sites, which involved 46% of all student Internet use. In stark contrast, about 10% of activities only involved producing material online for others—that is, Web publishing. Again, the results loosely follow the same pattern found over the three phases of the present study.

While Schofield and Davidson (2002) explain that some teachers made little use of internet-based activities because they knew so little about them, most of the tasks they engaged students in did not lead to a radically different curriculum that would instigate major change in their pedagogical practice. As Olson (2000) would say, they are not the first teachers to have domesticated a new educational technology. In the end, Schofield and Davidson (2002) conclude:

> *There is little reason to believe that Internet access will fundamentally transform education or its outcomes as some expect it will (p.308).*

This assessment of teachers' assimilation of the Internet is remarkably similar to the present study where apart from the final phase there was little or no local action of a reconceptualist nature. Although a core group of early adopters were embracing the educational opportunities made possible by the Internet, there was little or no sign of a "second order" transformation to their teaching practice. Admittedly, many of the internet-using teachers were still coming to terms with the novelty of the Internet and the raft of new online activities and projects available. However, beyond their personal experimentation:

> *Tension: #7*
>
> *A tension exists between the rhetoric of what is said about ICT and the Internet and what teachers actually do with new educational technologies in the crucible of their own classroom.*

Teaching is Messy

It would be wrong to construe from the above discussion that there is one single common approach to Internet use. On the contrary, a rich tapestry of colours and textures characterise the way teachers have responded to the Internet. After all the Internet is not a monolithic innovation as the Literature Review established, and even though most use fell within the "content" metaphor a diversity of practice was associated with using the Web as an information source. This point illustrates that much of the data was insensitive to the context in which students used the Internet to gather information. Although it is interesting to know that students predominantly used the Internet as a research tool, which is consistent with the results of the Otago Technology Project (Lai & Pratt, 2003), what does this really tell us? By analogy, the pencil is also a tool but it would be absurd to draw too many conclusions from the observation that students mainly use their pencils for writing instead of drawing, tracing and so on. Knowing the frequency students use their pencils for writing is helpful but it still tells very little about the genre—what is being written and how.

With this in mind, from what can be ascertained, as a research tool the Internet was utilised in a variety of ways, as teachers appear to have modified and incorporated the Web to fit their own conceptions of the functions and purposes of research. The value and interpretation of research itself is open to conjecture and the use of the Internet is sure to reflect teachers' subjective and idiosyncratic understandings of the research process, as demonstrated in Phase Three by the difference between using the Web to look up information on water as opposed to investigating the problem of child labour. Accordingly, there was no single approach to the use of the Internet for research-related activities, as this was influenced by a complex interplay of factors including amongst other things the level of access, conditions of use, technical know-how, pedagogical beliefs, pre-existing methods of teaching, collegial relationships and work culture.

The case study and narrative material shows teachers' experiences, perceptions and practices take on new meaning when interpreted in this wider ecological context. It follows that the situated and subjective nature of teaching was another strong theme to emerge from Phase Three. Likewise, a striking feature of the study was the way participants viewed the classroom as their own private space even though they were oriented towards "professional collaboration" (Becker & Riel, 1999). This was a place where they could express their artistry and enact their own philosophies and worldviews. Schofield and Davidson (2002) report a similar observation when they observe that teachers treat the physical space of their own classroom as sacred. Interestingly, they claim that teachers' autonomy, individualism and sense of possessiveness have an important bearing on Internet usage as classroom computers were regarded as the property of individual teachers, which made their location, reallocation, and wider use problematic. This sense of ownership along with the level of status conferred by the specifications of the computer—regardless of whether or not the teacher fully utilised it in their teaching—appeared to contribute to the variation of use from one classroom to another (Schofield & Davidson, 2002).

In a similar vein, the situated nature of teaching showed that traditional distinctions between learner-centred and teacher-centred pedagogy are woefully inadequate in capturing the rich kaleidoscope of practice. All three teachers during Phase Three adopted a blend of instructional techniques where they switched from being a *guide on the side* to *sage on the stage* or were both simultaneously depending on the circumstances. In the classroom, the teachers showed considerable ability to improvise, interchange roles and perform a multitude of tasks as the situation required. They did not have a fixed instructional approach along a single pedagogical continuum as often assumed in the literature (Gibson, 2001). Instead, their approach to teaching was far more fluid and dynamic than implied by this popular bifurcation. Thus, neither Anne, Barry nor Catherine neatly fitted the type of binary distinction encapsulated in the two contrasting teaching scenarios adapted from Becker and Anderson (1998), which gave further weight to the view that there is a false dichotomy between teacher-centred and learner-centred teaching. In short, teaching is far messier than conveyed by this crude dichotomy as students learn both less and more than what they have been taught (Eisner, 2000).

The lesson is that the teaching profession needs to move beyond binary positions, which attribute too much weight to a single metaphor or theoretical perspective (Sfard, 1998). At the moment, there is a tendency to reify these metaphors when such polemical stance-taking is unhelpful in building a more complex and multi-dimensional rubric of the good internet-using teacher. For this reason educators need to be wary of blanket statements that underestimate the non-linear and idiosyncratic nature of teaching such as Kozma (2003) makes in his recent analysis of Module Two of SITES. For example, he claims:

> *Based on these selected case studies, teachers in many countries are beginning to use ICT to help change classroom teaching and learning, and are integrating technology into the curriculum. Students are working together in teams and using computer tools and resources to search for information, publish results and create products. Teachers are using ICT to change their role from that primary source of information to one who provides students with structure and advice, monitors their progress, and assesses their accomplishments (Kozma, 2003, p.12).*

This generalisation highlights the extent to which contemporary developments in learning theory have overshadowed knowledge of the art and science of critical pedagogy in the adoption and implementation of ICT in schools. The above statement reflects a narrow instrumentalist conception of teaching as it fails to acknowledge potential changes of an ethical, moral or political nature. Arguably, such a simplistic analysis contributes to a type of folk theory that perpetuates the distinction between learner-centred and teacher-centred methods, which has almost become enshrined in the professional discourse. Thus, teachers need to be suspicious of those talking of a paradigm shift involving "new ways of learning" such as first muted in the draft revised ICT Strategy (Ministry of Education, 2001b).

Almost 35 years ago, Postman and Weingartner (1969) published a seminal book entitled *Teaching as a Subversive Activity* in which they launched a stinging attack on the traditional teaching methods of the time—that is, teacher-centred instruction. Their attack drew on the work of John Dewey and the progressive movement of the late 1920s that first promoted learner-centred teaching and the use of project-based learning (Brown & Murray, 2003). The Socratic approach and the cognitive revolution of the 1950s provided further impetus to the ideas of Dewey. While these ideas have gone through various iterations, in an historical sense, the catechisms of active and meaningful learning are little more than a flash-back from the past. Hence, up until now, the new ways of learning appear as largely ahistorical in both the policy and professional discourse. Why is this?

One explanation, first posited after Phase Two, is that the new ways of learning may be part of a larger meta-narrative seeking to depoliticise teaching by turning the classroom teacher into an obedient educational worker rather than a thinking professional. Again, there is reason to be wary of the discourses of persuasion associated with the ICT movement. The observation that experienced internet-using teachers still draw on a number of "old" teaching methods, and none of the perceived accomplished internet-using teachers value ICT skills over and above other more general characteristics of accomplishment, is reason to question the rhetoric of a paradigm shift. Remember, debates over what and how teachers should teach are part of a deeper ideological struggle over the control of the curriculum itself.

According to Hodas (1993), the curriculum is designed to preserve and transmit information and authority, and to inculcate certain values and practices at the expense of others. Typically, schools are built around four key institutional and organizational values—namely: (a) respect for hierarchy, (b) competitive individualization, (c) receptivity to being ranked and judged, and (d) division of knowledge into discrete categories susceptible to mastery (Hodas, 1993). On the surface, the so-called new ways of learning bring into question some of these traditional values, but it is important to recognise that they are not neutral. In turn, the language of the new science of learning promotes certain values over others and it contains a number of inherent contradictions. On the one hand, constructivist pedagogy aims to promote greater student choice, creativity and enterprise through using ICT in active and meaningful contexts. The contradiction or mixed message is that teachers are expected to also help students develop basic literacy and computer skills in an environment of excellence, greater teacher accountability and prescribed achievement standards. Set within this context, pedagogy is a politically negotiated act of compromise as:

> *Tension: #8*
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> *A tension exists between what teachers want to do with ICT in the private space of their own classroom as opposed to what teachers are expected to do and enact in the public sphere of schools.*

Computer as Tool

The tool metaphor was dominant throughout the study up until the end of Phase Two. Broadly speaking, a pragmatic, value-neutral, Toolster perspective stood out as the dominant response to the Internet as a social, economic and educational phenomenon. From this perspective there were two main conceptions of the Internet as tool: (a) a learning tool and (b) a tool for work. In other words, the tool metaphor was equally applicable to both the pedagogical and vocational rationales. Although most teachers claimed to place greater weight on the pedagogical rationale, they also acknowledged that internet skills will be required in the future for good jobs, which is consistent with the findings from Lai and Pratt (2003). Similarly, few teachers rejected the importance of ICT to the future success of New Zealand's Knowledge Economy. Hence, this suggests that the different rationales are intertwined deeply and most teachers draw on a number of competing and coexistent discourses simultaneously when discussing the Internet's educational potential.

Overall, the tool metaphor was adopted in accordance with the goal of either supplementing or supporting the existing curriculum. In this sense, teachers Internet use was underpinned by a "handy tool" rather than "transformational tool" conception of educational technology (Stratford, 2000). With few exceptions, the intention was to harness the motivational value

of the Internet to make the existing curriculum more exciting and meaningful. As Stratford and Brown (2002) point out, this type of Internet use may simply produce activities still related to a traditional "transmission-response" delivery of the curriculum. Bigum (2002) takes this one step further by arguing that the metaphor of computer as tool encourages the domestication of new educational technologies into pre-existing curriculum activities. If ICT is viewed as an educational good and education equals curriculum activity, then teachers will use the Internet to help students do better what they already do (Bigum, 2002). Schofield and Davidson (2002) provide further evidence of this as most teachers:

> *...conceptualised the Internet as a tool that would help them carry out their ongoing work more effectively, these teachers commonly indicated that they hoped Internet access would empower them to work more effectively within the framework of their established curricula. That is, they did not see the Internet as a vehicle for initiating new and radical kinds of change (p.51).*

Although Grabe and Grabe (2000) draw extensively on the principles of active and meaningful learning when conceptualising the Internet as a tool for "inquiry", "construction" and "communication", a kind of "technological neutralism" still contaminates the use of this metaphor. Consequently, two further problems arise. First, there is an implicit assumption that ICT is nothing different from the host of other tools that teachers have at their disposal. As Moss (2002) writes:

> *ICT is just another tool. You choose the best tools for the job—it might be the telephone, the Internet or a library book. If you get into that frame of thinking and your students have that frame of thinking, it is much easier to integrate ICT across the curriculum (p.3).*

This conception of ICT presented in a recent New Zealand Education Institute (NZEI) publication is remarkably similar to that held by many of the internet-using teachers. It reflects a form of social or cultural determinism in which the way the tool is used is far more important than the tool itself. Ironically, this places too much faith in the teacher. A related problem is that some teachers then misuse this metaphor as a convenient excuse for their limited use of ICT as just another tool (Morton, 1996). This is the second problem with the tool metaphor. There is no conception of the tool as having an effect over and above how teachers use it. Burbles and Callister (2000) expose the flaw in this type of thinking in their distinction between an "instrumentalist" and "relational" view of technology. The former views tools as something to accomplish specific purposes—that is, a coffee-maker, a jacket to keep you warm, a word processor as an electronic typewriter, and so on (Burbles & Callister, 2000). The instrumentalist view externalises an educational technology and treats it as a fixed object. As Burbles and Callister (2000) write:

> *There are a number of problems with the instrumental view. Tools do not only help us accomplish (given) purposes; they may create new purposes, new ends, that were never considered before the tools made them possible. In these and other ways tools change the user: sometimes quite concretely, as when the shape of stone tools became a factor in the evolution of the human hand (...). Tools may have certain intended uses and purposes, but they frequently acquire new, unexpected uses and have new, unexpected effects. What this suggests is that we never simply use tools, without the tools also "using" us (p.6).*

A handful of teachers only interpreted the metaphor of tool from a relational view of technology. From this perspective, the relationship between technology and society is not unidirectional as educational technology is part of a much wider social practice. It is no coincidence that the teachers chosen for further research in Phase Three possessed such a view. The Internet was not "read" by Anne, Barry or Catherine as a neutral tool or one that is automatically good for learning and teaching. In stark contrast to most Toolsters, they expressed serious reservations over what students were learning through ICT as illustrated by the example of the Neopets website. All three teachers were aware of potential negative side effects and deeply suspicious of the potential hidden agenda behind the drive to use the Internet in New Zealand schools. In a collective sense, they interpreted the Internet as a vehicle for the expansion of capitalism, consumerism and globalization.

It needs to be noted that the teachers in Phase Three were not the only ones to express misgivings over the advent of the Internet. Interestingly, some teachers were cautious toward the Internet because historically they perceived that new educational technologies have failed to live up to expectations. This suggests that the level of hype surrounding ICT and the overselling of the Internet may have adversely affected its adoption by the teaching profession. The implementation of the Internet was also influenced by the perception it had opened a window on the real troubled world beyond the classroom, which some teachers partly closed for reasons of Internet safety. Without dismissing the seriousness of these safety issues (e.g., Elliott, 2001), there is a danger of feeding a new moral panic by focusing on the hysterica associated with the dark side of the Internet (Lawson & Comber, 2000; Quigley & Blashki, 2003). Another concern with potential to become a moral panic was the way some teachers perceived new computer technology as a toy. Hence, there was a third conception of the tool metaphor—that is, as a play tool. As Selwyn (2002b) states:

> *Unceasing expenditure by parents anxious to augment their children's education has given rise to a multi-billion dollar industry in computer-based home learning (p.428).*

Okan (2003) claims much of this so-called "edutainment" is of dubious value. A group of internet-using teachers seem to agree, as they believed the use of the computers for games tainted their educational application at school. Put another away, there was a level of resistance to ICT based on a deep-seated belief that playing video games had little or no educational value and the Internet was too closely associated with popular forms of entertainment. Of course, this is a new variation of an old argument, which has its roots in children's television. As Cordes and Miller (2000) write in their controversial report, 'The computer—like the TV—can be a mesmerizing babysitter' (p.3). This type of comment is bound to strike a chord with some people as it appeals to a number of fundamental values about the need to educate the whole child, as reflected in the following statement:

> *Those who place their faith in technology to solve the problems of education should look more deeply into the needs of children. The renewal of education requires personal attention to students from good teachers and active parents, strongly supported by their communities. It requires commitment to developmentally appropriate education and attention to the full range of children's real low-tech needs—physical, emotional, and social, as well as cognitive (Cordes & Miller (2000, p.4).*

Although on the surface there is a grain of truth in this observation, the problem is that it promotes binary thinking. The argument overlooks the learning potential of new media in the home (e.g., Buckingham & Scanlon, 2003) and simply feeds a neo-conservative backlash in response to the ICT-related school reform movement. What Cordes and Miller (2000) fail to acknowledge is that teachers can use new educational technologies to enhance and extend the holistic education of their students (Abbot, Lachs & Williams, 2001). Thus, the *Fool's Gold* report like much of the earlier research on the effects of television ignores the context of computer use. As Clements and Sarama (2003) forcefully respond:

> *We believe its presentation of half-truths and misleading interpretations of theory and research under guise of academic respectability not only presents an unfortunate one-sided picture of the issues and related empirical research, but, more generally, plays the U.S. media game to the detriment of research, intellectual discourse, and, ultimately, children.*

At the other extreme, it is equally misleading to promote Green and Bigum's (1995) view that children in a media-rich world have become aliens in the classroom. Although this has become a popular catechism in the literature, and the gap between learning at home and learning at school is real (Downs, 2002), the suggestion is overly binary as there is increasing evidence to show that new computer technology does not dominate children's lives (Facer et al., 2003). Thus, embodied within these coexisting perspectives:

Tension: #9

A tension exists between teachers' conception of the Internet as a learning tool as opposed to work tool—coupled with concern that ICT is simply a play tool or entertaining toy.

Technology as Progress

Over and above the computer as tool, the dominant metaphor throughout the study was the conception of technology as progress. There was an aura or sense of inevitability about technology as a driving force of change. Those teachers who fitted the description of Boosters and Deschoolers placed considerable faith in the power and limitless potential of new computer technology to transform schools. They perceived the Internet was the next giant step forward in technology, which would have a profound impact on their lives and all aspects of society. Indeed, the Internet reflected a whole new epoch in human civilization. In contrast, the majority of participants were resigned considerably more to technological progress and they tended to accept that 'Like a force of nature, the digital age cannot be denied or stopped' (Negroponte, 1995, p.229). That said, these teachers—that is, the pragmatic Toolsters—held the coexisting view that despite rapid technological advances people will ultimately determine the real value of the Internet in education.

Thus, in a paradoxical sense, teachers at opposite ends of a determinism continuum supported the adoption and implementation of the Internet in schools. At one end of this continuum, a minority of internet-using teachers—namely the Boosters and Deschoolers—placed considerable weight on the "machine effects" of technology as a transforming force consistent with the principles of technological determinism. Conversely, at the opposite end of this continuum, teachers viewed technology as neutral—in spite of the apparent contradiction that new developments in computer technology were also inevitable—and they were inclined to over emphasise "people effects" in determining the impact of the Internet on the surrounding educational culture. Thus, the ICT movement appeared to unify two dialectically competing orientations towards the Internet as a social, economic and educational phenomenon, which helps to explain the "orthodoxy of optimism" (Selwyn & Gorard, 2002) that for the most part characterised the responses. In hindsight, it is unsurprising that most teachers were enthusiastic towards the Internet as:

The computer has been long heralded as the epitome of 'progress', following on from a long-held belief in technologically induced progress which can be traced back to the Enlightenment tradition (Selwyn & Gorard, 2002, p.3).

With few exceptions, irrespective of their location on the above continuum, an interest in the future also unified the internet-using teachers. The future ubiquity of computers was taken-for-granted and generally teachers supported the need to better prepare students for life-long learning in a rapidly changing world. For this reason most teachers endorsed the investment in ICT to ready students for their technology-induced futures and to help New Zealand remain competitive in the global economy. In this respect, the sample was similar to the portrait of exemplary technology-using teachers in Michigan who stated in their grant application that the main student outcome was to prepare students for an increasingly technological world (Zhao et al., 2001). Broadly speaking, most of the internet-using teachers viewed the nature of this world as inevitable rather than something that future citizens might reshape for the better.

A strong focus on the technological world of the future was also characterised by increasing concern over the disparity between old and new forms of literacy. As a new form of literacy, some teachers placed ICT on a par with reading, writing and mathematics. However, considerable confusion existed over the role of ICT in the curriculum, which is consistent with the findings reported by Web Research (2000). Teachers were torn between teaching ICT as a standalone subject with an emphasis on specific skills as opposed to integrating learning technology in an interdisciplinary manner envisaged by some Ministry of Education (1998b) publications. Arguably, this confusion simply echoes the mixed messages in the policy discourse; it was noteworthy that despite the high profile of the Internet over the duration of the research, few teachers conceptualised ICT as a multi-dimensional concept such as outlined in the Literature Review. Most teachers equated ICT with computers.

Without doubt, the discovery of a group of experienced internet-using teachers with a truly critical orientation toward ICT was the most significant outcome of the research. There is evidence to suggest that some teachers have adopted a pedagogical approach to ICT based on critical, humanistic, social reconstruction, or even liberal-progressive perspectives of the curriculum. The lesson is that answers to questions are very different depending on who and what is asked. Thus, the research has opened up a new terrain of questions concerning the ways in which teachers have read and responded to the discourse surrounding the use ICT in schools. As Apple (1991) once wrote, educators need to ask:

> *Whose idea of progress? Progress for what? And fundamentally, who benefits? These questions may seem rather weighty ones to be asking about schools and the curricular and teaching practices that now go on in them or are being proposed. Yet, we are in the midst of one of those many educational bandwagons that governments, industry, and others so like to ride. This wagon is pulled in the direction of a technological workplace, and carries with it a heavy load of computers (p.59).*

There is reason to be optimistic, however, as some teachers were deeply motivated by the need to prepare students who will one day become good citizens rather than just good workers. In the cases of Anne, Barry and Catherine, ethical, moral and political issues were at the foreground of their thinking, which is arguably in stark contrast to the 3% of teachers involved in the ICTPD Cluster Programme who reported social and ethical considerations as priorities at the outset of this initiative (Ham et al., 2002). Notably, Lai and Pratt (2003) reported that less than 10% of teachers perceive to a moderate or large degree that ICT may lead to negative effects. In like manner, Zhao et al. (2001) found that most of the exemplary technology-using teachers in Michigan did not think computers would bring about many negative effects. In contrast, the experienced internet-using teachers identified a number of potential concerns, as illustrated by the notion of an emerging "Warehouse generation" brought up on a diet of individualism and technology consumerism. The key difference is that these teachers viewed technological progress as a double bind encompassing both benefits and drawbacks the latter of which usually go unnoticed (Bowers, 2000).

Following on from this, another important outcome of Phase Three was the extent to which teachers were suspicious of business interests and possible ulterior motives behind the ICT-related school reform movement. Regardless of whether or not teachers have grounds to be suspicious, the level of mistrust of Government reforms should not be taken lightly, as it reveals a deeper layer to the barriers of technology adoption that previous research has failed to uncover. The results confirm that teacher resistance is not an irrational response to technological progress from a group of neo-Luddites. After all, Anne, Barry and Catherine expressed thoughtful concerns over the rapid growth of the Internet from a perspective informed by a reasonably high level of personal computer use. Although speculative, this suggests that other teachers may share these concerns; they might be reluctant to express them publicly as this requires the courage to challenge the dominant assumption embodied in the ICT policy discourse that teachers are currently doing something wrong.

Instead of being swept away in a tide of technophilia, there is a need to create a climate in which teachers are willing to express their reservations about technological progress rather than simply enact these in the private space of the classroom. Such a climate would respect what teachers actually do and value what experienced teachers have to say. In this regard, it is important to note that despite their respective leadership roles, the experienced internet-using teachers perceived a lack of ownership of recent ICT policy initiatives, which led them to question whose policy it was. More importantly, as a pedagogical innovation ICT was not always in accord with what teachers valued about education, as Catherine demonstrated in the perceived clash between the Internet as an icon of digital capitalism and the goal of promoting a more just society. In resolving this conflict, it was noteworthy how Catherine used the Internet as a research tool to subvert the perceived ideological message of e-commerce through her investigation of brand logos and the sources of child labour.

The apparent mismatch between social goals and economic agenda shows that the Internet is a medium in which many groups can express their ideas including the extreme right and the extreme left (Schofield & Davidson, 2002). Such a view brings the political economy of the Internet into the frame (McChesney, 1998). In a general sense, political economy is the study of power relations in the production, distribution, and consumption of resources. Put more straightforwardly, it involves the study of the ability to get what you want even when others do not want you to get it (Masco, 2000). From this perspective, those who wish to dominate must recruit teachers as vital educational workers willing to advance their particular ideological cause. This view of the teacher recognises that:

> *Schools reflect cultural, political, social, and economic changes of the larger society. The school is not an institution apart (Cuban, 2000; cited in O'Neil, 2000, p.9).*

With this in mind, the Internet in schools is a new and rapidly growing site of power that reflects a combination of cultural, economic and political forces. This being so, Selwyn (2002b) claims that the history of educational computing is characterised by a host of stakeholders intent on pursuing non-educational goals cloaked in the language of apparently educational aims. Hence, all research on teachers' Internet adoption and implementation must involve a socio-political dimension. As Bruner (1973) aptly stated many years ago:

> *A theory of instruction is a political theory in the power sense that it derives from consensus concerning the distribution of power within the society – who shall be educated and to fulfil what roles... [the] educator who formulates pedagogical theory without regard to the political, economic, and social setting of the educational process courts triviality and merits being ignored in the community and in the classroom (p.115).*

A political economy perspective addresses this criticism by interpreting the ICT-related school reform movement as enmeshed within an "enterprise culture" (Peters & Marshall, 1996). This concept refers to the way in which the curriculum has been reconstructed over the past decade around "busnocratic rationality" where there is a narrow emphasis on measurable outputs and vocational skills. Such an analysis identifies a powerful ideological discourse linked to the imperative for global economic restructuring and the dominance of neo-liberalism over other forms of social and economic order—albeit now repackaged in the softer language of "The Third Way" (Giddens, 1998). Although a vague and difficult concept to define, Giddens (2000) refers to "The Third Way" as the pursuit of market policies but not a market society. Despite this subtle difference, from a political economy perspective the Internet inhabits the terrain of neo-liberalism as it symbolises the laissez-faire principles of individual freedom and the ultimate goal of an unrestricted global market.

In this backdrop, the Internet is not on an independent trajectory (Clegg, Hudson & Steel, 2003). The advent of the Internet is intertwined deeply with the decline of influence of the nation-state and the expansion of digital capitalism (Schiller, 1999), which together compete against the role of schools promoting the goals of learning, equality, fairness and social justice. Under the influence of neo-liberal policies, schools themselves and the level of computer access have become part of the market, evidenced by the high profile of ICT in institutional branding. As Burbules and Torres (2000) argue, teachers must be informed of the global forces behind the move to corporatise schools as they shape and constrain the choices available to educational policy-makers and practitioners alike.

These forces are not clear-cut as the concept of globalization is a multi-faceted phenomenon (Codd, 2002). Although it refers to a set of very definite economic, cultural and political changes, the shape and significance of these are far from determined (Bowers, 2000). Indeed, the literature is full of debate about the nature and extent of globalization and there are just as many uncertainties as predictable consequences. The lesson from the globalization debate is that the pedagogical rationale for ICT in schools is infected by the language of a kind of "enterprise constructivism"—the celebration of innovation, entrepreneurship and learning for the real (unjust) world—that cannot be separated from the political economy of the Internet. As Apple (1992; cited in Peters & Marshall, 2004, p.111) reminds us:

> *Education is deeply implicated in the politics of culture. The curriculum is never a neutral assemblage of knowledge, somehow appearing in the texts of classrooms of a nation. It is always part of a selective tradition, someone's selection, some group's vision of legitimate knowledge. It is produced out of the cultural, political, and economic conflicts, tensions, and compromises that organize and disorganize a people (p.34).*

Thus, teachers need to recognise that by adopting authentic and real world learning in a technology-rich context the end result may be more of what we already have. This is precisely what Anne, Barry and Catherine objected to in their response to the Internet as a social, economic and pedagogical phenomenon. Of course, not all of the effects of globalization and constructivism can be classified as bad. In this sense, technological progress is a double bind in which:

> *Tension: #10*
>
> *A tension exists between promoting active and meaningful learning through the future-focused language of enterprise constructivism whilst upholding the traditional goals of education—namely, striving for learning, equality, fairness and social justice.*

In sum, there is no doubt that the teachers involved in this study have affected the adoption and implementation of the Internet in their schools. Perkins (1992) suggests that with any innovation teachers ask themselves many questions. Will it work in my school? Will the innovation address a real need? Will it fit my pedagogical approach? Will I have the time, energy, and skills to do this? What do I need to do? What about the other things I have to do? The internet-using teachers asked all of these questions and many others in one form or another. They have not just experienced the Internet but rather reshaped and reframed it based on core beliefs, values and lived experiences. As important opinion leaders, the participants have also had a key role in contributing to the co-construction of how the Internet is perceived by colleagues and is experienced by students. The reciprocity between the effects of ICT on teachers and their affect, in turn, on the nature of the innovation shows that the outcome of the rapid growth of the Internet in schools is far from certain. There are likely to be multiple and conflicting effects given the subjective and mutually adaptive nature of this relationship.

Thus, teachers should be wary of the "rhetoric of inevitability" that so often drives the ICT policy discourse (Burbles & Torres, 2000). The only certainty is that the Internet is not a separate force driving cultural, economic and political change but rather part of a much wider social practice. As described in the Literature Review, the term social practice refers to the complex interactions, multi-directional relationships and socio-political context in which educational technology is always located in a cultural system (Mehan, 1989). In the words of Burbules and Callister (2000):

> *Technological change is a constellation of what is chosen and what is not chosen; what is foreseen and what cannot possibly be foreseen; what is desired and what is not (p.2).*

The enduring lesson is that ICT is a contestable pedagogical innovation full of conflicts, tensions, and contradictions that give rise to the good, the bad, and the unknown. Accordingly, the effects of the Internet on teachers' lives and work culture cannot be analysed in terms of simple dichotomies of good and bad (Walker & White, 2002). Such dyadic thinking is unhelpful as there are multiple and simultaneous layers to how teachers have read and responded to the Internet as social, economic and educational phenomenon. Indeed, the same effects can be interpreted as both desirable and undesirable. Thus, a more dialectical perspective is required such as activity theory (Somekh, 2001) in which there is greater appreciation of the way the Internet is caught up in a web of contingencies requiring less linear conception of actions and outcomes, intentions and effects (Burbules & Callister, 2000). With this in mind, the next section shifts the discussion to the challenge of unravelling the many threads and competing mindsets that coexist in the educational technology landscape.

10.3 PORTRAIT OF EDUCATIONAL TECHNOLOGY LANDSCAPE

This section attempts to sketch a rough portrait of the educational technology landscape drawing on the literature and the tensions and individual mindsets embedded in the research sample. The term mindset refers to the lenses or theoretical orientations through which people view the world. As Goodson et al. (2002) explain, mindsets are default orientations—that is, 'the mode we automatically proceed from in approaching aspects of the world' (p.11). The "set" component is noteworthy because it has at least three meanings (Goodson et al., 2002). First, mindsets consist of "sets" of assumptions, beliefs and worldviews that more or less cohere as a set. Although mindsets can often be broken down to a single idea or key point, they usually embody a myriad of elements within the set. Second, the concept of mindset can be seen in the context of the phrase "ready set go" as they set up a person to respond to something in the world (Goodson et al., 2002). Third, the term "set" implies that one's views are consolidated in the way that concrete is set, which Goodson et al. (2002) claim need not be permanent but typically is difficult to move.

Building on this distinction, Cooper and Temby (cited in Goodson et al., 2002) assert that when people fail to challenge their own assumptions they slip into a state of mind where they close off alternative worldviews. When this happens they claim a mindset has developed, which is similar to what Bigum (1995) sought to encapsulate in his description of the four main perspectives embodied within the educational computing discourse: (a) the Doomsters, (b) the Boosters, (c) the Deschoolers and (d) the Critics. Over the years, a number of categories and taxonomies of the different mindsets adopted towards educational technology have appeared in the literature (e.g., Venditti, 1994; Yee, 2000). In describing the different scenarios of classroom computing, Cuban (1993b), for instance, identified "the technophiles", "the preservationists", and "the cautious optimists". As introduced in Chapter One, the technophiles adopt a utopian vision of the future—they are the cybertopians (Papert, 1996). The cautious optimists scenario predicts slow but steady movement towards fundamental changes to the nature of learning and teaching. In contrast, the preservationists wish to improve the curriculum but maintain the fundamental structures of schools. From this mindset, teachers view the computer an important tool that they can use to help students to be more productive. Mumtaz (2000) describes this scenario as using educational technology 'to support what schools have always done' (p.322). Hence, this group is similar in orientation to the Toolster perspective identified at the end of Phase Two.

In the past, new computer technology has provoked a range of reactions regarding its utility for education. Historically, computers have been characterized as demon, panacea, and technocratic dream (Stratford & Brown, 2002). Abbott (2001) claims that most responses fall into two categories: illusory hype or pessimistic Armageddon. Selwyn and Gorard (2002) concur with this bi-directional analysis and report that most people:

> *... conform to one of the two dominant paradigms that beset discussions about technology: either technological or social determinism (p.4).*

Although few people openly align themselves with technological determinism, the technophiles who ascribe to this view see ICT as shaping the nature of schools with its own logic, as an entity and influence independent of social forces (Selwyn & Gorard, 2002). The technophiles who chase the technological dream include both the Boosters and the Deschoolers as depicted in Figure 10.1. From this mindset, there is a sense of inevitability that the Internet is a driving force of society as implicit throughout Eadie's (2001) much publicised report on *Schools of the Future.* The so-called "techno-fundamentalists" (Haydn, 2003) accept and promote the view that 'as technology changes so society follows' (Selwyn & Gorard, 2002, p.4). At the dawn of the Digital Age the assumption is that the equivalent of the industrial revolution has occurred and schools have no choice but to embrace ICT and to expect teachers to develop their practice accordingly (Kennewell et al., 2000). This mindset is preoccupied with the "machine effects" where the Internet is often assigned an agency beyond its means, which Selwyn and Gorard (2002) claim obscure vested interests underlying the push to adopt new educational technologies.

The map of the landscape shows that of the two main types of technophiles, the Boosters have a passion for ICT that manifests itself in a "panacea perspective". Although the results suggest this group is not the largest numerically as Bigum and Kenway (1998) claim, many have had a long association with the use of new computer technology. The following profile in a recent occasional paper illustrates this perspective:

> *Steve Moss fell in love with computers back in the 1980s when his school bought an AppleIIe. "According to my wife, I and the rest of the men teachers stood around and worshipped it." ... Nearly 20 years on, he is still exploring ways to use them effectively in the classroom (Moss, 2002, p.3).*

In contrast, the Deschoolers are guilty of adopting a "technocentric perspective" in which they view new educational technology as the vehicle for transforming the curriculum. In response to the rapid changes of the new digital world of the 21st century, the Deschoolers believe that schools are past their use-by-date. They have a strong interest in the future and vision to steer the curriculum in bold new directions in keeping with Pelgrum and Plump's (1993) social and transformation rationales. Although few teachers neatly fit these two perspectives as they are simply explanatory constructs, the above mindsets are all technologically deterministic in that they place technology at the centre of educational discussions and fail to understand how ICT may interact with the social context of its application.

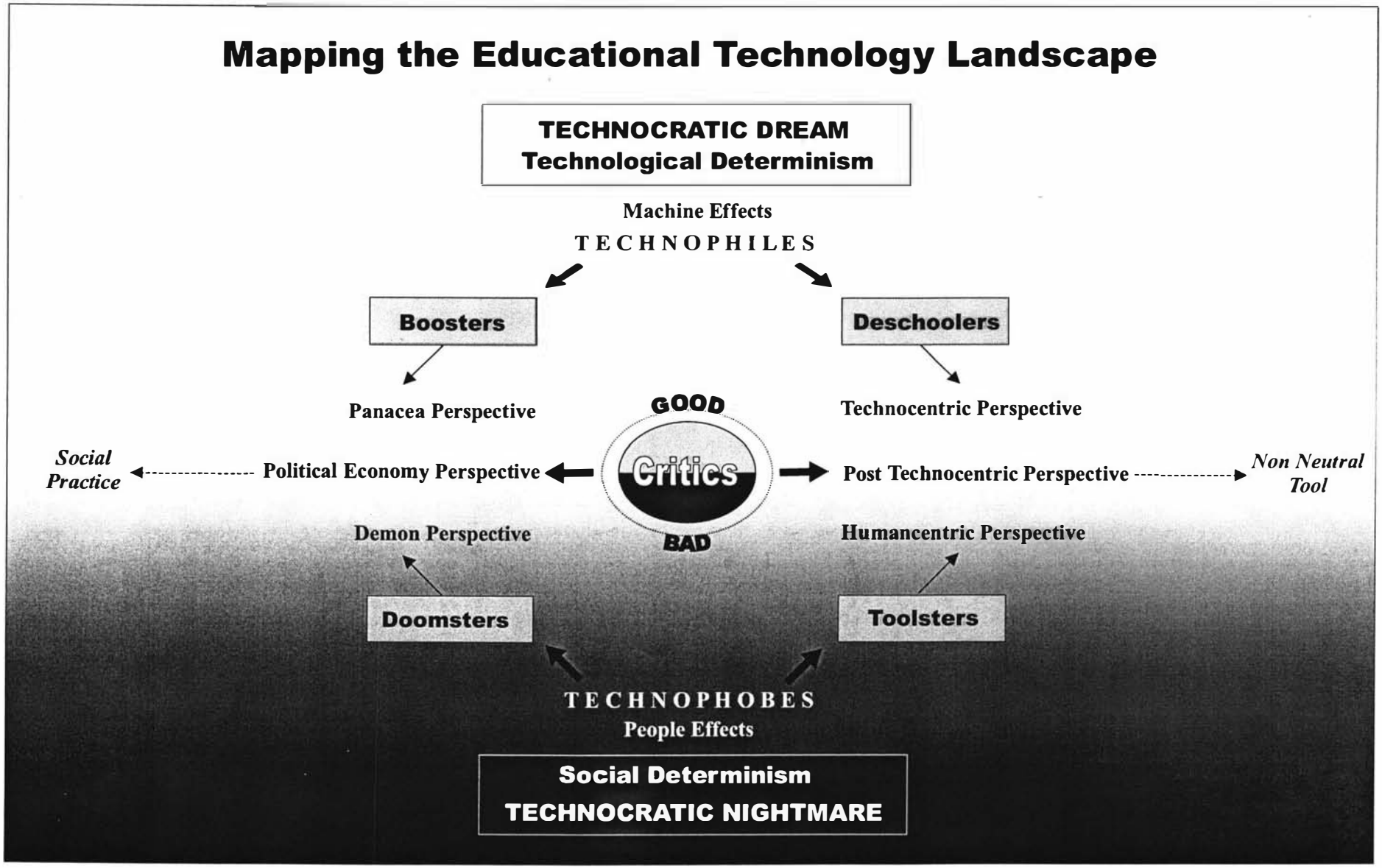

Figure 10.1 The educational technology landscape

The opposite position depicted in Figure 10.1 of a technocratic nightmare is open to similar criticism as the technophobes are guilty of adopting a social or cultural deterministic view of the relationship between society and technology. This type of determinism overemphasizes the role of social processes in mediating technology outcomes. Put another way, it asserts that society shapes technology rather than technology shaping society. Thus, social determinism posits that ICT is a more or less neutral instrument that can be moulded and used for various purposes (Selwyn & Gorard, 2002). A societal discourse often manifests itself in the claim that ICT as just another tool whose value depends almost entirely on people and pedagogy (Salomon, 2002). This mindset is encapsulated in popular vernacular as the "Mae West Syndrome"—that is: *It's not what you've got but how you use it!*

Albeit rather crude, the results of the present study confirm that such thinking is common in the professional discourse. This so-called syndrome is often used to appease concern that technology is overly influencing the direction of educational policy. The International Society for Technology in Education (ISTE) (2000b) adopted this defence in response to Corde and Miller's (2000) much publicised claim that new computer technology was yet another search for pyrite—that is, Fool's Gold. They argue:

> *Technology isn't the demon here. It's merely a tool in the 21st century educational repertoire (ISTE, 2000a).*

The problem is that to view the computer as a neutral tool arising from societal demand potentially misreads the social and cultural significance of the technology itself (Selwyn & Gorard, 2002). As Selwyn and Gorard (2002) claim:

> *Although social determinism acts as an antidote to 'naïve' technological determinism it is itself flawed in assuming that the technologies themselves are of little importance. In short, social determinism fails to recognize that technological artefacts are imbued with politics in their own right (p.6).*

Thus, the technophobes fall into the trap of placing too much faith in teachers' abilities to mediate, critique, and intervene in how new educational technologies are put to use. This mindset ignores the possibilities of unintended consequences and the ways in which new educational technologies bring with them restraints on how and for what purpose they can be used (Burbules & Callister, 2000). Such an orientation also fails to appreciate that new tools reframe the conception of the purposes to which they can be used and reshape peoples' perceptions of themselves as agents, their relations to one another, their concept of time and space, and so forth (Bowers, 2000). In the case of the Internet, for example, email has allowed people to communicate in new ways and the Web has given rise to new purposes for the use of information not previously imagined, which is not all bad.

Of the two main types of technophobes, the Doomsters adopt a "demon perspective" based on an emotive and illogical response to the threat of a technocratic nightmare. The perceived threat usually arises from concern over how people might use the technology. Broadly speaking, the Doomsters are reactionaries, nostalgic opponents and neo-Luddites who reject the use of ICT in favour of their pre-existing beliefs and pedagogical approaches. These teachers often get the blame for the failure of an educational technology due to their conservatism and reluctance to change time honoured habits, rituals and routines.

In a similar vein, the Toolsters are shown to favour established teaching practices and tolerate only subtle variations to the traditional curriculum. At their heart, they adopt a "humancentric perspective" in which teachers are often cautious of the drive to reform schools through new educational technology. As Hattie (1999) observes:

> *I do not believe that this lack of encapturing is a consequence of any latent-Ludditism, but rather because of a healthy scepticism about its promised efficacy in teachers' daily lives.*

Although speculative, the results suggest that the Toolster is the largest group numerically in the teaching profession; they are not entirely opposed to the use of ICT in schools as this type of teacher is generally willing to add the Internet as another resource to their professional toolbox. Put simply, if they can see a purpose then they will use the technology. In a paradoxical sense, the Toolster often accepts the inevitability of technological change but also frames ICT as a neutral tool, which they can amend and shape to achieve their own ends. Thus, teachers of this mindset are both pragmatic and selective about the way in which they adopt and implement the Internet in the classroom.

While the two main paradigms in this model have explanatory value, even in their expanded form they portray a simplistic dichotomy of the educational technology landscape. The distinction between the "technocratic dream" and "technocratic nightmare" implies that the use of ICT in schools is either inherently good or potentially bad. We need to move beyond such a bipolar conception of the Internet as the aforementioned tensions show that dyadic thinking is not overly productive (Walker & White, 2002). Indeed, this type of extremism in either direction is generally counter-productive to understanding the complex relationships, web of interactions and conglomerate of mutually nested factors that contribute to the educational technology milieu. As Burbules and Callister (2000) argue, the ICT-related school reform movement is simultaneously both good and bad, which is aptly demonstrated in the study of proficient, accomplished and experienced internet-using teachers. For this reason there is a subtle but important distinction between understanding how the Internet has affected teachers' lives and work culture, and *vis-à-vis* how teachers have affected the Internet—for better *and* worse as opposed to better *or* worse (Burbules & Callister, 2000).

Thus, the crude distinction between the technophiles and technophobes is inadequate as this fails to encapsulate the "cybercritics" (Papert, 1996) who adopt a more dialectical perspective. Up until recently, the "critics" have been dismissed as the "technological ignoramuses" (Graham, 1999) whose views carry little weight. The major contribution of the narrative-biographical and micro ethnographic case study material is that it shows a critical response to the rise of ICT in schools is often thoughtful and well-reasoned. As Selwyn (2002b) states:

> *Questioning the educational value of computing is treated as heresy among some sectors of the educational community. Such has been the enthusiasm and expenditure vested in educational computing over the past 20 years that any suggestion of doubt is often dismissed as being 'anti-progress' or 'Luddite' by educational technologists. Indeed, the whirl of public discourses surrounding educational use of computers has tended to offer only two entrenched positions—to be either for or against the use of IT in education, with little room for discussion in-between (p.428).*

Although Walker and White (2002) claim that technorealism offers an alternative middle ground, this is largely a pragmatic response that accepts the inevitability of technological change. It does not challenge the basic assumptions upon which the ICT-related school reform movement is based nor does it raise the important pedagogical questions that need to be asked in relation to the Internet. Thus, technorealism is not in the same tradition as "the Critic" as proposed by Bigum (1995) and illustrated in the centre of Figure 10.1. In this representation, the mindset of "the Critic" is framed around a non-neutral tool perspective in which educational technology is viewed good and bad, inherently political and part of social practice. As de Vaney (1998) writes:

> *Another story about technology in and out of the classroom is emerging. In this narrative technology is not anthropomorphized; it does not descend as a deus ex machine to rescue beleaguered students or citizens mired in the slough of stasis. Nor is technology a villain waiting to corrupt the morals of students. Rather, in this alternative account, the appearance of a machine in a home, a classroom, or an office can signal a site of power, but complex political and cultural forces already are at work when it appears (p.579).*

Of course, the non-neutral tool perspective is open to criticism as merely a subtle variant of the "technocratic dream" or "technocratic nightmare" if it takes no account of the simultaneous effects of a new educational technology. This perspective needs to go further than stating the point of fact that technology is not neutral. Accordingly, Burbules and Callister (2000) claim the perspectives of "computer as panacea", "computer as tool" and "computer as non-neutral tool" are merely different versions of a technocratic mindset that

leads to teachers, teacher educators and policy-makers asking the wrong questions. This claim is borne out by the raft of traditional evaluations of teachers technology uptake assuming rational conceptions of adoption and implementation rather than complex interactions with multiple layers of dynamic, fragile and multifarious effects.

Set in the theoretical backdrop of a post-technocratic perspective (Burbules & Callister, 2000), the Critic recognises that desirable and undesirable effects coexist on the same plane and the same pedagogical innovation can be both good and bad simultaneously depending on the educational context and the teacher's subjective realities. This mindset does not define the computer as demon or panacea, nor does it imagine that educational technology is just another tool. Instead, "the Critic" views the rapid growth of the Internet in schools as a type of Chinese crisis. As Oppenheimer (2003) explains:

> *In Chinese script, crisis consists of two opposing characters, one symbolizing danger, the other opportunity. The tension of this duality exemplifies what has been happening lately in schools as politicians and education leaders in nearly every community in the world have been making their largest investment ever in state-of-the-art technology (p.xiii).*

In sum, information gained from the study of internet-using teachers together with an analysis of related literature helps to identify some of the competing mindsets and theoretical orientations within the educational technology landscape. These perspectives, while generalized beyond the study itself, are well-informed by theory and research. In Bruce's (2000) terms, for example, there is evidence that teachers have read the Internet in at least four different ways that loosely resemble the distinction between Boosters, Doomsters, Deschoolers, Toolsters and Critics. First, the "exegetical reader" views the Internet as offering valuable resources but interprets it in a non-critical manner. Second, the "dogmatic reader" values traditional methods over and above new media and regards the Internet as chaotic and flawed. Third, the "agnostic reader" assumes a technical stance towards the Web's value and the pedagogical use of the Internet in the classroom. Finally, the "dialectical reader" adopts a critical stance by attempting to understand the "text" in wider socio-political and historical-philosophical contexts. This latter group of teachers are not sponges that absorb the concepts, theories and ideologies advocated in official policy discourse including ICT strategies. On the contrary, the present study provides evidence that "the Critics", indeed all teachers, read policy according to the knowledge, dispositions and powers of analysis that they have acquired through their life histories, professional experiences, collegial relationships and so forth. Thus, the proposed map of the educational technology landscape is overly deterministic, as teachers are not necessarily rooted to one location. The ground will always be loose and open to shifts in response to new developments and new understandings.

10.4 COMPETING DISCOURSES OF THE DIGITAL LANDSCAPE

This section extends the landscape metaphor by digging beneath the various mindsets and theoretical orientations that appear in the general topography of the research sample. It seeks to uncover and understand the brittle substrata upon which the current digital landscape is built by applying a political economy perspective to the internet-using teachers' responses. Although the discussion goes beyond the data, it draws on a number of contemporary developments from a well-informed perspective to explain the bigger picture of the competing and coexisting discourses that have contributed to ICT permeating almost every aspect of education. Such a meta-narrative views the digital landscape as a political landscape in which teachers are in the middle of a power struggle over the future of schools and who should benefit the most from the advent of the Internet as a social, economic and educational phenomenon. First and foremost, this perspective recognises the inherently political nature of the education system. As Apple (2003) once again writes:

> *Formal schooling by and large is organized and controlled by the government. This means that by its very nature the entire schooling process—how it is paid for, what goals its seeks to attain and how these goals will be measured, who has power over it, what textbooks are approved, who does well in schools and who does not, who has the right to ask and answer these questions, and so on—is by definition political (p.1).*

With this basic principle established, a political economy analysis of the growth of the Internet in schools also draws on a post-technocratic perspective of the dialectical relationship between technology and society. In so doing such a dualism avoids the chaos of post-modernism by acknowledging that the Internet has opened up a road of possibilities including new means to communicate, search for information, shop electronically, learn and teach, and so on. At the same time, these opportunities are clearly shaped and constrained by a number of social and cultural factors. In other words, the effects of the Internet are not random. Rather the Internet has given rise to multiple effects that are good and bad (and unknown) simultaneously. As Goodson et al. (2002) state:

> *There is a new recognition that the use of ICT is part of a larger cultural shift that is becoming an increasingly complex and multi-faceted process—a process in which patterns of globalizing domination collide with new opportunities for individual and self-expression. Within education, pernicious trends toward privatization, commercialization, standardization, and deskilling can be seen to coexist (p.4).*

Following on from the coexistence of opposing forces, a political economy perspective incorporates an historical analysis of the discourse(s) surrounding the use of new educational technology in schools. Selwyn (2002b) argues that if researchers and policy-makers are to make sense of the competing and coexisting discourses in which teachers' present-day use of the Internet is enmeshed it is vital that the historically constructed nature of the computer is laid bare. Even with the benefit of hindsight, he claims that it is all too easy to overlook the inherent economic, commercial and political influences imbued in the pedagogical language surrounding the computer as an educational technology (Selwyn, 2002b). In his analysis of the history of educational computing in the UK between 1979 and 1989, Selwyn (2002b) reveals the extent to which non-educational rationale have shaped the orthodoxy of the computer in British schools as an accepted and taken-for-granted pedagogical machine. He concludes:

> *Thus, behind an amalgam of commercial, political and economic interests, it is clear that the discursive construction of 'educational computing' by government and industry was certainly justified by tenuous educational claims, yet was founded on non-educational intentions. At the time, the spuriousness of the educational assertions surrounding computing was noted with suspicion by some academic commentators, reasoning that such stories were wholly unsustainable (...). Nevertheless, as we now know, such stories are continuing to be told in the early twenty-first century with even more vigour and even higher levels of investment (Selwyn, 2002b, p.440).*

This story is not unique to the UK given the high level of "policy borrowing" (Finegold, McFarland & Richardson, 1993; Selwyn & Brown, 2000) between OECD member countries. Indeed, the use of ICT in schools is a key linchpin of the OECD's (2001) neo-liberal blueprint for economic and educational reform as implicit throughout their six scenarios on the future of schools. Set in this context, the following analysis of the digital landscape endeavours to tell a different tale, one in which dominant groups are seeking to advance their own educational agendas not through brute force but persuasion. In the context of the Internet, this involves persuading teachers or at least a reasonable proportion of the teaching profession that the ICT-related school reform movement makes good sense. It also involves recruiting, often unwittingly, a group of teachers as the persuaders of their colleagues since they are likely to have more influence on the adoption of ICT than those behind the real agenda. By analogy, these teachers are the necessary but expendable foot soldiers of the digital revolution. Thus, the concept of hegemony—in which dominant groups in society seek to establish the common sense, define what counts as legitimate areas of agreement and disagreement, and shape the political agendas made public and discussed as possible (Apple, 2003)—is central to peeling away and mining through the deeper layers of the digital landscape.

When the surface is removed and educators sift through the loosely compacted sediments, the drive to use ICT in schools is rooted in several competing and coexisting discourses with conflicting ideological and pedagogical assumptions. While a deeper analysis of these assumptions incorporates material beyond the study, five distinct discourses of persuasion can be identified within the teachers' responses, reflecting quite different understandings of learning and teaching with very different social, economic and educational outcomes. The main discourses can be described as: (a) reproduction, (b) reschooling, (c) deschooling, (d) reconceptualist, and (e) socio-cognitive (Codd, et al, 2002). Although Figure 10.2 adopts an old metaphor for a digital problem, it shows how the above discourses occupy different spaces of an hourglass in which the sand flows currently in the direction of the so-called Knowledge Economy through reproduction and reschooling discourses.

The reproduction discourse assumes that schools are still the major agent of social and cultural reproduction. Accordingly, this discourse places strong emphasis upon the preparation of students with the skill and knowledge required for future employment. As the results show the vocational rationale for the use of ICT in schools is at the forefront of this discourse along with elements of cognitive science relevant to the concept of lifelong learning, which is partly because in the Knowledge Economy jobs will frequently change in response to new technical developments. In a similar vein, the reproduction discourse recognises changing demographic conditions brought about by globalization and population ageing. As Barber (2000) pointed out at an OECD conference on future schooling:

> *In the past, an ample supply of young workers made it possible for employers to update skills by replacing older workers with more recently trained younger ones. Population ageing will make this impractical.*

Thus, the Knowledge Economy will require a more flexible and skilled workforce. This explains the move to open the way for private and international competition in the education sector (including via the Internet) to support more authentic work, just-in-time learning and skill acquisition in niche areas. One of the so-called Digital Opportunity Projects (e.g., GenXP) has already led to students undertaking computer training and certified networking courses in New Zealand high schools. Such a response to the shortage of ICT skills can be understood as simply a crude attempt to prepare a pool of future "hi tech" employees to keep business competitive in the Knowledge Economy. In this discourse, schools are the producer of human capital needed by the economy in the form of a trained and differentiated workforce. As Connell (1995; cited in Smyth et al., 2000) writes of this discourse, 'Teachers are then readily seen as the specialized workforce producing the larger workforce' (p.6).

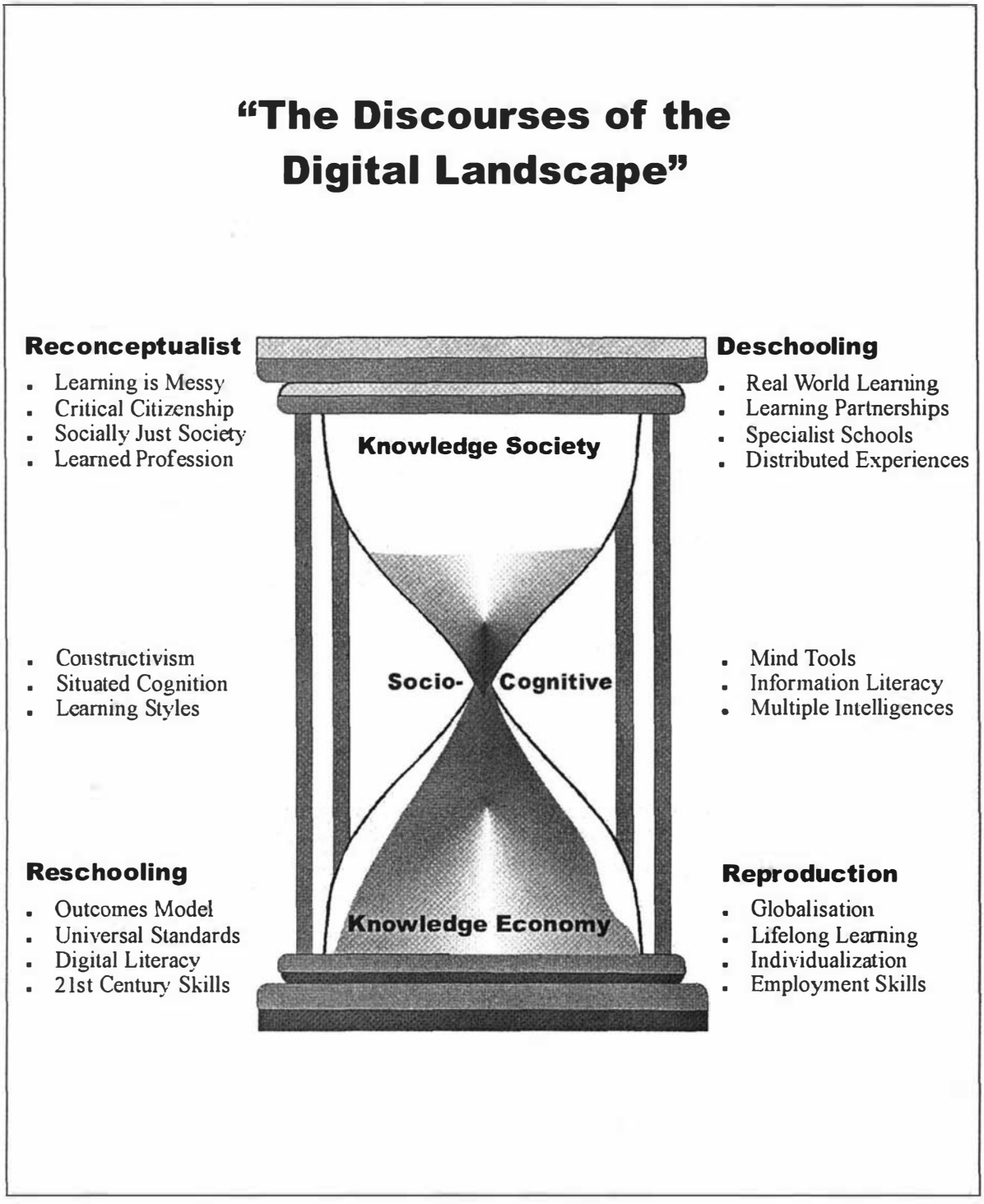

Figure 10.2 The five main discourses of the digital landscape

The reproduction discourse is pervasive throughout the New Zealand curriculum. As the previous Government wrote in its vision of Education for the 21st century:

> *We live in a global community and a global market place. If we seek to improve our economic standing relative to that of our competitors, our commitment to education and training must be greater than that of other countries. We must adapt more quickly to change than our competitors, and the skills of our workforce must improve faster than the skills of other workforces. We must invest in people, our greatest economic resource (Ministry of Education, 1993b, p.7).*

In sum, the fundamental purpose of education in a Knowledge Society is not considered within the reproduction discourse, nor is the fact that learning has always been a lifelong process. Put simply, ICT is promoted as the digital lubricant of a new kind of "fast capitalism" in the Knowledge Economy. The discourse is constructed around the language of an economic and social reproduction rationale, albeit buried and cleverly disguised in educational terms, rather than the goal of creating critical thinkers, critical consumers and critical citizens.

The reschooling discourse promotes an outcomes model of education with an alliance between a neo-conservative attachment to traditional values and the neo-liberal emphasis on meeting the needs of the Knowledge Economy. This represents a shift from controlling the inputs—that is, teacher qualifications, curriculum content and instructional methods—to standardizing the outputs. It seeks to reform or reschool the traditional curriculum by advancing universally high standards through the language of modernisation and technology as progress. Standards are seen as the solution to reducing the current achievement gaps, which ICT makes possible through more efficient data transfer and reporting of student progress. It follows that the metaphor of ICT as tool is also common throughout this discourse. With the advent of networking, there is a move to share learning objects and participate in common online learning experiences across national boundaries as a means of enhancing quality assurance and internationalising the curriculum. Such a curriculum helps to promote a mobile workforce capable of shifting from one market to another as required thereby reducing temporary shortages and overcoming the high costs of labour. Thus, the reschooling discourse is about preparing a sufficient pool of hi-tech workers for the low-tech electronic factories of the future. In the words of President Bill Clinton:

> *Frankly, all the computers and software and Internet connections in the world won't do much good if young people don't understand that access to new technology means... access to the new economy (cited in Cuban, 2001, p.18).*

In the US, a number of major lobby groups with their own economic agenda have been active in promoting the type of computer skills required for the so-called digital economy (e.g., The CEO Forum). The pressure to define a new set of educational technology standards for teachers was triggered partly by "The Professional Competency Continuum" developed by Coughlin and Lemke (1999) for The Milken Exchange—a family foundation with strong business interests. In recent years, the teacher education community in the US has adopted and refined these standards working alongside ISTE (2000a), which is proof of the level to which this discourse has permeated the teaching profession. The pressure to introduce educational technology standards for both students and teachers comes despite a lack of research evidence showing their effectiveness in promoting better learning in the manner described in the Literature Review. As Smyth et al. (2000) remarks:

> *Teachers are increasingly expected to follow directives and become compliant operatives in the headlong rush to encase schools within the ideology, practices and values of the business sector – never mind that they have histories, aspirations and professional cultures that make them decidedly different to car plants, breweries or fast-food outlets (p.1).*

In sum, the lesson from the reschooling discourse is that what policy-makers say they want to accomplish in schools and how they propose teachers should assess what students have learned are often contradictory. This is evident when organizations such as the OECD advocate new constructivist teaching methods at the same time as promoting the adoption of more rigorous standards-based curricula. It is highly problematic to standardize critical thinkers, critical consumers and critical citizens but this remains a stated goal of the reschooling discourse. Thus, this discourse propagates an instrumentalist view of learning and reduces teaching to a narrow practical craft. The reschooling discourse therefore erodes the ethical, moral and political dimensions of teaching as critical pedagogy.

The deschooling discourse contains an interesting mix of future-focused initiatives that on the surface promote the impression that schools are losing their monopoly on learning and teaching. This discourse advances the view that students live in a new Digital Age where the Internet is chipping away at the walls of the classroom. It challenges the traditional status of the teacher as the fount of knowledge and advocates education with a strong local and participatory flavour. Indeed, participatory action research (PAR) is a common strategy promoted by this discourse—albeit often using a naive practical as opposed to critical methodology (Codd et al., 2002). Other practical initiatives under the language of deschooling include the development of ICT lead schools along with a raft of virtual learning experiences. Notably, the discourse recognizes the role of informal learning and the potential of new professional networks, as illustrated by the ICT teacher community known as "Talk2learn" managed by UltraLab South for the Ministry of Education, New Zealand.

In spite of a strong literature base supporting such online communities of practice, it is noteworthy that Nichani and Hung (2002) argue most of these initiatives are nothing more than networks of practice. The participants are primarily involved in discourse *about* knowledge rather than learning *to be* (Nichani & Hung, 2002). Moreover, these networks are not truly inclusive. They can be a powerful way of propagating "groupthink" that masquerades as consultation where the mind becomes the most important economic asset (Castells, 1996). Thus, this type of collaboration can be used as a political ruse to obtain teacher compliance and commitment to educational reforms decided by others. As Hargreaves (1995) states, teachers can end up collaborating with the enemy.

Another theme of the deschooling discourse is partnerships between school, business and community groups that attempt to extend the traditional role and boundaries of schools. The language of partnerships is behind the move to establish homework and community learning centers and tacit support for the burgeoning industry of after school services with an ICT flavour (e.g., NumberWorks). Although these initiatives recognize that learning can occur in out-of-school settings, they often treat education as a purchasable commodity and few advance a genuine deschooling agenda (Codd et al., 2002). Even the most innovative of these initiatives (e.g., ThinkQuest) still rely extensively upon the support of teachers and typically they take place in the regular context of the classroom. Hence, they do not advocate deschooling in a radical sense, as there is a tendency to merely "bolt" ICT on to the existing curriculum. For this reason the term deschooling is somewhat misleading.

While many of the deschoolers adopt the language of local autonomy and decision-making, they also support the goals of increased competition and deregulation in keeping with free market policies of neo-liberalism, which is the real paradox of decentralization (Valovic, 2000). Arguably, much of the deschooling discourse promotes a type of "e-schooling" very distant from the original vision of a "Learning Society" (Faure, 1972) committed to active citizenship, liberal democracy and equal opportunities. Extending the hourglass analogy, the sands of the deschooling discourse come in different colours often closer to those of the Knowledge Economy than the concept of a "Network Society" (Castells, 1996). First developed by Castells (1996), the Network Society acknowledges the significance of the Knowledge Economy but also views this global version of capitalism as potentially brutal and socially destructive. Hence, the original conception of the Network Society or Knowledge Society approaches the digital landscape as problematic. It recognizes that ICT and the new economy go hand-in-hand with the decline of the nation-state, the loss of social identity and the emergence of a new "Fourth World" in which the rich are getting richer (Castells, 2000). Such an analysis highlights Cornu's (2003) superficial analysis of teaching in the Networked Society presented at the recent International Federation for Information Processing (IFIP) Working Conference on *ICT and the Teacher of the Future.*

In sum, the deschooling discourse harbours a tension between endorsing neo-liberal market reforms albeit in the softer language of the Third Way and embracing an empowering paradigm that challenges the entrenched and oppressive nature of schooling in the tradition of Illich (1971). Thus, the discourse supports both the goals of the Knowledge Economy and the elusive ideal of a Learning Society (Coffield, 1997). While many deschooling initiatives have tremendous potential, they often embody a set of values quite different from education as a public good in which the government is responsible for the provision of a strong education system. In the backdrop of globalization, there is pressure on policy-makers to expand and modernise the curriculum to produce highly flexible workers, fluent with new computer technology and capable of working across national boundaries. With an eye on the future, the discourse often detracts from the present—'from education *as life,* by viewing it only as *preparation for life'* (Codd et al., 2002, p.71).

The reconceptualist discourse advocates critical pedagogy and the promotion of education *for* democratic citizenship. This discourse encompasses not just knowledge of democracy but skills and understandings for active participation in all aspects of the community and the Knowledge Society. As Selwyn (2002c) demonstrates in his literature review on *Citizenship, Technology and Learning,* there is an important difference between passive and active citizenship, and education *for* citizenship as opposed to education *about* and *through* citizenship. Not surprisingly, the goal of education for democratic citizenship goes well beyond teaching information literacy, which is a common theme in the deschooling and reschooling discourses. Notably, the reconceptualist discourse is not driven by an ICT imperative or the libertarianism of the wired (Warnick, 2001). Indeed, educational technology is understood as social practice that unlike other discourses requires a critique of technophilia. It rejects the metaphor of ICT as tool and the techno-utopian view that the Internet is changing teaching for the better. The reconceptualist discourse is concerned that the ICT-related school reform movement is bypassing deeper questions about the nature of the Knowledge Society and what counts as good pedagogy in the digital landscape.

Importantly, pedagogy has a personal quality that values teachers' lived experiences and professional judgments. The discourse recognizes the ethical, moral and political dimensions of good pedagogy largely ignored in the new science of learning and conceptualises teaching as a learned profession. Thus, there is no quick fix or recipe for teaching and teacher education. It follows that teaching is understood as a cognitive and intellectual process that requires a strong theoretical and research base. A basic premise is that unless teachers have a critical understanding of research and theory and a role to play in shaping curricula, innovations and educational reforms are likely to fail. Overall, the discourse seeks to reconceptualise teaching as a scholarly profession, which is characterised by a high level of trust and a collaborative professional culture (Codd et al., 2002).

At the same time, the reconceptualist discourse is not anti ICT as new educational technologies are recognized to be very beneficial, especially when linked to fundamental values of freedom, equality, tolerance, shared responsibility, and respect for nature (World Summit on the Information Society, 2003). Thus, the distinguishing feature of this discourse is the way the Internet is located in wider debate about the purpose and fundamental values of education, along with social issues relating to life chances, life pathways and basic human rights. In this regard, the following common vision developed at the recent World Summit on the Information Society (2003) is consistent with the goals of the reconceptualist discourse:

> *We, the representatives of the peoples of the world, assembled in Geneva from 10-12 December 2003... declare our common desire and commitment to build a people-centred, inclusive and development-oriented Information Society, where everyone can create, access, utilize and share information and knowledge, enabling individuals, communities and peoples to achieve their full potential in promoting their sustainable development and improving their quality of life, premised on the purposes and principles of the Charter of the United Nations and respecting fully and upholding the Universal Declaration of Human Rights (p.1).*

Although a worthy initiative, the reconceptualist discourse is wary of efforts and empty visions that fail to challenge some of the basic assumptions about the role of ICT in the Knowledge Society. Hence, one of the problems is identifying the "true" reconceptualists as the language of social and educational reform is infected and colonized often by other discourses. Arguably, this has already occurred with the *New Basics Project* in Australia (Education Queensland, 2000) where talk of "rich tasks" and "productive pedagogies" has become increasingly mainstream in the adoption of ICT throughout New Zealand schools, as evidenced by discussion of these concepts in "Talk2learn".

In the case of the World Summit on the Information Society (2003), a closer analysis of the *Plan of Action* and the *Declaration of Principles* suggests that the vision is not what it seems. After all, ICT is portrayed as a neutral tool, which suggests that the goals of the Information Society conceal a number of competing and coexisting discourses. The Declaration of Principles states:

> *We are aware that ICTs should be regarded as tools and not as an end in themselves. Under favourable conditions, these technologies can be a powerful instrument, increasing productivity, generating economic growth, job creation and employability and improving the quality of life of all (World Summit on the Information Society, 2003, p.2).*

On closer inspection, there is a mismatch in the language of this initiative, as woven throughout the World Summit is the centrality of ICT to economic prosperity and the metaphor of technology as progress. It is noteworthy that standardization is viewed as one of the essential building blocks of the Information Society. Moreover, the Declaration of Principles is awash with the language of "enterprise culture" and the discourse of the Knowledge Economy as illustrated in the following core principle:

> *We are committed to realizing our common vision of the Information Society for ourselves and for future generations. We recognize that young people are the future workforce and leading creators and earliest adopters of ICTs. They must therefore be empowered as learners, developers, contributors, entrepreneurs and decision-makers (World Summit on the Information Society, 2003, p.2).*

In sum, the reconceptualist discourse is concerned with critical pedagogy and fundamental questions about the purpose of education itself. In this sense, education is not synonymous with learning and teaching. The discourse adopts the view that teachers need to educate people so they can not only participate as future citizens but also actively shape a very different kind of world. This wider societal view recognises that the failings of the education system are not amenable to improvement via technology alone (Kearsley, 1998). There is a basic need to reconceptualise the curriculum around ethical, moral and political principles, which Chapman and Pearce (2001) describe as a "Knowledge Culture". Such a culture is one in which ICT is used to promote an active citizenry capable of transforming society to ensure a more equitable education system and socially just future for all.

Finally, the socio-cognitive discourse advances new understandings of learning and teaching from contemporary developments arising out of the so-called cognitive revolution—that is, the new science of learning. As discussed in the Literature Review, the interactive features of new computer technology make it easier to create active and meaningful learning environments in which students build new knowledge and continually refine their understandings. Bransford, Brown and Cocking (1999) report that educational technology can help people visualize difficult-to-understand concepts and when learning experiences are intellectually engaging is a powerful tool for knowledge construction. In this sense, the language of the socio-cognitive discourse promotes ICT as an intellectual toolkit similar to that used in out-of-school settings. Likewise, the Internet is conceptualised as a tool that can provide access to vast databases of information and real-world data for analysis, synthesis and sharing with others. It also makes possible connections to people, partnerships and participation in online communities of practice, all of which under the right conditions potentially enhance the learning and teaching process.

While the socio-cognitive discourse itself needs no further discussion, as it is already well-documented in the professional literature, the key point is that the four other discourses all draw on contemporary developments in cognition science but with very different intentions. The language of the cognitive revolution acts as a meta-discourse that simultaneously infuses the other discourses and thereby renders the socio-cognitive discourse as problematic. As the metaphorical hourglass illustrates, the sands of the competing and coexisting discourses all funnel through educational concepts and theories from the new science of learning. Consequently, they are difficult to disaggregate from the socio-cognitive discourse, and contemporary developments in learning theory provide a haven that conceal many of the desired non-educational outcomes behind the ICT-related school reform movement. In this sense, the different interest groups and stakeholders borrow and co-construct a socio-cognitive language of persuasion to legitimise their own hegemonic agenda. The lesson from this analysis is that educators need to adopt a critical perspective of the pedagogical rhetoric surrounding the Internet in schools and reframe the teacher's role to take into account and, if necessary, subvert the highly politicised nature of the new digital landscape.

10.5 REFRAMING THE TEACHER'S ROLE

It is important to acknowledge that much of what we are coming to learn about the use of the Internet in schools is only partially understood. While the good is at the forefront of the literature and the bad is beginning to emerge, there is a lot still unknown. Hence, the above analysis of the competing and coexisting discourses of the digital landscape is far from the complete picture. It simply attempts to keep alive and provide an alternative lens through which to view the Internet as a social, economic and educational phenomenon. By attempting to break new ground the aforementioned discussion offers a robust and powerful conceptual framework to challenge the dominant language of persuasion associated with the move to wire New Zealand schools. In the current revivalist environment, it is not easy to swim against the "orthodoxy of optimism" surrounding the Media Wave, which puts a different spin on the notion of Internet Safety (Brown, 2003b). Irrespective of the unpopularity of being critical, the results of the study coupled with a deeper analysis of the literature raise serious questions about recent efforts to plug New Zealand schools into the Knowledge Economy. As Selwyn (2002a) states:

> *Yet given this increasing ideological and financial importance it is more vital than ever to ask awkward questions of education and technology, its strengths and weaknesses and, above all, the often messy and never straight-forward nature of its implementation and insertion into the social settings of the school (p.8).*

In a similar vein, Selwyn (2002b) writes elsewhere:

> *If IT is to be successfully and effectively used for educational purposes in the twenty-first century, then it is essential that the myth of the omnipotent teaching and learning machine is challenged by those within the educational community and that computers are (re)constructed and (re)contextualised along more appropriate and realistic lines (p.441).*

Although Selwyn's argument is overwhelming, the reconception of ICT also needs to extend to the teacher's role. In the face of globalization and the new imperialism, McLaren and Farahmandpur (2001) argue for a new "revolutionary pedagogy" that raises teachers' political awareness and critical consciousness. There is need for a new breed of teacher willing to accept their responsibility as intellectuals (Smyth, 2001) and prepared to confront the problematic assumptions seldom examined about the non-neutrality of ICT in schools. Such teachers will posses "strategic knowledge" (Carr & Kemmis, 1986) of the bigger picture and understand how pedagogy is enmeshed in much more expansive social practices. As Connell (1995; cited in Smyth et al., 2000) puts it:

> *There is a sense in which virtually everything about teaching is political... Teachers cannot choose to be non political (p.7).*

Thus, we need to repoliticize pedagogy if teachers are to become critical, reflective, learned and trusted professionals who raise important questions of what is to be taught, to whom, how, and for what purpose. Such questions will as Freire (1972) writes help to undermine the power of oppression and thereby help to uncover the contradictions and mixed messages woven throughout the ICT movement. The assumption is that in the convergence of the language of excellence with the rush to wire New Zealand schools to the new Knowledge Economy, the political and contested nature of education has been and remains the forgotten part of the pedagogical equation.

This is probably no more apparent than in the recent effort by Hattie (2002) to describe the attributes and differences between "expert" and "experienced" teachers. While Hattie (2002) identifies five dimensions that differentiate such teachers—that is, (a) identifying essential representations of their subject, (b) guiding learning through classroom interaction, (c) monitoring learning and providing feedback, (d) attending to affective attributes, and (e) influencing student outcomes—and 16 separate attributes based on a review and synthesis of over 500,000 studies, none of the above categories recognise the ethical, moral and political nature of good pedagogy. Hence, this type of meta-analysis is inherently flawed and potentially quite dangerous. Of course, Hattie (2002) is in good company as the recent literature review on ICT and pedagogy by Cox et al. (2003) along with the synthesis of good practice and pedagogic benchmarks proposed by Kirschner and Davis (2003) remains locked within an apolitical conception of the good teacher.

The crucial point is that values are inseparable from the definition and identification of the characteristics of good pedagogy. Values permeate everything that people do. To reiterate a core tenet of the study, good teaching can not be reduced to a supposedly objective, value free set of personal attributes and professional qualities. Yet, the dominant ideology expects the capable teacher to adopt and implement ICT with little or no regard for the value-laden nature of the innovation. It is time to reject this type of catch up or deficit model as it ignores teachers existing perceptions and experiences (Watson, 2003). The narrative-biographical and micro ethnographic case study material shows that whether ICT is good depends on one's pre-existing values. Consequently, teachers may blindly support certain innovations that they value or their colleagues tell them to value because they are oblivious to the long-term implications and consequences. It follows that the first step in reframing the teacher's role is raising awareness of false consciousness, as values are partly personal moral choices and partly encoded mores connected to community and societal expectations.

Again, this latter point illustrates that the personal and the political are enmeshed in all the professional choices of teachers (Fullan, 1993b). There are complex forces behind the drive to reform schools and workplaces through ICT and rather than be lured by the appeal of "authentic work" and "real world" learning the teaching profession needs to create a culture of activism and reconceptualism. Such a culture would reclaim the true status of teaching in a liberal democratic society where pedagogical activism is a moral imperative. As Fullan (1993a) writes:

> *Moral purpose without change agentry is martyrdom; change agentry without moral purpose is change for the sake of change (p.14).*

Accordingly, in the context of ICT teachers need to address the most basic questions of purpose and meaning. What kind of society do we want? What is the meaning of schooling in the Knowledge Society? What are the real problems confronting schools that need solutions? What conditions must policy-makers provide for teachers if the public education system is to be fair and equitable? Such questions bring issues of critical citizenship, democratic community, and social justice to the forefront of discussion. At the same time, pedagogical activism should not be confused with creating vision and engaging in strategic planning as these practices have their roots in the "busnocratic rationality" that has permeated the New Zealand curriculum. It needs to be borne in mind that history is littered with leaders who have relentlessly pursued their vision in the face of widespread resistance (e.g., Stalin). While past governments have been criticised for their lack of foresight, arguably there is now a new problem of placing too much weight on ICT at the expense of critical dialogue and building vision from the ground up. Both Fullan (2001b) and Willis (2001) make the point that real vision in a culture of change is what you end with—not what you start with. In this regard, Fullan (2001b) states:

> *Visions, for example, can act as attractors, but only when they are shared at all levels of the organization, and only when they emerge through experience, thereby generating commitment. In contrast, lofty visions crafted in the boardroom or on a retreat meet the "strange" criterion in the eyes of employees, but not the "attractor" one (p.115).*

By reframing the teacher's role around critical pedagogy and pedagogical activism (Sachs, 2003) in which the focus is on the global politics of ICT in schools, the teaching profession will be more skilled at interpreting whose vision they are really following in the pursuit of a new Knowledge Economy. Such an approach is in stark contrast to the current decentralised school-based participatory paradigm of ICT professional development where the focus is on local initiatives removed from the contested outcomes of past historical and political events. Although the new flexible participatory ways of teacher learning are more respectful and sensitive than old hierarchical, reductionist methods of professional development, they are nevertheless still a form of surveillance and indirect rule over the work of teaching (Smyth et al., 2000). Smyth et al. (2000) argue that none of these changes equate with the disappearance of control over teachers' work or even a democratising of schools as workplaces. Instead, the decentralizing of teachers' work is a deception because it occurs within a framework of greater centralised surveillance (Smyth et al., 2000).

The basic assumption of pedagogical activism is that wired schools need "wired educators" capable of reading and responding to the competing and coexisting discourses of persuasion surrounding the ICT-related school reform movement. While a culture of activism centred on critical pedagogy is far from straightforward, the term "wired" acts as an acronym that encapsulates the basic tenets of this approach in contrast with traditional conceptions of the good teacher. The wired educator, for example, needs to be *wise* possessing a wealth of pedagogical experience in order to integrate new educational technology with integrity beyond the existing curriculum. Such a teacher also needs to be *inventive* as critical pedagogy requires an artful and sophisticated form of connected knowing where you sometimes have to teach against the grain. It follows that wired educators have an orientation towards *reconception* in which they are committed to critical citizenship and passionate about building a cohesive and truly egalitarian society. In a similar vein, they are *enlightened* teachers who work in a Knowledge Culture that nourishes their minds and spirits rather than arrests, deskills, and even reverses the trajectory of their professional growth. Above all, wired educators are *deep* thinkers and intelligent people who trust their own thinking and have mastered the art, craft and applied science of good teaching. In this sense, they adopt a kind of critical or ethical constructivism as opposed to enterprise constructivism where their thinking is not blinded by ideology.

In sum, there is much to still understand about the complex forces behind the drive to reform schools and workplaces through new computer technology. However, as the teachers stand on the crest of the latest broadband wave the enduring lesson is that the ICT-related school reform movement is problematic. It needs to be reconceptualized from a critical mindset as a contestable and value laden innovation located in the socio-political history of educational reform. Although the claims about the Internet are impressive and many innovative projects are underway, teachers need to learn more about possible negative side effects as well as potential benefits (Willis, 2001). The teacher's role needs to be reframed so that the teaching profession has the skill, knowledge and powers of analysis to critique, challenge and change the current and future direction of ICT in schools—for the better.

10.6 DARK CLOUDS ON THE DIGITAL HORIZON

This section attempts to synthesize some of the potential troubles and tribulations that loom on the digital horizon from the aforementioned discussion—albeit in the somewhat theatrical and speculative genre of story. While the Government has successfully elevated the status of ICT in schools to new heights, the evidence of this longitudinal research suggests that rather less attention has been devoted to the negative distal effects of the Internet on teachers' lives and work culture. Thus, the following discussion centred around the framework depicted in Figure 10.3 ties together insights gained from the study of proficient, accomplished and experienced internet-using teachers with the above post-technocratic political economy analysis in order to highlight some of potential metaphorical dark clouds casting a shadow on the digital landscape. The intention of this section is to unravel some of the myths woven throughout the policy discourse to generate a deeper level of critical debate.

The basic premise is that ICT is not inherently good as there are just as many hidden costs as positive consequences. In their book on the history of technological advancement from the prehistoric to the present, Burke and Ornstein (1997) argue that with each new technology something is lost. Although the results of the present study demonstrate that gains and losses depend to a large extent on one's perspective, the authors claim the progress wrought by Gutenberg's printing press also brought increased control over peoples' lives by making it easier for those in positions of power to disseminate the written dicta of authority (Burke & Ornstein, 1997). The question is: does this principle apply to the Internet? What will be lost in the wake of the digital revolution? In the backdrop of the war on terror, has the development of the Internet already contributed to a more volatile world where a new metaphor has emerged in which information is against the public good? Although such questions are beyond the scope of this study, predicting the distal effects of the Internet in schools is no easy matter, as the ICT movement is shrouded in a number of myths. The ensuing discussion attempts to shed further light on some of these myths before they become assigned to the history of yet another educational technology wave.

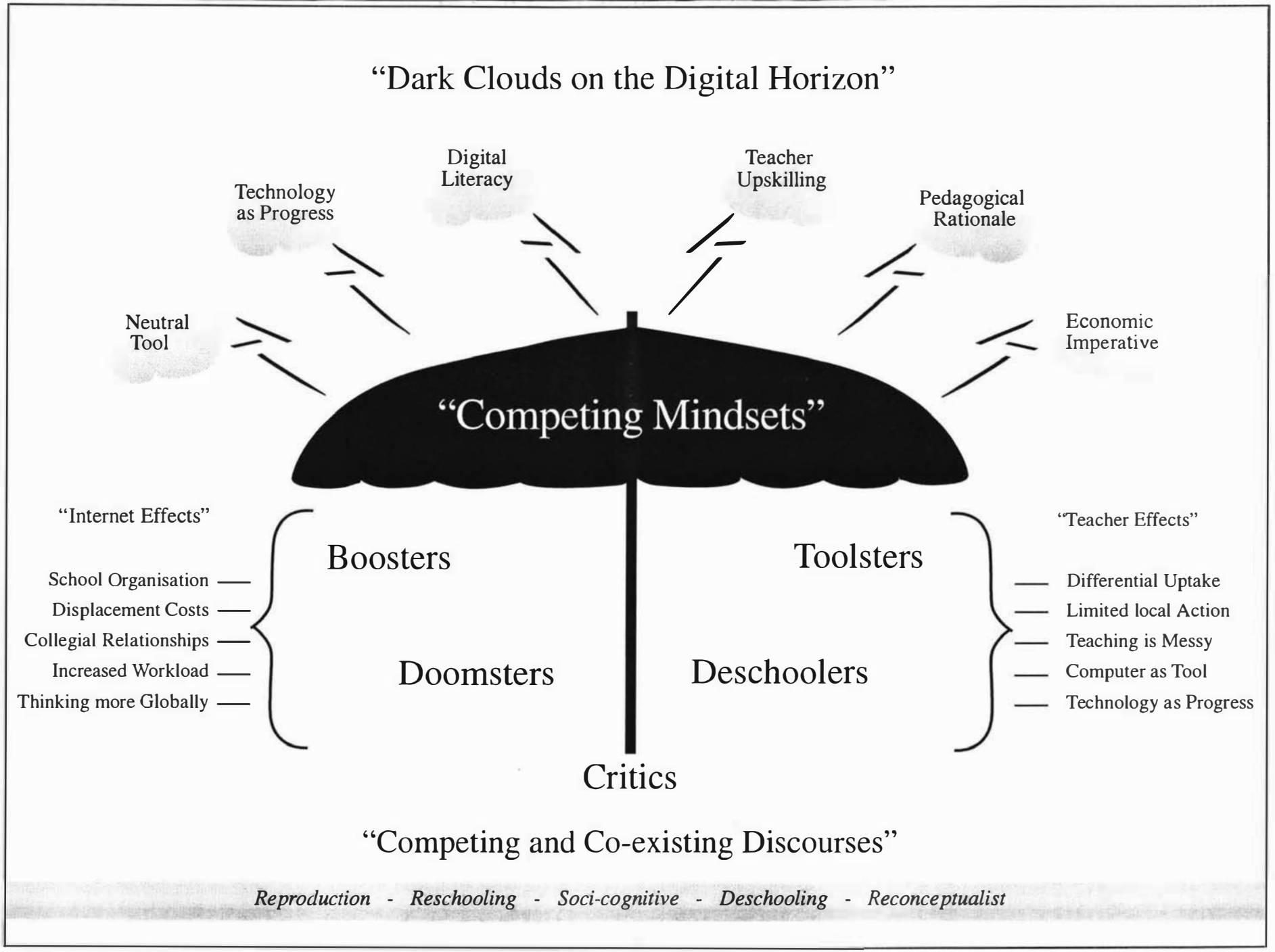

Figure 10.3 The metaphorical dark clouds on the digital horizon

Cloud 1 – Myth of the Neutral Tool

The metaphor of ICT as tool is inherently flawed. Despite this, the study shows that the tool metaphor is common throughout official policy and the discourse of the teaching profession. It exists at the highest levels as The Honorable Trevor Mallard, Minister of Education, also promotes a pragmatic Toolster perspective, illustrated in the following statement:

> *The Government has been quick to seize on the importance and practical benefits of digital technology as a key tool for 21st century teaching and learning (Ministry of Education, 2002, p.2).*

The problem is the neutral tool myth promulgates the belief that the "added value" of ICT is all a matter of how wisely people use the technology. It overemphasizes the role of social processes and the way that "people effects" mediate technology outcomes. Ironically, the tool myth places too much faith in the teacher. The myth of the neutral tool metaphor evokes the same logic as the slogan 'Guns don't kill people, people kill people' (Bromley, 1998, p.4). As Bromley (1998) points out, guns lend themselves to certain actions because they have an inherent propensity based on ontological assumptions to be used in certain ways toward certain outcomes. In short, a gun is never just a gun!

In a similar vein, it is known that ICT including productivity tool applications such as databases, spreadsheets and word processors are far from neutral (Agalianos & Cope, 1994; Chandler, 1990). All ICT conveys and reflects a milieu of social practices. As Bowers (2000) points out, many of today's high profile internet-based learning experiences (e.g., Globe) unashamedly promote technology consumerism with an implicit message that ICT is the solution when in fact it is central to many of our current problems—such as the destruction of the environment. A more socially responsible approach is required toward the role of technology in society. Although the research shows that some teachers have adopted a critical approach, they are the exception rather than the rule further evidenced by the depository of uncritical *ICT Learning Experiences* available from TKI.

While the tool metaphor appears to be enshrined throughout the teaching profession, little will be gained from perpetuating the myth of ICT as value free. Instead, the non-neutrality of ICT should be the focus of professional development where the Internet becomes an important object of inquiry rather than just a vehicle for acquiring information. Despite this, there is little attempt in government policy to better inform teachers of the wider social practice in which the Internet is located. Hence, it is time to encourage a more wired teaching profession willing to argue, debate and act on the anticipated risks and rewards of the ICT-related school reform movement. Such debate might help to better define the real educational problems teachers face and develop long-term solutions to these.

Cloud 2 – Myth of Technology as Progress

It is a myth to believe that technology is progress despite the claim that the power of the Internet is transforming society (e.g., Report of the Web-based Education Commission, 2000). Instead, ICT and the Internet are inextricably linked to, and an important by-product of, powerful social, economic and political forces, which have been described under the umbrella of globalization. In the face of globalization, it is highly misleading for teachers to read in the latest ICT Strategy that:

> *The expansion of ICT is driving significant changes in many aspects of endeavour throughout the world (Ministry of Education, 2002, p.6).*

Such technological determinism ignores the hegemonic forces that this chapter has shown are at least partly behind the drive to equip students and teachers with computer skills and new types of digital literacy. The key point is that this thing called globalization is highly problematic as vast sections of the world are untouched by ICT—most of the world's population still have no access to a telephone—and opponents to the new world order believe the threat from global media could be greater than was colonialism itself (Pilger, 1998).

Codd (2002) makes a useful distinction between the economic, political and educational patterns and principles of globalization. In economic terms, he warns globalization represents a shift from Fordist to Post-Fordist forms of workplace organization; a reduction in barriers to the free exchange of goods, workers, and investments across national borders, and, correspondingly, new pressures on the roles of consumer and the rights of worker (Codd, 2002). In political terms, Codd (2002) links globalization to the erosion of national autonomy; a loss of nation-state sovereignty, and, in turn, a weakening of the definition of the "citizen" as a unifying concept characterized by precise roles, rights, obligations, and status. In educational terms, the neo-liberal forces of globalization are reflected in an agenda that advances particular policies for evaluation, financing, assessment, standards, teaching education, and so forth (Codd, 2002).

In the context of these changes, there are inherent flaws in the goal of promoting students who can participate fully in society and achieve in a global economy, as expressed through several of the recent ICT policy documents. This is what The Honorable Trevor Mallard stated, for example, in the draft revised ICT Strategy:

> *My vision for education is: for all students, irrespective of their backgrounds, to develop the knowledge, understandings, skills, and attitudes to participate fully in society, to achieve in a global economy, and to have a strong sense of identity and culture (Ministry of Education, 2001b, p.4).*

Although the vision acknowledges the presence of competing local, national and global interests, there is a fundamental tension between retaining a strong sense of identity and culture on the one hand, and full participation and achievement on an international scale in a global economy on the other. In short, the retention of a sense of identity and culture is increasingly problematic in the face of globalized forces (Hlynka, 2003). Perhaps the most damming shortcoming of the Minister's vision statement is that it promotes the goal of full participation rather than critical education for citizenry. This suggests that we should settle for citizens who will uncritically participate in the type of society we have today. Is this as good as it gets? Surely, teachers need to use ICT to promote education *for* critical citizenship where people can contribute to building a socially just society and very different type of global community than the troubled one that exists today.

The lesson is that teachers need to start thinking about the way in which ICT is a political and ideological vehicle for shaping a wider social, economic and educational agenda. At a pragmatic level, if one accepts the reality of needing to achieve in the global economy, it is naive to imply that the world economy is unproblematic. Kelsey (2002) has revealed that all is not well with international capitalism. Remember, this is the same economy where the wealth gap between the richest 20% of humanity and the poorest 20% has doubled in the last 50 years (Pilger, 2002). The benefits of globalization have failed to solve hunger and poverty in the West let alone in the Third World. Thus, it is potentially dangerous to promote the view that achievement in the global economy, as it stands, is a desirable goal and a myth to claim that we can all exploit the opportunities of the global community. Burbules and Callister (2000) point out that the benefits of the digital economy are privileged to a handful of overdeveloped nations. The key point is that wider access to ICT on its own is unlikely to overcome some of the deeper structural problems associated with the harsh reality of today's fragmented digital world.

Cloud 3 – Myth of Digital Literacy

There was a tendency throughout the study for teachers to assume that functional literacy in ICT is central to an adequate preparation for life. Such a view is unsurprising as the assumption is implicit throughout the ICT policy discourse. While Snyder (1998) brings attention to some of the new emerging literacies, and Lankshear, Snyder and Green (2000) make an important distinction between operational, cultural and critical dimensions of literacy and technology, the latest ICT Strategy crudely embraces the concept of digital literacy and goes so far as to state:

> *Digital literacy must be seen as a life skill in the same way as literacy and numeracy (Ministry of Education, 2002, p.3).*

Putting aside the undefined nature of digital literacy that no doubt involves more than becoming competent in the latest version of a Microsoft product, educators need to ask what are the implications of raising the status of ICT to this level. What are the displacement costs? What does the rise of digital literacy tell us about the status of the Arts, Science or Physical Education in Mr Mallard's mix of 21st century skills? Moreover, where does digital literacy fit within the *New Zealand Curriculum Framework* (Ministry of Education, 1993a) and how does it relate to the goal of education *for* critical citizenship?

There is a sense of *deja vu* about the emergence of a new kind of literacy in response to renewed interest in the future during a period of rapid technological change (Brown & Murray, 2003). In the post Sputnik era of the 1960s and early 1970s, scientific literacy dominated curricula reforms especially in the US on the belief that scientific progress was central to future security and economic prosperity. Notably, this assumption also fuelled an interest in gifted education (Colangelo & Davis, 1997). The "Space Race" was the catalyst for a number of new science curriculum initiatives throughout the Western world including New Zealand. By the end of the Cold War, arguably, these reforms were not overly successful and they did not lead to a population of budding scientists.

Then, in the 1980s, the emphasis in the US shifted to computer literacy. In 1983, the landmark report *A Nation at Risk* identified computer literacy as a fourth basic skill (National Commission on Excellence in Education, 1983). Again, concern was that America was falling behind the rest of the developed world and a population skilled at using computers would provide the competitive edge. For some years, debate raged over the nature of computer literacy and the emergence of information literacy and technological fluency are important by-products of this debate (e.g., US Department of Education, 2000). The key point is that throughout this period the engine of curriculum reform was as much economic as pedagogical. With this in mind, it is noteworthy that when the first national ICT Strategy was released in New Zealand one of the four objectives was to:

> *Increase opportunities for schools, businesses, and government to work together in developing an information technology-literate workforce that will help New Zealand to maintain its competitive advantage (Ministry of Education, 1998, p.10).*

It is a myth to think that an emphasis on digital literacy heralds a new era in the history of New Zealand curriculum reform. As the above quote shows, the use of ICT in schools is perceived as the latest linchpin of future economic prosperity. While the challenge of new literacies is real (Lankshear & Knobel, 2003) and literacy practices are different in electronic texts (Snyder, 2002; Valmont, 2003), there is reason to be wary of overarching economic agenda driven by powerful reproduction and reschooling discourses.

At a basic level, the tension between old and new forms of literacy—a fluid and multi-dimensional concept—might be resolved if the core functions of education were better understood as reflected in the four pillars of learning proposed by the International Commission on Education for the Twenty-first Century (UNESCO, 1996). These pillars include: (a) learning to do, (b) learning to be, (c) learning to know, and (d) learning to live together. When combined the above pillars capture the social and cognitive, individual and collective, and ethical, moral and political dimensions of education *for* citizenry. The question is whether the current emphasis on ICT in schools advances all four pillars. Although there is a danger of adopting a binary position, do students need digital literacy or just more critical literacy *per se?* The even bigger question is whether in a rapidly changing world ICT can be grafted on to an already crowded curriculum without addressing the deeply rooted structural problems of the education system itself. It remains to be seen whether the current Curriculum Stocktake exercise will truly address the core functions of education in Aotearoa/New Zealand.

Cloud 4 – Myth of Teacher Upskilling

In recent years, thousands of New Zealand teachers have participated in ICT professional development initiatives. The irony is that many of these initiatives may have inadvertently contributed to the gradual deskilling of the teaching profession. Drawing on the narrative-biographical and micro ethnographic case study material along with Boshuizen and Wopereis's (2003) analysis of professional development based on the above pillars of learning, it is a myth to believe that teachers are now more capable due to their newly found ICT know-how. Although there is evidence from the ICTPD Cluster Programme that teachers' confidence and competence with ICT has improved (Ham et al., 2002), the trustworthiness of this research is not what it seems. There are many potential covariates that need to be considered and it is highly questionable whether such gains have contributed to a better educated teaching profession in the manner envisaged by the concept of the "wired" educator.

This observation strikes at the heart of what it means to be a good educator—that is, a teacher with a critical pedagogical orientation based on a reconceptualist educational philosophy. Although most teacher educators would agree there is more to ICTPD than acquiring the *International Computer Drivers Licence,* it is noteworthy that Ham et al. (2002) report increased ICT skills was by far the main goal teachers stated for their own professional development. This finding is perhaps not surprising given the pressure on teachers to update their computer skills, but it brings into question the current decentralised model of ICTPD designed to provide local solutions for local problems. In their independent assessment of the New Zealand approach to ICTPD, Downs, et al. (2001) claim that it falls short of altering the structure and organization of schooling itself. It is not truly reconceptualist!

The trap is that without the right theoretical tools to identify the competing and coexisting discourses of the digital landscape, many schools may already be investing in professional development that will become as redundant as the technology itself. In the past, Collis (1994) argues, professional development has been hamstrung by the historical accident that many providers have not had the formal academic and theoretical background required of teacher educators. In addition, problems of teacher education have been confounded by the involvement of many people outside of the field of education. The result is that the teaching profession will be deskilled if policy-makers produce a generation of trained technicians who have mastered the capabilities listed on the various ICT skill checklists downloadable from the Web including TKI. Although it would be wrong to suggest that all of the ICTPD has a narrow skill fixation, there is reason to be concerned when the following statement appears on the website of a high profile ICT Lead School:

> *We value our staff. Each year we have put hundreds of hours per staff member into the coaching and supporting of the use of packages like FileMaker Pro, Appleworks, Athenaeum and the multimedia packages of Hypercard, Kid Pix and HyperStudio (Tahatai Coast School, 2002).*

Put simply, this type of professional learning comes at a cost. Needless-to-say, when evaluating the success of professional development it is equally important to consider what teachers are not learning in the push to develop their ICT skills. Although traditional evaluations have failed to yield such insights, the study of proficient, accomplished and experienced internet-using teachers suggests that what is missing is a sufficiently large pool of wired educators with strategic knowledge of the bigger picture. The point is that ICTPD should not be removed from the political economy of knowledge. While binary and overly simplistic questions are problematic, it is useful to ask do teachers need more ICTPD or just more teacher education *per se?*

Cloud 5 – Myth of the Pedagogical Rationale

Although recent interest in ICT has contributed to a greater awareness of the so-called new science of learning, a little knowledge can be a dangerous thing (Brown, 2000). In some cases, it can lead to an unhealthy level of psychological dogmatism. The messy nature of learning and teaching revealed throughout the study, coupled with a deeper analysis of the socio-cognitive literature, suggests that the pedagogical rationale itself requires further critique as it promotes a kind of instrumental progressivism (Robins & Webster, 1999). This section identifies three pedagogical myths associated with the ICT-related school reform movement that emerge from the present study.

First, the learning styles movement has flourished in the context of ICT when in the academic literature there is considerable debate over the validity of this innovation (e.g., McMillan, 2001; Stahl, 1999). In a recent best evidence synthesis, Alton-Lee (2003) concludes there is increasing '... evidence of negative outcomes for some students when teachers use learning styles approaches' (p.17). It is fair to say this evidence is largely absent from discussions within the ICT teacher education community, evidenced by the lack of critique in professional networks such as "NZCompEd" and "Talk2learn". In some cases, the official ICT policy discourse has actively promoted this type of popular psychology:

> *The most effective teaching and learning occurs where the context matches the individual's preferred learning style (Ministry of Education, 1998a, p.7).*

The second myth relates to the naïve adoption of constructivism in the context of ICT integration. As the work of Jonassen et al. (2003) illustrates, this has become the fashionable perspective for those promoting the cognitive revolution. The frequent reference to constructivism across each research phase suggests that New Zealand is no exception. For example, under the heading "A New Way of Learning" the website at the high profile Navcon2k2 (2002) conference stated:

> *The design and construction of effective, technology-rich learning environments requires a sound pedagogical framework that is constructivist and is mediated by a teacher who is equipped with clearly defined learning outcomes.*

In the academic literature, there is heated debate over the adoption and interpretation of constructivism (Phillips, 2000). There is no single perspective and numerous scholars have exposed the flaws of constructivist thinking (e.g., Clark, 2004; Richardson, 2003; Terhart, 2003; Wen, 2003; Winn, 2003). Yates and Chandler (1991) argue, for instance, that knowledge needs to be tested even to the point of demolition rather than built-on as most interpretations of constructivism assume. Also, Bowers (2000) makes the point that those who advocate constructivism do not always put their theory into practice. He cites the example of conference keynotes where the audience listens passively to so-called experts. People do, of course, learn from these experiences. Irrespective of the blend, many basic assumptions of constructivism are quite sound but the messiness between learner-centred and teacher-centred methods of instruction requires a much deeper level of analysis, which recognises the existence of alternative and equally legitimate learning theories.

The third myth relates to the teaching of higher order thinking skills (HOTs) through ICT. At the moment the work of Bloom (1956) is enjoying renaissance. For example, teachers can access the TKI website and download under the *ICT Community* example units and lesson

plans based on this taxonomy. Notably, the research on the ICTPD Cluster Programme utilized Bloom's Taxonomy to identity the type of learning taking place through ICT in the classroom, despite this hierarchy being highly problematic (Bereiter & Scardamalia, 1998). There is no doubt that ICT has tremendous largely untapped potential in teaching for understanding as Harlen and Deakin-Crick (2003) note in their systematic literature review of thinking skills. However, in a separate comprehensive review, Wegerif (2002) alerts to the danger that the move to teach thinking skills through ICT is potentially a white, male and middle class response to new conditions, which may simply reproduce social inequality. After all, what teachers define as thinking is reflection of what the dominant class values as thinking at a given time. In the past, definitions of higher order thinking have overlooked the more intuitive, holistic feminine and non-Western ways of thinking (Wegerif, 2002).

In sum, rather than perpetuate folk psychology teachers should be openly exposed to different schools of thought and challenged to engage with the deeply contestable nature of educational theory. A more Socratic approach is the real pathway toward critical self-reflection and the goal of a more educated or wired teaching profession. To reiterate Sfard's (1998) concern, devotion to a single metaphor or learning perspective is likely to lead to distortions and undesirable teaching practices. Even Jonassen (2003), a devoted constructivist, now agrees that learning is such a complex and poorly understood process that it is impossible—let alone desirable—to explain by any single theory.

Cloud 6 – Myth of the Economic Imperative

The economic imperative so strongly infused throughout the ICT-related school reform movement is predicated on a number of myths. First, there is a real danger of linking the measure of educational success in ICT to economic prosperity. In spite of this, Stephen Heppell (2001), Director of UltraLab and a key advisor to the New Zealand Ministry of Education writes:

> *Will our technologically induced learning futures show that we made a good use or bad of the opportunities presented? Future economic prosperity will tell us tomorrow (p.xvi).*

Once again, this assumption reveals the extent to which the reproduction and reschooling discourses have taken root in the education profession. It shows the danger of blindly following the policies of the UK as it endeavours to create a Knowledge Economy that is in the words of Tony Blair (1998), *Open for Learning, Open for Business.* Similarly, the economic imperative is explicit in high profile initiatives in the US such as the provision of laptop computers throughout the state of Maine. The main goal of the Maine Learning Technology Initiative (MLTI) is to:

> *...transform Maine into the premier state for utilizing technology in kindergarten to grade 12 education in order to prepare students for a future economy that will rely heavily on technology and innovation (cited in Silvernail & Harris, 2003, p.i).*

As New Zealand embarks on a similar policy agenda, it is timely to remember that the idea capitalism wants a good many critical thinkers is simply absurd (Neill, 1995). We should also remember that teachers have been recruited as crusaders of the digital revolution because they are far more effective at promoting the economic rationale than through brute force. Beyond the pedagogical rhetoric, it is important to note that the economic imperative promoting ICT as a growth lubricant is highly contestable as illustrated in the work of Kelsey (2002). Some of the flaws in this line of reasoning are evident in the following quote from an ITAG report to the Minister of Information Technology:

> *If New Zealanders do not seize the opportunities provided by the knowledge economy we will survive as an amusement park and holiday land for the citizens of more successful developed economies (Frederick, Beattie & McIlroy, 1999; cited in Chapman & Pearce, 2001, p.427).*

What this statement fails to acknowledge is that tourism is a major earner of foreign exchange. Moreover, by all accounts the current economic recovery has been driven by the primary production sector rather than developments in new computer technology. Post the "dot.com gloom" New Zealand appears to have a shortage of skilled people in traditional crafts—that is, builders, plumbers and electricians. Arguably, many of these jobs are far more skilled than the majority of IT positions. Bowers (2000) concern, however, is that those people and groups who are not participating in the digital revolution (e.g., women and minority cultures) are being framed as less developed and thus less intelligent. In this regard, the economic imperative needs to shift from training good workers to preparing good citizens capable of enhancing basic human rights.

In sum, the story of the Internet in schools is far more problematic than most people are lead to believe. The teaching profession should not blindly accept the rhetoric of the pedagogical rationale or the inevitability of the new Knowledge Economy. Teachers need to recognise their own false consciousness and they must go deeper to examine the ethical, moral and political grounds on which they can either support or reject different aspects of the ICT-related school reform movement. In short, they must become "wired" pedagogical activists who do more than reproduce existing social and cultural norms. Instead, teachers need to adopt critique as a permanent philosophical ethos. It follows that promoting alternative ways of thinking and acting on these becomes the real meaning of pedagogy (Le Court, 2001). In other words, critical pedagogy seeks to:

> *...engage students in cultural critique, in a reading of the forms of knowledge, thinking and expression that culture makes available to them... In this way, culture is seen as hegemonic, wherein hegemony represents the perspectives of the dominant ideology in such a way that its interests are taken on as the interests of other social groups (Le Court, 2001, p.88).*

However, rather than lament these hegemonic forces there is reason to speak of hope as the Internet offers tremendous potential. Without underestimating the extent of the so-called "Chinese crisis", Anne, Barry and Catherine illustrate teachers can and have critically responded to (and reshaped) the competing and coexisting discourses surrounding the rapid growth of the Internet in schools. In conclusion, therefore, the research shows on a positive note that some teachers are beginning to problematise the Internet as a social, economic and educational phenomenon.

10.7 REFLECTIONS ON METHODOLOGICAL LIMITATIONS

The way any research is conducted is of crucial importance in determining how the results should be interpreted. At the outset of the study, the researcher anticipated a number of potential methodological limitations. Many of these issues were raised in Chapter Four although several additional limitations and methodological problems arose over the duration of the study. No doubt, other people will identify these shortcomings in their own interpretation of the results, so rather than provide a blow-by-blow account of the mistakes and inherent weaknesses of the research this section reflects on the methodological trustworthiness of the study as a whole.

First, it is important to acknowledge that the story of wired schools has taken a long time to tell. The Internet itself has evolved and mutated as a technical innovation over this time and the ICT-related school reform movement has not stood still either. Unlike many other fields of inquiry, this is no ordinary story. There is no clear ending and the narrative contains a number of loose ends and speculative assumptions that may leave traditional scholars unsatisfied. The reality is that not all stories have simple narratives and some of the most interesting tales take a long time to unfold. Indeed, the length of time taken to document the adoption and implementation of the Internet in New Zealand schools has been crucial in helping to make sense of the Internet as a social, economic and educational phenomenon. As Haymore-Sandholtz and Ringstaff (1996) observe in relation to the ACOT Project:

> *We recognize the importance of studying teachers' experiences in technology-rich classrooms over a number of years. Had we examined teachers' experiences for only a year or two, our conclusions would have been significantly different (p.283).*

The lesson is that in a field as dynamic as the study of new educational technology, it is easy to forget that deep thinking and theory building does not happen by chance. It requires time, wide reading and a sense of the bigger picture with genuine commitment to the study of educational technology as social practice. Although some of the results may only have historical significance, and certain aspects of the study remain under-theorized while arguably other sections suffer from being over-theorized, the alternative paradigm offers more of the same—that is, traditional evaluations of an uncritical, superficial and technocentric nature, which fail to question the basic assumptions of the current ICT-related school reform movement.

The second important limitation to acknowledge is the researcher's tendency to focus on negative and unintended effects of Internet adoption at the expense of beneficial outcomes and the language of possibility. In the tradition of Foucault (1980), the researcher was conscious of seeking out those stories not being told about the use of the Internet in New Zealand schools. Given the exaggerated hype and sheer weight of research from the tradition of technocratic dream it was almost inevitable that the study would lean towards a more circumspect interpretation of the proximal effects *with* the Internet. So, this critical orientation can be defended but when interpreting the results it is important to keep in mind that the story of wired schools is deeply interwoven with the researcher's own story. Thus, as Bryson and de Castell (1998b) point out:

> *There is no 'master narrative' to be found or made in educational discourses about educational computing. There is no true story, no grand synthesis. There is instead a set of stories, each with its distinctive scope and limits, each of which imposes, in different ways, a different system of constraints, prescriptives and prohibitions, a different set of limit situations defining the boundaries beyond which teachers and learners cannot go (p.82).*

With the benefit of hindsight, it is also important to acknowledge that the research contains a number of technical limitations, which other researchers may wish to attend to in the future. The study began at a time of transition in thinking about the ethical requirements of social research. In the current research environment, each phase would require separate ethical approval and some aspects of the study might attract closer scrutiny—such as, the sample selection process. This comment is not intended to suggest that the research would be judged as unethical based on today's codes of ethical conduct. Rather, a raft of new expectations and research protocols are required of social researchers (e.g., Tolich, 2001) and a similar study in the future would need to meet the new culture of compliance. The important point is that the researcher is conversant with the new ethical requirements unlike other New Zealand research on the use of ICT in schools where no reference is made to such matters even though data collection often involves student observations (e.g., Ham et al., 2002).

In comparison with Ham et al. (2002) the research made limited use of more advanced procedures of statistical analysis. Beyond reporting basic statistics, which for convenience are abbreviated to means and significance levels only, this was deemed unnecessary given the research objective, which sought to elicit individual teacher's beliefs and lived experiences. While the size and purposive nature of the research sample does not lend itself to elaborate multivariate analysis, if the researcher was true to the principles of a multi-paradigmatic approach then more attention could be given to statistically measuring the significance of the relationship between variables such as gender, teacher beliefs, Internet use, and so forth.

It needs to be acknowledged that as the study unfolded the researcher was torn between traditional quantitative conventions and more contemporary qualitative research approaches, which may give the impression of the research being somewhat stuck between different paradigms. There is a tension in the dissertation between meeting the conventions of a PhD and the researcher's desire to use narrative to tell the rapidly unfolding story of wired schools through his own research experience. This problem, typified by the decision to refrain from writing in the first person, demonstrates that the adoption of a multi-paradigmatic approach is far harder to achieve than first envisaged.

Chapter 11 discusses the implications for research in more detail but the above limitations highlight the need for more sophisticated techniques of quantitative and qualitative data analysis of the factors that effect teachers' work and their implementation a new educational technology in schools. The study falls short of such an analysis as comparisons across phases use raw data that is not disaggregated from the three independent samples of proficient, accomplished and experienced internet-using teachers. Moreover, a major omission in the present study is the influence of teacher sub cultures and the learning organization at large, which Windschitl and Sahl (2002) have begun to explore in their research of laptop use in US high schools. This line of ecological research coupled with greater consideration of activity theory as an overarching framework (e.g., Lim, 2002) for studying the dynamic interactions within the socio-political context of schools is likely to open a fruitful avenue of inquiry.

Following on from this, it is clear that future research needs to learn more about the experiences, perceptions and beliefs of those teachers who do not have reputations amongst their colleagues for their deployment of new educational technologies. As this study found, without such baseline data it is difficult to access the differences between rank-and-file teachers and those perceived to be proficient, accomplished and experienced in their use of the Internet for pedagogical purposes. It is also important to note the possibility that a purposive sample of so-called good teachers are likely to want to present themselves in the

best possible light, which might artificially inflate the differences between teachers. A level of caution is therefore required when placing too much weight on self-perceptions as the study revealed teachers are prone to false consciousness. Thus, this observation brings into question new phenomenographic methods of inquiry.

Lastly, the growth of the Internet in schools is dynamic, thereby limiting the credibility, confirmability, dependability, and transferability of the results. This explains why the researcher speculates on the research findings beyond what might be considered acceptable as he wanted to ensure that in the tradition of Foucault (1980) the work truly challenges those promoting and researching the use of ICT in schools. Of course, it needs to be stated that the story of wired schools is not truly generalizable and the research may not be to everyone's taste. It also needs to be noted that the study contains a strong Western bias as the researcher makes little or no use of literature from developing nations and parts of Europe. However, before dismissing the critical aspects of this work, the trustworthiness of the research should be judged using Bullough and Pinnegar's (2001) recently published guidelines for autobiographical styles of research. Arguably, these guidelines, together with the concerns and tensions raised by the present study, signal a new research direction very different from traditional, self-referential, system-wide evaluations based on rational assumptions of the patterns of technology adoption.

10.8 SUMMARY

This chapter has presented a synthesis of the main research findings. It highlighted the major points to emerge from the study in terms of a duality between how the Internet has affected teachers and how teachers' lives and work culture have affected the Internet—for better and worse. The discussion was centred around 10 main types of effects that manifest themselves in a number of inherent tensions. From the different tensions and individual mindsets embedded in the research sample a rough portrait of the New Zealand educational technology landscape was sketched and the general topography was shown to amplify rival theoretical positions in the literature. At a deeper level, the digital landscape was claimed to consist of a number of competing and coexisting discourses sharing a socio-cognitive language of persuasion to advance their own hegemonic agenda. From a post-technocratic political economy perspective, the ensuing discussion reframed the teacher's role around pedagogical activism and went on to posit a number of dark clouds looming on the digital horizon. Finally, the chapter acknowledged a number of additional methodological limitations that need further consideration when judging the quality and trustworthiness of the research.

The final chapter evaluates the research in realising its objective and considers the overall implications of the study for teachers, researchers and policy-makers.

CHAPTER ELEVEN

Conclusion

'Every technology is both a burden and a blessing; not either-or, but this-and-that' (Postman, 1993, p.5).

11.0 INTRODUCTION

On Friday 14th June 2002, The Honorable Trevor Mallard, Minister of Education, released the revised ICT Strategy for New Zealand schools. As the title *Digital Horizons* suggests, the latest version of the ICT Strategy (Ministry of Education, 2002) was an attempt to look over the horizon for the period of 2002-2004. The horizon of 2004 has quickly arrived and the story of wired schools has now spanned almost two full policy iterations of the attempt by Government to modernise the curriculum through ICT to prepare students with so-called 21st century skills (Mallard, 2003). Although the profile of ICT has never been higher in the professional discourse, much faddism, superficiality, and exaggerated hope still surrounds the introduction of the Internet in New Zealand schools. The policy discourse continues to tell a distorted one-sided story and there remains lack of critical dialogue and evidenced-based research to challenge the act of faith that the ICT-related school reform movement will lead to a better type of education system—that is, a strong compulsory schooling sector which produces critical thinkers, critical consumers and critical citizens.

This chapter reflects on an alternative story of the drive to wire New Zealand schools telling how the Internet has impacted on teachers' lives and work culture—for better and worse. It evaluates the success of the study in meeting its objective and the effectiveness of the multi-paradigmatic approach in answering the specific research questions. The story thus far then is brought together through the metaphor of planes, trains and automobiles in which a lot of misinformation, dissembling language and even propaganda is claimed to prevent teachers from understanding the meaning and non-educational intention of contemporary developments. A number of implications arise from the storyteller's explanation of how things have come to be this way and these are presented for teachers, researchers and policy-makers. Overall, the central thesis is that teachers need to approach the Internet as problematic and a deeper level of intellectual debate is required in the teaching profession over the move to plug New Zealand schools into the Knowledge Economy. This is a complex and multi-layered narrative with many different threads and the final chapter merely establishes a critical conversation for other people to follow, as the story unfolds and is told and retold from different points of view.

11.1 DID THE RESEARCH MEET ITS OBJECTIVE?

The research was designed to investigate how teachers believe the Internet has affected learning and teaching—for better and worse. Using a systematic sample selection process and explicit set of criteria it sought to document the experiences, perceptions and practices of a purposive sample of proficient, accomplished and experienced internet-using teachers. A central aim of the research was to describe the teachers' background characteristics and to gather specific information on how they were using the Internet for learning and teaching. The study also wanted to elicit the teachers' pedagogical beliefs and describe their perceptions of how the Internet supports the learning and teaching process. In addition, it attempted to document the changes teachers perceive to have occurred to their teaching practice and work culture since the advent of the Internet in schools. Finally, the research hoped to identify factors that teachers perceive inhibit and/or enable the use of the Internet for pedagogical purposes. The overall intention was to yield valuable insights into how teachers are affected by, and reshape the impact of, a new educational technology such as the Internet on their professional lives and work culture.

The short answer is that the research was successful at meeting its objective. It was effectual in identifying a raft of little known distal and proximal effects from the rapid growth of the Internet in schools with positive, negative and unknown outcomes. Hence, the study covers new ground and contains a wealth of rich insights into the terrain of online pedagogy and the contestable nature of the digital landscape. The research was notable for the willingness of teachers to participate, reflected by a relatively high response rate at each phase of the sample selection process. Broadly speaking, there is every indication that the study was successful in identifying a purposive sample of proficient, accomplished and experienced internet-using teachers, as defined, evidenced by the critical orientation of the participants in Phase Three. The written questionnaires were reasonably effective in gathering baseline data on teachers' background characteristics and on their use of the Internet for learning and teaching, along with general perceptions of the ICT-related school reform movement. In Phase Two, the interviews provided the type of thick contextual information missing from previous New Zealand research and shed considerable light on teachers' pedagogical beliefs and their perceptions of how the Internet supports the learning and teaching process. Having said that, it is problematic to claim that the interviews successfully elicited participants deeply rooted beliefs and worldviews, as the narrative-biographical and micro ethnographic case study material revealed a much deeper layer into the way in which some teachers have read and responded to the Internet as a social, economic and educational phenomenon. Each phase in its own way contributed to a better understanding of the various factors that inhibit and/or enable the use of the Internet in schools. In sum, the research was successful in achieving its initial objective—albeit taking a longer period to complete than originally envisaged.

11.2 THE STORY SO FAR

The story of wired schools began in the critical tradition. At the beginning, the basic assumption was that previous ways of telling stories about the use of computers in schools have failed to ask the right type of questions that might lead to new conceptions and more enlightened understandings of the ICT-related school reform movement. In this sense, the research was not another traditional evaluation of the *adoption* of a new educational technology. Instead, it deliberately sought out and followed up those stories not being told and circulated about the *implementation* of ICT in either the policy or professional discourse. In so doing, the narrative was constructed around questions such as who is telling the ICT story and whose voice is not being heard? The role of the researcher was to question and challenge the official story rather than report what is known already. Therefore, before reflecting on the story thus far it is important to acknowledge that:

> *A story is never just a story—it is a statement of belief and of morality, it speaks about values. Stories carry loud messages in both what they say and what they do not say. They may accept political and social priorities without comment, or they may challenge those priorities (Goodson, 1995, p.56).*

As the novelist Jeanette Winterson wrote, 'the vital thing is to have an alternative so that people will realize that there is no such thing as a true story' (cited in Bryson & de Castell, 1998b, p.84). With this in mind rather than retelling the "official" story, the counter narrative of wired schools attempts to raise awareness of false consciousness. It encourages a form of pedagogical activism in the face of powerful global forces and a number of dark clouds implicit within the ICT movement, cleverly disguised within the pedagogical rationale and language of the so-called new ways of learning.

In the genre of story, a three-part transportation metaphor of planes, trains and automobiles helps to summarise the main threads of the narrative of the introduction of the Internet in New Zealand schools. In Chapter One, the story began by introducing the technology debate surrounding the hype of the Information Highway. By analogy, Postman (1996) argued that what people first needed to learn with the invention of the car was not how to drive them but rather what motor vehicles might do to us—our air, our landscape, our social relations and so forth. Although empirically difficult to substantiate, later in the study it was interesting to note how Catherine drew on a similar analogy when discussing the non-neutrality of technology by comparing deaths linked with the motor vehicle to the number of people killed in wars over the past century. Irrespective of the accuracy of this claim, the car analogy locates the story of wired schools in the technology debate, which continues and has recently intensified in the face of Oppenheimer's (2003) renewed criticism and no-holds-barred assault on the use of computers in schools.

The point is that Postman's (1996) car analogy encapsulates the critical perspective adopted from the outset along with the critical mindsets of the teachers selected for in-depth study in Phase Three. In many ways, the research extends this analogy by showing that the car is not simply an internal combustion engine with seats in a steel casing on wheels (Henwood et al., 2000). Indeed, whether people own cars at all, and if they do, their ages, makes, and colours all provide meaning for them and others about who they are and what they value. The lesson is that ICT, just like the car, is an inherently value-laden cultural artefact.

The second part of the metaphor involves trains. The advent of the Internet rivals and has many parallels with the invention of the steam engine that rapidly transformed the 19th century (Simon, 2001). As mentioned in Chapter One, from conception to completion the research process was like running to catch a moving train. In the past schools have been accused of being like 'a pufferbelly locomotive chugging incongruously through a hi tech landscape' (Dixon, 1994, p.362). Importantly, this analogy does not apply to the story of wired schools. Unlike traditional fields of social and educational inquiry, the research attempted to document and make sense of a unique period of rapid technological change in the history of human civilization. Arguably, the real significance of these changes has yet to be fully appreciated but at a practical level it meant that keeping up with the story presented a number of challenges. In sum, the research landscape was always a moving target.

The use of a flight metaphor is not unique in the literature. Papert (1997) once described the history of computers in schools as similar to the 1903 accomplishment of the Wright brothers. At the time, few people anticipated how a flight of 22 feet would in less than a century lead to the Jumbo jet and corresponding transformation of global travel and international relations. He asks critics to think about where the current stage of educational computing compares with the evolution of aviation. Notably, Papert (1997) posited that we are at a stage comparable to the launching in the mid 1930s of the great DC-3s, the first viable commercial aircraft. Despite his techno-utopianism, Papert (1997, p.79) also warns of the potential negative side of this metaphor as it could easily lead to an overemphasis 'on the evolution of the *power* of a technology'. Hence, this version of the aviation metaphor is inherently technocentric, a criticism that still applies today to the ICT movement.

In an equally powerful metaphor, Heppell (2001) reports rather prophetically just before the tragic events of September 11th how his 1955 edition of the *History of the World* foresaw a darker side of technology. With an eye on the future this encyclopaedia wrote:

> *When your Daddy was a boy there was no television. What will your children have tomorrow, that you have never dreamed of today? That depends on you. Every discovery has a good and bad. Aeroplanes can whisk us away on trips and holidays or they can drop bombs to blow up homes and factories and towns (cited in Heppell, 2001, p.xvi).*

The lesson from this plane analogy is that rather than be fearful of new computer technology our teachers need to think about how to best use ICT for learning and teaching. On the surface, Heppell (2001) offers sound advice; however, on closer analysis this quote treats the plane as a neutral tool when the history of aviation suggests that aircraft lend themselves to certain actions because they are designed based on certain ontological assumptions to be used in certain ways toward certain outcomes. Like the early history of the Internet, the major research and development projects in the aviation industry have strong links to the military. Moreover, not everyone has the luxury of travelling by plane for trips and holidays. Indeed most of the world's population has probably yet to experience the sensation of flight and the people in Iraq are more likely to have had their house or village bombed by plane than to have flown in one. The key point is that the story of wired schools helps to reveal the extent of the neutral tool myth amongst the teaching profession and shows that ICT is part of social practice linked to much deeper social, economic and political changes.

A flight theme often appears in descriptions of teaching practice. For example, Rogers (2000) refers to the "high flyers" and Ham et al. (2002) report that some ICT facilitators spoke of their work as 'Getting people to fly' (p.49). Such metaphors, of course, raise questions about the "grounded", the "low flyers", the "joy-riders" and those with their "head in the clouds". Nevertheless, a number of the internet-using teachers also drew on a flight metaphor to describe the potential of the Internet with one participant referring to the classroom as an executive jet where children can now experience the riches of the globe including Paris, London and New York. The flight metaphor is extended by Strudler (2003) in the suggestion:

> *...that designing and implementing technology-based learning activities in schools can be likened to learning to fly an airplane while it is being built (p.72).*

This observation finds a close accord with the story of the early adoption of the Internet in New Zealand schools. Indeed, the different mindsets and competing and coexisting discourses can be identified in this metaphor. As depicted in Figure 11.1, the pioneers—that is, the Boosters and Deschoolers—are hanging on the wing as they attempt to build the future even though this is dangerous work and they have little or no idea of the final destination. While the plane is being built on the fly, the passengers or Toolsters sit patiently in their seats; they are willing to endure a little discomfort and go along for the ride on the chance that the journey may live up to expectations. Back on the ground the pedestrians—that is, Doomsters—would rather walk, as they have no intention of flying due to fear or lack of adventure.

Up front on the plane now shut off behind closed doors are the pilots. Few people get to see those steering the direction of the aircraft and even less have the opportunity to negotiate the flight plan. Of course, this may be unrealistic as the plane is often on automatic pilot since those back in the control tower have already predetermined the real decisions and the overall flight strategy.

Figure 11.1 Building a plane on the fly (EDS, 2001)

The story of wired schools has attempted, nevertheless, to reveal the existence of such a strategy and the identity of those seeking to exert their control over the direction of the voyage by asking searching questions of who will really benefit from the ICT-related school reform movement. Put more straightforwardly, the research asks the "3Ws" of the World Wide Web in schools—that is, why, what for and where is it going. It has challenged the misconception that because the Internet is a relatively unregulated and decentralized space it is politically neutral (Burbules & Callister, 2000). Although the story has many threads, a single recurring theme runs throughout the narrative:

> *Cyberspace is not politically neutral. It favors the political ideals of libertarian, free-market Republicans: a highly decentralized, deregulated society with little common discourse and minimal public infrastructure (Shenk; cited in Burbules & Callister, 2000, p.169).*

Indeed, the very portrayal of ICT as apolitical reveals the deepest political tendencies beneath the surface of the digital landscape. It helps to uncover the hidden curriculum that the story teller argues is designed to prepare students to be hi-tech consumers and low-tech post-industrial data entry workers in the digital economy of the future, which has little to do with education—namely, promoting learning, equality, fairness and social justice. The story of wired schools also foreshadows the dark clouds on the digital horizon and the myths, e-illusions and half-truths supported under the umbrella of a socio-cognitive meta-discourse of persuasion.

In the midst of this power struggle, the Critics or parachutists are hanging on to the wild ride although they have become increasingly uneasy about the dangers of building on the fly and the true nature of the long-term destination. They are not fazed by the aircraft itself or the risks of flying, but rather the parachutists have shifted from their initial excitement to troubled scepticism as the plane banks off in the wrong direction toward a number of dark clouds. Although the Critics are few in number, they have the dilemma of either jumping ship or attempting to reclaim the plane, which is precisely the course of action contemplated by the researcher.

Thus far, the story of wired schools tells the tale of a new educational technology enmeshed in a complex and multi-layered narrative that goes beyond simplistic bifurcations of technology enthusiasts versus technology demonises. It challenges the orthodoxy of optimism surrounding the ICT-related school reform movement and unravels the complex relationships, web of interactions and conglomerate of mutually nested factors that give rise to the multifarious effects of the Internet as a social, economic and educational phenomenon—for better and worse. The story is not finished and the outcomes are far from certain but the tale presents a sobering picture of the conflicts, tensions, and contradictions embedded in the digital landscape and the terrain of online pedagogy, especially given the millions spent on ICT in schools over the past decade.

11.3 IMPLICATIONS FOR TEACHERS

The teacher's role was the central focus of this research. Teachers were presumed to be a key factor in determining the ultimate fate of the rapid growth of the Internet in New Zealand schools. Two aspects of the study of internet-using teachers distinguished it from previous research. First, the study was conceptually framed to unify the literature on good computer-using teachers with that on good pedagogy *per se*. A related point is that an analysis of the teacher's role was undertaken from within a multi-paradigmatic research framework. Second, the research adopted the position that at its core, teaching is an ethical, moral and political profession. Unlike earlier research, the study sought to investigate the experiences, perceptions and practices of a sample of trusted and learned professionals with a critical understanding of pedagogy in its wider social, historical, and political context. Not surprisingly, these two dimensions underpin the main implications of the study that warrant further consideration.

At the moment, teachers are under enormous pressure to integrate ICT into the New Zealand curriculum. However, it is paradoxical that efforts to improve schools through ICT have excluded the vast majority of regular classroom teachers from the policy dialogue. Indeed, Selwyn (2002a) claims that it is seen as obstructive and almost heresy to question the current technological orthodoxy that has taken root in the education system. In the current environment in which ICT is seen as inherently good, teachers are on an ideological and

technological leash that may lead to the deskilling of the teaching profession. There is a danger that teachers may become nothing more than servants of government policy and vital educational workers in promoting the goals of the new Knowledge Economy. Thus, the Internet is both panacea and Pandora's box simultaneously, as there is no question that new educational technologies can contribute to active and meaningful learning when employed under the right conditions. The message is that thinking about the Internet does not mean thinking about the Internet; rather it means thinking about education and adopting critique as a permanent philosophical ethos, which is not necessarily synonymous with embracing the so-called new ways of learning.

In the long term, the goals that teachers and members of the broader community establish for their schools will ultimately determine whether the ICT-related school reform movement is worth the considerable cost in funds, time, and effort (Schofield & Davidson, 2002). Thus teachers must not be blinded by technology. Moreover, they need to be wary of the libertarianism of the wired which will simply amplify the gap between "connected" and "disconnected" teachers and further erode the true status of teaching in a liberal democratic society. From this perspective, it is essential that teachers be wired with the powers of analysis, critique and pedagogical activism to disrupt hegemonic discourses to build a more socially just education system for critical citizenry. Hence, the single most pressing implication arising out of the study is that:

Implication #1:

Teachers can and should continue to teach against the grain despite the pressure on New Zealand schools to adopt ICT under the gauze of enterprise constructivism to help create a new Knowledge Economy.

11.4 IMPLICATIONS FOR RESEARCH

The research offers only a glimpse into the experiences, perceptions and practices of internet-using teachers in a highly specific context. Despite this, there are numerous implications for future research. First, the study confirms the superficiality of the results of traditional evaluations of teachers' technology adoption. A deeper level of analysis is required in which the implementation of an educational technology is viewed as a highly subjective experience with multifarious effects both good and bad simultaneously. Even teachers within a relatively small purposive sample had quite different opinions, perceptions and beliefs on the way the same Internet experience has affected learning and teaching. It follows that teachers can no longer be conceived as a constant or stable variable as they each construct their own unique identities through an interwoven and constantly evolving and unfolding story. In the future, research needs to operate within a multi-paradigmatic framework that incorporates both numbers and narratives (Nash, 2002).

A second implication arises from this conclusion. Such a pluralistic approach is highly dependent upon asking the right questions. In the past, Selwyn (2002, p.3) argues that 'educational research has long been limited by an excessive technological optimism' founded on many untested assumptions. A lack of critique leads to the wrong type of questions. As Kenway (1996) maintains, research has often been too micro-focused with a "wilful blindness" to the wider implications—that is, the big picture! In a similar vein, Goodson et al. (2002) argue it is important to maintain a critical perspective that is partly on "the outside" to constantly examine and re-examine the bigger picture of the cultural, economic and political implications of any new computer technology.

The key point is that psychology has its limits. In Papert's (1995; cited in Willis, 2001) view, it is not enough for research on educational technology to focus on improving existing teaching practices. In addition, educators must keep an eye on the future, as new technological developments will inevitably have a dramatic impact on schools. As Papert explains using another transportation parable:

> *Nineteenth century researchers seeking to improve transportation stumble on the idea of a jet engine and propose to use it to augment the power of horses pulling stage coaches. Researchers of a rival school ridicule the idea of using technology to solve the problem and suggest that the better way is to train the coachman. They cite careful experiments to show that stage coaches are slowed down by friction in the axle bearings. They demonstrate that a statistically significant improvement in speed can be obtained simply by training the drivers to use more and better grease. Of course, anti-technologists were probably right in the short term. But the revolution in transportation was not going to come from studying axles and grease or by training coachman in better skills. It would come through the invention of the airplane (cited in Willis, 2001, p.307).*

Although the parable illustrates the importance of the bigger picture, it assumes that technology is progress and, thereby, treats the plane as neutral when recent tragic events show that aircrafts lend themselves to any number of purposes some of which have never been anticipated. This point raises another implication. Not only does future research need to go beyond the tool metaphor and the determinism of technology as progress, it has to ask the right people the right questions from a socially responsible paradigm (Reeves, 2000). If the study of proficient, accomplished and experienced internet-using teachers taught anything it was that you learn different things from different people. It showed different criteria of good teachers produces quite different results, and what researchers look for at the outset is exactly what they get and precisely what they report. Above all, therefore, the major implication to arise from these methodological considerations is that:

Implication #2:

Researchers have a moral obligation to explain how things have come to be this way and seek to raise awareness of false consciousness and uncover the tensions, contradictions and half-truths woven throughout the ICT-related school reform movement.

11.5 IMPLICATIONS FOR POLICY

Although the research did not set out to critique policy, this was an inevitable consequence of adopting a critical understanding of pedagogy in its wider social, historical, and political context. Consequently, the study contains a number of implications for policy-makers at all three levels—that is, at the national policy level, the local school board level and the level of implementation policies made within schools. The following implications build on the three main myths introduced in Chapter One that Nash and Moroz (1997) claim have infected the policy discourse over the past 20 years.

First, the research suggests a considerable gulf exists between policy and practice. There is a danger of the policy talk and policy action underestimating the relatively low level of policy implementation. A stand out feature of the study was the lack of curriculum integration even within a purposive sample of proficient, accomplished and experienced internet-using teachers. Irrespective of whether "seamless integration" is the ultimate goal, the tensions that arise from the ICT movement are reason to infer that policy-makers need to give more attention to the why before the how (Roblyer & Knezek, 2003). While it is taken-for-granted in most policy initiatives that students should be using new educational technology (e.g., McMillan Culp, Honey & Mandinach, 2003), the research brings into question whether teachers actually accept this assumption. Indeed, some teachers harbour a number of understandable concerns and others have deep philosophical objections to the *push* to use ICT in the classroom. Yet, the major focus of policy is to overcome first order barriers such as lack of access, lack of training, inadequate infrastructure, and so forth. Thus, it would appear that the so-called Everest Syndrome continues to infect the policy discourse.

On the surface, there is no longer a naïve assumption that students will automatically benefit from mere exposure to new computer technology. The disappointing results over the past 20 years have helped the policy-makers to acknowledge the importance of the teacher's role. That said, an implicit assumption that technology is inherently good remains and the language of the policy discourse has become cloaked in the so-called new ways of learning, which are far more problematic than most teachers are lead to believe. So the myth has not gone away. Rather it has evolved into a more sophisticated form that belittles teachers' intelligence and the deeply contested nature of the curriculum itself.

An arguably more dangerous myth exists in the claim that to attain the goals of education new computer technology must be linked to the new methods of enterprise constructivism. There is little or no regard for what students might be learning *through* ICT as they engage in "authentic work" and "real world" learning to prepare for the challenges of life in the new Knowledge Economy. Instead of promoting the inevitability of this image of the future, policy-makers need to accept the messy realities of the world people live in and enable teachers to envisage the type of society an educated citizenry might want to create. Such an approach requires a level of consultation and policy analysis that goes well beyond the inherently technocentric development of an ICT strategy.

The final myth—if schools can obtain a sufficient quantity of hardware and software the quality of educational outcomes will take care of itself—also continues in a more subtle form. As mentioned above, a lot of policy is directed still at first order barriers of access, training and infrastructure that make certain assumptions about the real problems teachers face. There is still a degree of faith that the quality of the learning and teaching will follow once these problems are overcome. Although it is a cliché:

> *If technologies are the solution they claim to be, then what or where is the problem (Haddad & Draxler, 2002, p.12).*

Arguably, the failure to articulate the problems that new computer technology will solve in helping to produce critical thinkers, critical consumers and critical citizens simply adds to the legacy of mistrust of educational reform over the past decade. At the national level, rather than engage teachers in genuine consultation on the relative merits of the ICT-related school reform movement, including consideration of the advantages and disadvantages, strengths and weaknesses, and positive and negative effects, the policy has adopted a deficit perspective by attempting to teacher-proof the new educational technology. Although there are policy choices, these are not apparent as no consideration is given to alternative low-tech innovations. In a similar vein, the use-by-date of the latest ICT Strategy and the lack of policy integration creates the impression of a short-term fix, which may have simply raised expectations and left teachers vulnerable to a neo-conservative backlash. Teachers cannot be expected to own the ICT-related school reform movement when they have been given little opportunity to shape and question the long-term objectives. Thus, the over-riding implication is that:

> Implication #3:
>
> *Policy-makers need to better understand the real problems teachers face and respect what they have to say rather than expect the teaching profession to serve policy that views students as mere participants in someone else's conception of the future.*

11.6 FINAL REMARKS

The research did not set out to make us all neo-Luddites. Indeed, it would be churlish to claim that the advent of the Internet has not provided teachers with a raft of new beneficial possibilities for active and meaningful learning. However not all of these opportunities are better. Although more space is devoted to potential negative effects of the Internet, the research does not argue against the use of new computer technology in schools. Rather it attempts to show what is at risk in the rush to wire New Zealand schools. In so doing, it warns of the sleepwalking attitude of the teaching profession towards the potential hidden curriculum of the ICT-related school reform movement. At the same time, the researcher is aware of the dangers of advancing the "pedagogy of the depressed" and seeks to go beyond pedagogies of despair and the politics of cynicism (Giroux, 2003). Thus, the study argues that wired schools need wired educators capable of leading people out of darkness into light in the tradition of the Latin root of the word educate—that is, *educere.*

These are surreal times as wired schools can now become wireless. There is every indication that we are on the verge of the next wave—the next big technology. While the "e-Learning Wave" is another story, the lesson is that each new technological solution often merely replaces one problem with another. Thus, the introduction of a new educational technology is always problematic. To unravel the complex story, thus far, of both the hidden costs and the potential of the Internet in schools there is a need to hear more from the critics[1]. In this regard, it could be said that as New Zealand's first *Apple Distinguished Educator,* the researcher's thinking about ICT and the Internet is encapsulated by the slogan—think different! By revealing a different story, albeit incomplete and biased toward the storyteller's four core assumptions, the study of proficient, accomplished and experienced internet-using teachers has shown an urgent need to engage in greater critical dialogue over efforts to boost capacity, increase bandwidth and catch the knowledge wave—for better and worse. In the words of Shakespeare:

> *The web of our life is a mingled yarn, good and ill together... (All's Well That Ends Well, Act 4, Scene 3; cited in Burbles & Callister, 2000).*

[1] The following website offers a voice for the critics of the ICT-related school reform movement [http://www.edtechnot.com]

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APPENDICES

APPENDIX A

Preliminary Phase: Sample Selection

[LETTER HEAD]

[SchoolName]
[Address]
[Location]

18th March 1999

Dear Board of Trustee Staff Representative

I am writing to seek your assistance with my research on Internet use in New Zealand primary and intermediate schools. This research seeks to study teachers in your region who you consider are proficient in their use of the Internet for learning and teaching.

The study of these teachers aims to provide valuable information on the conditions and factors that are important in the design of successful internet-based learning experiences in schools. It is hoped that the research findings will help teachers, principals and Boards of Trustees to make more informed decisions about the role of the Internet in their school. The research also has international significance, as it is the first study of this kind on internet-using teachers.

To assist in identifying teachers for participation in the study, I would be grateful if you would complete and return by 1st April the enclosed nomination form. The information that you provide will be treated as confidential. It will be used only as a basis for the selection of teachers to participate in the study. A number of different people and groups are being asked for nominations and the researcher will endeavour to keep anonymous the identity of each nominator.

The nominated teachers will be invited to participate in the study, but no teacher will be involved without their prior permission. Teachers will be fully informed about the research and free to withdraw at any time. Furthermore, no school or teacher will be identified by the researcher in any presentation of the research findings. All research data will be kept secure and only accessible to those involved in the study. The details of the study are explained further in the attached Information Sheet.

The research is being done as part of my Doctoral Study and it follows the Massey University *Code of Ethical Conduct for Teaching and Research Involving Human Subjects*. If you have any questions concerning the research, please do not hesitate to contact me. I am employed as a Lecturer in the area of Educational Technologies in the Department of Learning and Teaching. Alternatively, you can speak with one of the research supervisors, either Dr Ken Ryba or Professor William Tunmer. They can be contacted during office hours at the College of Education, Massey University (see the attached Information Sheet for further information).

Thank you for your co-operation. I really value your assistance, as the research would not be possible without your support. Accordingly, I undertake to widely disseminate the results and an executive summary of these will be available on request at the completion of the study.

Yours sincerely

Mark E. Brown

PS: It would be helpful if you returned the nomination form by **1st April 1999** regardless of whether or not you are able to nominate any teachers for participation in the study.

[LETTER HEAD]

[Name]
[Address]
[Location]

18th March 1999

Dear [Expert]

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Yours sincerely

Mark E. Brown

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[LETTER HEAD]

[SchoolName]
[Address]
[Location]

18th March 1999

Dear Principal

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Yours sincerely

Mark E. Brown

PS: It would be helpful if you returned the nomination form by **1st April 1999** regardless of whether or not you are able to nominate any teachers for participation in the study.

[LETTERHEAD]

Wired Schools: A Study of Internet-Using Teachers

INFORMATION SHEET – Preliminary Selection Process

1. Identity of the Researcher:

Mark E. Brown (Lecturer, Department of Learning and Teaching).

This research is part of Mark's Doctoral Study (PhD) at Massey University. If you have any questions about the research please do not hesitate to contact Mark and/or one of his research supervisors.

2. Identity of the Supervisors:

Associate Professor Ken Ryba (Chief Supervisor)
Professor William Tunmer (Second Supervisor)

3. Contact Information:

The Researcher and/or Supervisors can be contacted at the following address:

Massey University		
College of Education	Mark Brown:	Telephone (06) 356 9099, Extension 8626
Private Bag 11 222	Dr Ken Ryba:	Telephone (06) 356 9099, Extension 9606
Palmerston North	Prof William Tunmer:	Telephone (06) 356 9099, Extension 8962

4. The Nature and Purpose of the Study:

The objective of this study is to investigate how teachers believe the Internet has affected learning and teaching—for better and worse. The research aims to identify a sample of nominated proficient internet-using teachers to document current practice and collect valuable information on the conditions and factors important if teachers are to effectively use the Internet for educational purposes.

There are three phases to the research and most participants will be involved only in the first phase—the completion of a teacher questionnaire. In the remaining phases, a Research Advisory Group will assist to select a refined sample of internet-using teachers for more in-depth investigation. This will involve a follow up questionnaire and interview along with a case study of no more than five experienced internet-using teachers.

5. Your Involvement and Time Commitment:

If you agree to participate in the selection process for this study, you will be asked to complete a nomination form to help recruit the initial research sample. This form invites you to nominate teachers in your region who you consider proficient in using the Internet for learning and teaching. It is estimated that completion of the nomination form will require a commitment of approximately five minutes of your time. A stamped, addressed envelope has been provided in which to return the nomination form.

6. What you can Expect of the Researcher:

The information that you provide will be treated as confidential and will only be accessible to those immediately involved in the research. All research data will be kept secure and the researcher will take all reasonable steps to protect your identity. The main risk associated with your participation in this research relates to your anonymity. While no teacher or school will be directly identified in the research findings, it is impossible to guarantee absolute anonymity. The researcher can only give an assurance of anonymity based on a personal guarantee and to the extent allowed by law. In addition to these assurances, the researcher will:

- Attempt to honestly represent the participants' experiences, perceptions and practices.
- Explain all procedures throughout the research process and secure informed consent at each phase of the study.
- Endeavour to treat all participants in an open, courteous and respectful manner throughout the study.
- Store all data in a locked cabinet or password protected electronic folder and will either destroy or return all information gathered throughout the research process.
- Provide participants with an executive summary of the results or make this available to those involved on request.

7. The Rights of the Participants:

It is assumed that completion and return of the nomination form implies consent. However, you are under no obligation to participate in this process. If you take part in the nomination process, you have the right to:

- Ask further questions about the study arising from your participation.
- Decline to answer any particular question(s) and are free to withdraw your nomination at any time.
- Expect that no teacher will be involved in the study without informed consent. All participation is voluntary and participants may withdraw from the study at any time.
- Provide information on the understanding that it will be treated as completely confidential to the researcher and it will not be possible to identify you or any of the nominated teachers in the dissemination of the results.
- Be given access to an executive summary of the research findings when the study is completed.

This research abides by the regulations in the Handbook for Doctoral Study and the Code of Ethical Conduct for Teaching and Research Involving Human Subjects at Massey University. If you have any concerns or further questions about the study please do not hesitate to contact the researcher and/or one of the supervisors.

Thank You Very Much For Your Time
And Help In Making This Study Possible

MASSEY UNIVERSITY
Department of Learning and Teaching

Wired Schools: A Study of Internet-Using Teachers

Nomination Form

This research aims to examine ways in which teachers use the Internet to enhance learning and teaching in their school—for better and worse. To assist in identifying proficient internet-using teachers for participation in this study, I would be grateful if you would nominate any such primary and/or intermediate teachers within your region. The quality of the research depends upon people nominating those teachers they consider are proficient in the use of the Internet within their teaching.

The information you provide will be used as a basis only for the selection of teachers to participate in the study. Your response will be treated as **confidential** and the researcher will endeavour to keep anonymous the identity of each nominator. The teachers you nominate will be invited to participate in the study, but no teacher will be involved without their prior permission. Teachers will be fully informed about the research and free to withdraw at any time. Furthermore, no school or teacher will be identified by the researcher in any presentation of the research findings. All research data will be kept secure and only accessible to those involved in the study. The number on this nomination form is for administrative purposes only. See the attached Information Sheet for further details.

==========

SECTION ONE -- No Nominations

If you are unaware of any proficient internet-using teachers, or do not wish to nominate any specific teachers, please complete (tick) this section and return in the reply paid envelope by **1st April** 1999.

☐ We do not have access to the Internet in our school.

☐ I am unaware of any proficient internet-using teachers.

☐ I do not wish to nominate any proficient internet-using teachers for this study.

==========

SECTION TWO -- Nominated Teachers

If you can nominate one or more proficient internet-using teachers please complete this section and return in the reply paid envelope by **1st April** 1999.

I consider the following teachers to be proficient in their use of the Internet for learning and teaching:

Teacher's Name	Name of School	Position	Level

(Use the reverse side of this form if you require more space)

==========

SECTION THREE -- Other Comments

Do you have any comments to make about this research and/or those teachers you have nominated?

_____

_____

_____

Many thanks

(Please return by the **1st April** in the reply paid envelope to Mark Brown, Massey University, Department of Learning and Teaching, Private Bag, Palmerston North).

[LETTERHEAD]

[Name]
[Address]
[Location]

19th April 1999

Dear Board of Trustee Staff Representative

I wrote to you a few weeks ago seeking your assistance with a study I am doing on Internet use in New Zealand primary and intermediate schools. This research seeks to study teachers in your region who you consider are proficient in their use of the Internet for learning and teaching. The study aims to provide valuable information on the conditions and factors that are important in the design of successful internet-based learning experiences in schools.

To assist in identifying teachers for participation in the study, I would be very grateful if you would complete and return by **15th May** the enclosed nomination form. It would really enhance the research methodology if you returned the nomination form, regardless of whether or not you are able to nominate any teachers for participation in the study.

The information that you provide will be treated as confidential. It will be used only as a basis for the selection of teachers to participate in the study. A number of different people and groups are being asked for nominations and the researcher will endeavour to keep anonymous the identity of each nominator.

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Thank you for your co-operation. I really value your assistance, as the research would not be possible without your support. Accordingly, I undertake to widely disseminate the results and an executive summary of these will be available on request at the completion of the study.

Yours sincerely

Mark E. Brown

[LETTERHEAD]

[Name]
[Address]
[Location]

19th April 1999

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Yours sincerely

Mark E. Brown

[LETTERHEAD]

[Name]
[Address]
[Location]

19th April 1999

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Yours sincerely

Mark E. Brown

[LETTERHEAD]

[No Response]

[Name]
[Address]
[Location]

[date]

Dear Board of Trustee Staff Representative

I am writing to thank you for your assistance with the study I am doing on internet-using teachers in New Zealand primary and intermediate schools. I am grateful that you took the time to return the nomination form. This helps to better define the sample and enhances the overall quality of the research methodology.

The next phase of the study is to contact the nominated proficient internet-using teachers. These teachers will be invited to complete a brief questionnaire relating to the use of Internet in their teaching. A small number of the teachers may also be invited to participate in an interview and case study to collect more detailed information.

I hope that as a result of the study, I will be able to provide the educational community with some potentially useful information on how teachers can make the most effective use of the Internet for learning and teaching. The results of this research will be widely disseminated and an executive summary will be available on request at the completion of the study. Please do not hesitate to contact me if I can help on any other matter related to the use of the Internet in schools.

Yours sincerely

Mark E. Brown

[LETTERHEAD]

[Yes Response]

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Yours sincerely

Mark E. Brown

[LETTERHEAD]

[No Response]

[Name]
[Address]
[Location]

[date]

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I am writing to thank you for your assistance with the study I am doing on internet-using teachers in New Zealand primary and intermediate schools. I am grateful that you took the time to return the nomination form. This helps to better define the sample and enhances the overall quality of the research methodology.

The next phase of the study is to contact the nominated proficient internet-using teachers. These teachers will be invited to complete a brief questionnaire relating to the use of Internet in their teaching. A small number of the teachers may also be invited to participate in an interview and case study to collect more detailed information.

I hope that as a result of the study, I will be able to provide the educational community with some potentially useful information on how teachers can make the most effective use of the Internet for learning and teaching. The results of this research will be widely disseminated and an executive summary will be available on request at the completion of the study. Please do not hesitate to contact me if I can help on any other matter related to the use of the Internet in schools.

Yours sincerely

Mark E. Brown

[LETTERHEAD]

[Yes Response]

[Name]
[Address]
[Location]

[date]

Dear Principal

I am writing to thank you for your assistance with the study I am doing on internet-using teachers in New Zealand primary and intermediate schools. I am very grateful for your co-operation. My research would not be possible without your support. The information that you provided will be treated as confidential.

The next phase of the study is to contact the nominated proficient internet-using teachers. These teachers will be invited to complete a brief questionnaire relating to the use of Internet in their teaching. A small number of the teachers may also be invited to participate in an interview and case study to collect more detailed information.

I hope that as a result of the study, I will be able to provide the educational community with some potentially useful information on how teachers can make the most effective use of the Internet for learning and teaching. The results of this research will be widely disseminated and an executive summary will be available on request at the completion of the study. Please do not hesitate to contact me if I can help on any other matter related to the use of the Internet in schools. Once again, thank you.

Yours sincerely

Mark E. Brown

[LETTERHEAD]

15 March 1999

Name
Address
City

Dear [Potential Member]

I am writing to seek your assistance with my PhD research on Internet use in New Zealand schools. The research aims to study a select group of teachers in a specific region who are considered either proficient, accomplished or experienced in their use of the Internet for learning and teaching (see the attached Information Sheet).

This study of internet-using teachers hopes to collect valuable information on the conditions and factors that are important in the design of successful internet-based learning experiences. It is also hoped that the information gathered may help other teachers, principals and Boards of Trustees to make more informed decisions about the role of the Internet in their school.

To identify teachers for participation in this study, I have asked the principals, staff representatives on the Board of Trustees, and various experts in the regions concerned to nominate teachers they consider to be proficient in their use of the Internet for learning and teaching. The nominated teachers will then be invited to complete a questionnaire on their use of the Internet in their school. The information gathered will be analyzed and used as a basis for the selection of a refined sample for additional research involving an interview and potential case study.

At the moment, I am in the process of establishing a Research Advisory Group to help me select the teachers for further study. This group will consist of several people with both practical experience and theoretical knowledge on the use of the Internet in education. Your experience and knowledge in this area makes you ideally qualified for the role as an advisory group member. I would really value your membership on this group. You would make an important contribution in helping me to select teachers who make use of the Internet in their teaching—for better and worse.

I will contact you in a few days to further explain the role of this group and to secure your support. I do not expect that membership on the Research Advisory Group will involve a lot of your time. It may require two or three brief meetings over the course of the study where I need to convince you of the teachers who are most suitable for further research.

I look forward to providing you with more information about my study and the prospect of working with you during the selection of internet-using teachers for this research.

Yours faithfully

Mark E. Brown

APPENDIX B

Phase One:
Nominated Proficient Internet-using Teachers

[LETTERHEAD]

[Name]
[School]
[Street]
[Location]

8 August, 1999

Dear [Name]

I am writing to invite you to participate in my research on Internet use in New Zealand primary and intermediate schools. This research is designed to study a special group of teachers who have been nominated by other teachers, principals, or experts in the field as proficient in their use of the Internet for learning and teaching.

The study aims to provide valuable information on the conditions and factors that are important in the design of internet-based learning experiences. It is hoped that the research findings will help other teachers, principals and Boards of Trustees to make more informed decisions about the role of the Internet in their school. The research has both national and international significance as it is the first study of this kind on internet-using teachers.

You have been nominated [Name] as a teacher who is suitable for participation in this study. Accordingly, I would really value your support. The Internet is still very new in schools and there is a lot we can learn from your early experience. This study depends on a small number of internet-using teachers and the quality of the research is highly dependent upon your participation.

Therefore, I would be grateful if you could find time to complete the enclosed questionnaire. This questionnaire is designed to collect a range of information about your background experience and your use of the Internet for learning and teaching. It will involve about 30 minutes of your time. There is a separate Information Sheet attached to the questionnaire that outlines the identity of the researcher, nature and purpose of the study, issues relating to anonymity, confidentiality and your rights as a research participant. Please read this information carefully before agreeing to complete the questionnaire.

If you complete the questionnaire, you need to be aware that there is a chance I may wish to contact you again to gather further information. In the second phase of the study, I intend following up the questionnaire with a face-to-face interview. The final phase is likely to involve a more in-depth case study of between three and five teachers. The follow up phases will involve a refined sample of internet-using teachers selected on the basis of accomplishment and experience with the using the Internet in education. At this stage, it would be helpful if you could indicate in the appropriate section of the questionnaire whether you are prepared to be involved in any further study. Your response does not commit you to further research.

Thank you for your co-operation. I really value your support, as the research would not be possible without your participation. Accordingly, I undertake to keep you informed of the results by providing an executive summary of the findings on completion of the study.

Yours sincerely

Mark E. Brown

PS Please return the questionnaire in the stamped addressed envelope by the **23rd August** 1999.

[LETTERHEAD]

[Name]
[School]
[Street]
[Location]

30 August, 1999

Dear [Name]

I wrote to you a few weeks ago seeking your assistance with a study that I am doing on Internet use in New Zealand primary and intermediate schools. This research is designed to study a special group of teachers who have been nominated as proficient in their use of the Internet for learning and teaching. I would really value your participation, as my research is highly dependent upon a small number of internet-using teachers.

The study aims to provide valuable information on the conditions and factors that are important in the design of successful internet-based learning experiences. It is hoped that the research findings will help other teachers, principals and Boards of Trustees to make more informed decisions about the role of the Internet in their school.

I know this is a very busy time of the year, but I would be grateful if you could find a few spare minutes to complete the enclosed questionnaire. This questionnaire is designed to collect baseline information about your use of the Internet for learning and teaching. It will involve about 30 minutes of your time. There is a separate Information Sheet attached to the questionnaire that outlines the identity of the researcher, nature and purpose of the study, issues relating to anonymity, confidentiality and your rights as a research participant. Please read this information carefully.

If you complete the questionnaire, you need to be aware that there is a chance I may wish to contact you again to gather further information. In the second phase of the study, I intend following up the questionnaire with a face-to-face interview. The final phase is likely to involve a more in-depth case study of between three and five teachers. The follow up phases will involve a refined sample of internet-using teachers selected on the basis of accomplishment and experience with the using the Internet in education. At this stage, it would be helpful if you could indicate in the appropriate section of the questionnaire whether you are prepared to be involved in any further study. Your response does not commit you to further research.

Thank you for your co-operation. The research would not be possible without your participation. Accordingly, I undertake to keep you informed of the results by providing an executive summary of the findings on completion of the study.

Yours sincerely

Mark E. Brown

PS Please return the questionnaire in the stamped addressed envelope by **15th September,** 1999.

[LETTERHEAD]

[Name]
[School]
[Street]
[Location]

20 September, 1999

Dear [Name]

I wrote to you just before the holidays seeking your assistance with a study that I am doing on Internet use in New Zealand primary and intermediate schools. I know this is a very busy time of the year, but I would be grateful if you could find a few spare minutes to complete the enclosed questionnaire. This research is designed to study a special group of teachers who have been nominated as proficient in their use of the Internet for learning and teaching. I would really value your participation, as my research is highly dependent upon a small number of internet-using teachers.

There is a separate Information Sheet attached to the questionnaire that outlines the identity of the researcher, nature and purpose of the study, issues relating to anonymity, confidentiality and your rights as a research participant. Please read this information carefully. If you complete the questionnaire, you need to be aware that there is a chance I may wish to contact you again to gather further information. In the second phase of the study, I intend following up the questionnaire with a face-to-face interview. The final phase is likely to involve a more in-depth case study of between three and five teachers. The follow up phases will involve a refined sample of internet-using teachers selected on the basis of accomplishment and experience with the using the Internet in education. At this stage, it would be helpful if you could indicate in the appropriate section of the questionnaire whether you are prepared to be involved in any further study. Your response does not commit you to further research.

Thank you for your co-operation. The research would not be possible without your participation. Accordingly, I undertake to keep you informed of the results by providing an executive summary of the findings on completion of the study.

Yours sincerely

Mark E. Brown

PS Please return the questionnaire in the stamped addressed envelope by **1st October,** 1999.

[LETTERHEAD]

Wired Schools: A Study of Internet-Using Teachers

INFORMATION SHEET – Phase One

1. Identity of the Researcher:

Mark E. Brown (Lecturer, Department of Learning and Teaching).

This research is part of Mark's Doctoral Study (PhD) at Massey University. If you have any questions about the research please do not hesitate to contact Mark and/or one of his research supervisors.

2. Identity of the Supervisors:

Associate Professor Ken Ryba (Chief Supervisor)
Professor William Tunmer (Second Supervisor)

3. Contact Information:

The Researcher and/or Supervisors can be contacted at the following address:

Massey University		
College of Education	Mark Brown:	Telephone (06) 356 9099, Extension 8626
Private Bag 11 222	Dr Ken Ryba:	Telephone (06) 356 9099, Extension 9606
Palmerston North	Prof William Tunmer:	Telephone (06) 356 9099, Extension 8962

4. The Nature and Purpose of the Study:

The objective of this study is to investigate how teachers believe the Internet has affected learning and teaching—for better and worse. The research aims to document the experiences, perceptions and practices of a sample of nominated proficient, accomplished and experienced internet-using teachers to collect valuable information on the conditions and factors important if teachers are to effectively use the Internet for educational purposes.

There are three phases to the research and most participants will be involved only in the first phase—the completion of a teacher questionnaire. In the remaining phases, a Research Advisory Group will assist to select a refined sample of accomplished and experienced internet-using teachers for more in-depth investigation. This will involve a follow up questionnaire and interview along with a case study of no more than five teachers.

5. Your Involvement and Time Commitment:

You were identified as someone suitable for participation in this study through a nomination process. If you agree to participate in Phase One, you will be asked to complete a questionnaire which gathers baseline data on your Internet use for learning and teaching. It is estimated that completion of the questionnaire will require a commitment of approximately 30 minutes of your time. A stamped, addressed envelope has been provided in which to return the questionnaire.

6. What you can Expect of the Researcher:

The information that you provide will be treated as confidential and will only be accessible to those immediately involved in the research. All research data will be kept secure and the researcher will take all reasonable steps to protect your identity. The main risk associated with your participation in this research relates to your anonymity. While no teacher or school will be directly identified in the research findings, it is impossible to guarantee absolute anonymity. The researcher can only give an assurance of anonymity based on a personal guarantee and to the extent allowed by law. In addition to these assurances, the researcher will:

- Attempt to honestly represent the participants' experiences, perceptions and practices.
- Explain all procedures throughout the research process and obtain informed consent at each phase of the study.
- Endeavour to treat all participants in an open, courteous and respectful manner throughout the study.
- Store all data in a locked cabinet or password protected electronic folder and will either destroy or return all information gathered throughout the research process.
- Provide participants with an executive summary of the results or make this available to those involved on request.

7. The Rights of the Participants:

It is assumed that completion and return of the questionnaire implies consent. However, you are under no obligation to complete the questionnaire. If you agree to take part in Phase One of the research, you have the right to:

- Ask further questions about the study arising from your participation.
- Decline to answer any particular question(s) and are free to withdraw from the study at any time.
- Expect that no other teacher will be involved in the study without having given their informed consent. All participation is entirely voluntary.
- Provide information on the understanding that it will be treated as completely confidential to the researcher and it will not be possible to identify you or any of the nominated teachers in the dissemination of the results.
- Be given access to an executive summary of the research findings when the study is completed.

This research abides by the regulations in the Handbook for Doctoral Study and the Code of Ethical Conduct for Teaching and Research Involving Human Subjects at Massey University. If you have any concerns or further questions about the study please do not hesitate to contact the researcher and/or one of the research supervisors.

Thank You Very Much For Your Time
And Help In Making This Study Possible

[LETTERHEAD]

[Name]
[Address]
[Location]

[Date]

Dear [Name]

I am writing to thank you for your assistance with the study I am doing on Internet use in New Zealand primary and intermediate schools. I am very grateful for your co-operation in returning the questionnaire, and I particularly value the information that you provided. It will be treated as confidential and the information will only be accessible to those immediately involved in the research.

In the next stage of the study, I will follow-up on some of the questionnaire responses in order to gather more in-depth information. Thank you for indicating on the questionnaire if you are prepared to be involved in any further study. This was very helpful and I will contact the teachers I would like to study further at some stage during the first term next year. The intention is to survey a refined sample of teachers to collect more detailed and precise information on teachers' adoption and implementation of the Internet.

I hope that from the study I will be able to provide schools with some potentially useful information on how teachers can make the most effective use of Internet in the classroom. Thank you again [Name] for your co-operation and I will send you an executive summary of the results at the end of the study. If I can help in the future on any matter related to the use of Internet in your school, please do not hesitate to contact me.

Best wishes

Mark E. Brown

MASSEY UNIVERSITY
College of Education

Wired Schools:
A Study of Internet-Using Teachers

Teacher Questionnaire I

(1999)

On Completion

When you have completed the questionnaire, please return in the stamped addressed envelope to:

Mark E. Brown
Department of Learning and Teaching,
Massey University,
Private Bag 11 222,
Palmerston North

THANK YOU VERY MUCH FOR YOUR COOPERATION

MASSEY UNIVERSITY
College of Education

Wired Schools: A Study of Internet-Using Teachers

Instructions

Please read each question carefully and respond accordingly. Where appropriate tick the box, circle the response, or write a short answer in the space provided. The questionnaire should take about 20 minutes to complete. Please answer the questions as accurately as possible. The value of this research is highly dependent on the quality of the information that you provide. Please note that it is assumed that completion and return of the questionnaire implies consent.

1.0 Background Information

1.1 Your Name: _____

1.2 Name of School: _____

1.3 School Decile Ranking *(if known):* _____

1.4 Teaching Position *(e.g. AP, Scale A, etc):* _____

1.5 Current Teaching Level *(e.g. NE, Year 5, etc):* _____

1.6 Number of Years Teaching in Present School: _____

1.7 Number of Years Teaching in All Schools: _____

1.8 Gender *(Please √the appropriate box):* ☐ Male ☐ Female

1.9 Age Group *(Please √the appropriate box):*

☐ 20-29 ☐ 30-39 ☐ 40-49 ☐ 50-59 ☐ 60+

1.10 Ethnic Group *(Please √the appropriate box):*

☐ European ☐ Maori ☐ Polynesian ☐ Other *[specify]*. . . . .

1.11 Qualifications *(e.g. BEd, DipTchg, etc):* _____ *(Completed)*

_____ *(In Progress)*

This Information Will Be Treated As Confidential

2.0 Your Personal Internet Experience

2.1 In what year did you first use the Internet? 19____

2.2 Do you have personal Internet access at home? Yes ☐ No ☐

2.3 If yes, what do you mainly use the Internet at home for?

_____

_____

_____

2.4 In what setting did you first become reasonably comfortable at using the Internet?

☐ At Home ☐ At School ☐ During Inservice ☐ During Preservice ☐ Other *[specify]*

2.5 Do you have any special responsibility for the use of computers and/or the Internet in your school? Yes ☐ No ☐

2.6 If yes, what is the nature of your responsibility? _____

_____

_____

_____

2.7 Have you ever completed a formal course or tertiary qualification on the use of computers in education? Yes ☐ No ☐

2.8 If yes, briefly describe each course and/or qualification? _____

_____

_____

_____

2.9 Have you attended in the last two years any type of professional development course on the use of the Internet in education? Yes ☐ No ☐

2.10 If yes, briefly describe the nature of each course? _____

_____

_____

_____

_____

_____

2.11 Do you use the Internet for your own professional development? Yes ☐ No ☐

2.12 If yes, what do you mainly use the Internet for? _____

_____

_____

_____

2.13 How many hours of professional development have you received approximately over the past 12 months on the use of the Internet from the following people / groups?

a) Other Staff _____ hrs
b) Other Schools _____ hrs
c) Teacher Support Services _____ hrs
d) Colleges of Education _____ hrs
e) Polytechnics _____ hrs
f) Private Providers _____ hrs
g) Others *[specify]* . . . _____ hrs

2.14 Have you received any other training related to Internet use? Yes ☐ No ☐

2.15 If yes, what was the nature of this training? _____

_____

_____

_____

2.16 Have you ever been involved in the formal training of other teachers on the use of Internet in education? Yes ☐ No ☐

2.17 If yes, briefly describe the nature of the training and your involvement?

_____

_____

_____

_____

_____

2.18 How often do you have informal discussions with colleagues where you offer advice about using the Internet for learning and teaching? *[circle the most appropriate answer]*

Never Some Weeks Most Weeks Every Week Most Days Every Day

2.19 How often do you provide informal or impromptu technical support for other staff who are trying to use the Internet with their class? *[circle the most appropriate answer]*

Never Some Weeks Most Weeks Every Week Most Days Every Day

2.20 Have you ever attended a conference, given a presentation or conducted a workshop on the use of the Internet in education? Yes ☐ No ☐

2.21 If yes, what was the nature of the conference, workshop and/or presentation?

_____

_____

_____

_____

2.22 Do you or your school subscribe to any journals, magazines or online discussion groups on the use of computers in education? Yes ☐ No ☐

2.23 If yes, what are the names of these journals, magazines or groups? _____

_____

_____

2.24 Have you ever been a member of a computer club or organisation? Yes ☐ No ☐

2.25 If yes, what is the name and purpose of the club or organisation? _____

_____

_____

2.26 How would you rate your technical skills and knowledge in relation to computers?

☐ Novice ☐ Emerging ☐ Proficient ☐ Accomplished ☐ Expert

2.27 How would you rate your technical skills and knowledge in relation to the Internet?

☐ Novice ☐ Emerging ☐ Proficient ☐ Accomplished ☐ Expert

2.28 How would you rate your level of teaching experience at using computers in the classroom?

☐ Novice ☐ Emerging ☐ Proficient ☐ Accomplished ☐ Expert

2.29 How would you rate your level of teaching experience at using the Internet in the classroom?

☐ Novice ☐ Emerging ☐ Proficient ☐ Accomplished ☐ Expert

2.30 How would you describe the level of support you receive from other staff for using the Internet within your teaching?

☐ Poor ☐ Adequate ☐ Good ☐ Very Good ☐ Excellent

2.31 How would you describe the level of support you receive from the Principal and Board of Trustees for using the Internet within your teaching?

☐ Poor ☐ Adequate ☐ Good ☐ Very Good ☐ Excellent

2.32 How would you rate your current knowledge of recent ICT developments in New Zealand education?

☐ Poor ☐ Adequate ☐ Good ☐ Very Good ☐ Excellent

2.33 Do you have anything else to report about your prior Internet experience? _____

_____

_____

_____

_____

3.0 Your Use Of The Internet For Learning And Teaching

3.1 In what year did you first use the Internet to support your teaching? 19_____

3.2 Do children have regular access to the Internet in your classroom? Yes ☐ No ☐

3.3 If yes, how many networked computers are available and what year did you first get Internet capability in your classroom?

Number: _____ Year: 19_____

3.4 Do children have access to the Internet in a school computer suite? Yes ☐ No ☐

3.5 If yes, how many networked computers are available and what year did you first get Internet capability in this suite?

Number: _____ Year: 19_____

3.6 Do children have access to the Internet in the school library? Yes ☐ No ☐

3.7 If yes, how many networked computers are available and what year did you first get Internet capability in the library?

Number: _____ Year: 19_____

3.8 How often do children in your class use the Internet for their learning?

☐ Never ☐ Most Weeks ☐ Every Week ☐ Most Days ☐ Every Day

3.9 How many hours did children in your class use the Internet last week? _____ hrs

(e.g. 2 hours of the school day x 5 days of the school week = 10 hours).

3.10 Do you have a method or system to manage the type of access children have to the Internet? Yes ☐ No ☐

3.11 If yes, briefly explain how this method or system works? _____

_____

_____

_____

3.12 Compared to 3 years ago, are you using the following computer applications in your teaching more frequently, or less frequently?

(circle the most appropriate answer for each type of software)

Word Processing	Much Less	Less	Same	More	Much More
Educational Games	Much Less	Less	Same	More	Much More
Interactive Fiction	Much Less	Less	Same	More	Much More
Drill and Practice Software	Much Less	Less	Same	More	Much More
Databases and Spreadsheets	Much Less	Less	Same	More	Much More
Multimedia Presentations	Much Less	Less	Same	More	Much More
E-mail	Much Less	Less	Same	More	Much More
Internet	Much Less	Less	Same	More	Much More

3.13 During a typical school week, what percentage of computer time in your class is devoted to each of the following software applications?

Email: _____% Web: _____% Word Processing: _____% Educational Games: _____%

3.14 Typically, when children in your class are using the Internet what percentage of their time is spent working in the following ways?

Individually _____% Pairs _____% Small Groups _____% Teacher Led _____%

3.15 What type of access do children in your class have to the Internet? *[circle the most appropriate answer]*

Unrestricted Few Restrictions Some Restrictions Tight Restrictions Teacher Only

3.16 Do you have a procedure or written policy to ensure Internet safety? Yes ☐ No ☐

3.17 If yes, briefly explain how this procedure or policy works? _____

_____

_____

_____

3.18 Which of the following types of Internet applications have been used (or are definitely planned for use) by your class this year?

(circle the most appropriate answer for each Internet use)

	Number of Weeks this Year			
Electronic Mail	Never	Some Weeks	Most Weeks	Every Week
Web Page Browsing	Never	Some Weeks	Most Weeks	Every Week
Internet Search Engines	Never	Some Weeks	Most Weeks	Every Week
Internet Chat	Never	Some Weeks	Most Weeks	Every Week
Discussion Lists (Listserv)	Never	Some Weeks	Most Weeks	Every Week
Discussion Groups (USENET)	Never	Some Weeks	Most Weeks	Every Week
Web Page Construction	Never	Some Weeks	Most Weeks	Every Week
FTP	Never	Some Weeks	Most Weeks	Every Week
Telnet	Never	Some Weeks	Most Weeks	Every Week
Other *[specify]* . . .	Never	Some Weeks	Most Weeks	Every Week

3.19 What do you consider is the <u>main</u> benefit to arise from children using the Internet in your class?

_____

_____

_____

_____

_____

3.20 How often do you use the Internet in lesson planning and preparation?

☐ Never ☐ Most Weeks ☐ Every Week ☐ Most Days ☐ Every Day

3.21 Which of the following types of Internet experiences have been used (or are definitely planned for use) by your class this year?

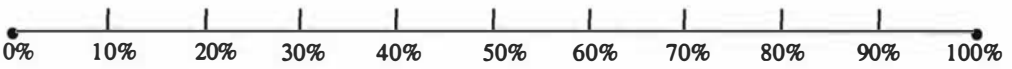
(circle the most appropriate answer for each Internet use)

	Number of Days this Year				
Web Quests	0 Days	1-5 Days	6-14 Days	15-24 Days	25 + Days
Information Searches	0 Days	1-5 Days	6-14 Days	15-24 Days	25 + Days
Internet Investigations	0 Days	1-5 Days	6-14 Days	15-24 Days	25 + Days
Information Exchanges	0 Days	1-5 Days	6-14 Days	15-24 Days	25 + Days
Key/Pen Pal Exchanges	0 Days	1-5 Days	6-14 Days	15-24 Days	25 + Days
Ask an Expert	0 Days	1-5 Days	6-14 Days	15-24 Days	25 + Days
Electronic Guests	0 Days	1-5 Days	6-14 Days	15-24 Days	25 + Days
Virtual Field Trips	0 Days	1-5 Days	6-14 Days	15-24 Days	25 + Days
Online Adventures	0 Days	1-5 Days	6-14 Days	15-24 Days	25 + Days
Internet Competitions	0 Days	1-5 Days	6-14 Days	15-24 Days	25 + Days
Sequential Stories	0 Days	1-5 Days	6-14 Days	15-24 Days	25 + Days
Electronic Publishing	0 Days	1-5 Days	6-14 Days	15-24 Days	25 + Days
Author/Book Raps	0 Days	1-5 Days	6-14 Days	15-24 Days	25 + Days
Travel Buddies	0 Days	1-5 Days	6-14 Days	15-24 Days	25 + Days
Social Action Projects	0 Days	1-5 Days	6-14 Days	15-24 Days	25 + Days
Other *[specify]* . . .	0 Days	1-5 Days	6-14 Days	15-24 Days	25 + Days

3.22 Describe the most innovative or successful Internet learning experience thus far in your teaching?

3.23 Do children in your class have a specific email address? Yes ☐ No ☐

3.24 What percentage of children use e-mail per week in your class? *(circle the appropriate percentage)*



3.25 What is the most common use of email by children in your class?

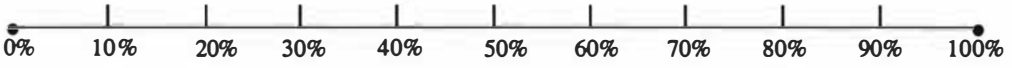
_____

_____

_____

_____

3.26 What percentage of children use the Web per week in your class? *(circle the appropriate percentage)*



3.27 What is the most common use of the World Wide Web by children in your class?

_____

_____

_____

_____

3.28 List, in order, the actual names of the three web sites most frequently used by children in your class? *(For example; CNN, Sunshine Books, etc):*

1: _____

2: _____

3: _____

3.29 List, in order, the three main Essential Learning Areas in which the Internet is used by children in your class? *(For example; Math, Science, etc):*

1: _____

2: _____

3: _____

3.30 Does your class or school have an Internet Home Page? Yes ☐ No ☐

3.31 If yes, what type of information does the home page contain? _____

_____

_____

_____

_____

3.32 Does your school have an Intra-net network between classrooms ? Yes ☐ No ☐

3.33 If yes, how do children use this Intra-net to support their learning? _____

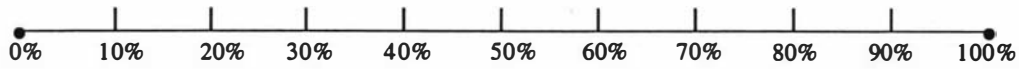
_____

_____

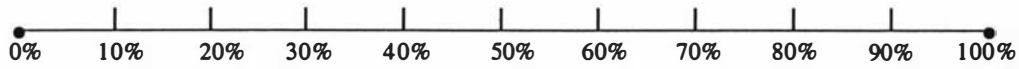
_____

3.34 When children in your class are using the Internet, what percentage of their time is devoted to meeting the following learning outcomes? *(circle the appropriate percentage)*

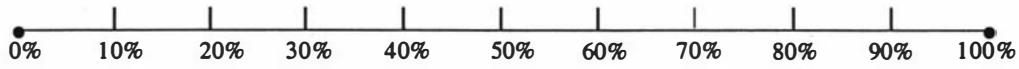
a) Learning to use Email



b) Learning to use Web Pages

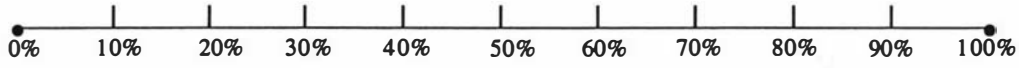


c) Learning to use Search Engines

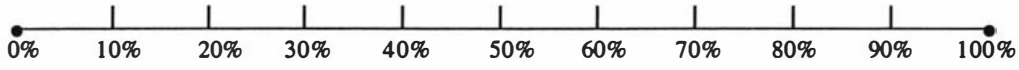


d) Learning to use other Internet Skills *[specify]* ...

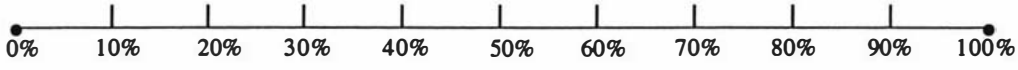
e) Using Email to Develop Communication and Language Skills



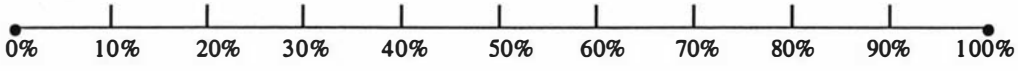
f) Using Search Engines to Develop and Reflect on New Learning Strategies



g) Using the Web for Meaningful Learning that Develops Critical Reasoning Skills



i) Using the Internet for Individual or Group Projects where Findings are Shared with an Audience



3.35 Do you have anything else to report about your use of the Internet for learning and teaching?

_____

_____

_____

_____

4.0 Your Approach To Teaching With The Internet

4.1 Which one of the following terms best describes your current approach to teaching with the Internet?

Instructor Guide Coach Facilitator Manager

4.2 Which one of the following terms best describes your current experience at implementing the Internet for learning and teaching?

Enthusiastic Beginner Committed Innovator Cautious Integrator
Struggling Adopter Accomplished Achiever

4.3 How would you describe your philosophy of teaching? _____

_____

_____

_____

_____

_____

4.4 Has the advent of the Internet changed your teaching philosophy? Yes ☐ No ☐

4.5 If yes, briefly explain the type of changes that have taken place? _____

_____

_____

_____

_____

4.6 How would you rate your current knowledge of teaching?

☐ Excellent ☐ Very Good ☐ Good ☐ Adequate ☐ Poor

4.7 How would you rate your knowledge of contemporary learning theory?

☐ Excellent ☐ Very Good ☐ Good ☐ Adequate ☐ Poor

4.8 How would you rate your knowledge of learning and teaching in relation to computers?

☐ Excellent ☐ Very Good ☐ Good ☐ Adequate ☐ Poor

4. 9 How would you rate your knowledge of learning and teaching in relation to the Internet?

☐ Excellent ☐ Very Good ☐ Good ☐ Adequate ☐ Poor

4.10 How would you rate your success at integrating the Internet into the school curriculum?

☐ Excellent ☐ Very Good ☐ Good ☐ Adequate ☐ Poor

4.11 How would you rate your level of confidence at using the Internet for learning and teaching?

☐ Excellent ☐ Very Good ☐ Good ☐ Adequate ☐ Poor

4.12 What (or who) has made the most significant contribution to your knowledge and understanding about using the Internet for learning and teaching?

4.13 I feel enthusiastic about using the Internet in my teaching.

Strongly Agree Agree Not Sure Disagree Strongly Disagree

4.14 I am committed to deeply reflecting about the quality of my teaching.

Strongly Agree Agree Not Sure Disagree Strongly Disagree

4.15 I usually explain the concept and then give lots of specific practice in my teaching.

Strongly Agree Agree Not Sure Disagree Strongly Disagree

4.16 I find the Internet very useful in a number of Essential Areas across the school curriculum.

Strongly Agree Agree Not Sure Disagree Strongly Disagree

4.17 I use real problems with no easy solutions for children to research in my teaching.

Strongly Agree Agree Not Sure Disagree Strongly Disagree

4.18 I often question how the use of the Internet is enhancing my teaching.

Strongly Agree Agree Not Sure Disagree Strongly Disagree

4.19 I ensure children learn correct answers and facts related to the curriculum in my teaching.

Strongly Agree Agree Not Sure Disagree Strongly Disagree

4.20 I find the Internet allows me to link different subjects of the curriculum in my teaching.

Strongly Agree Agree Not Sure Disagree Strongly Disagree

4.21 I prefer active learning experiences like debates, projects and investigations in my teaching.

Strongly Agree Agree Not Sure Disagree Strongly Disagree

4.22 What type of knowledge and skills do you think is most important for teachers to acquire if they are to enhance children's learning with the Internet?

5.0 Your Opinion About The Internet

5.1 I find the Internet helps to increase the social interaction between children in my class.

Strongly Agree Agree Not Sure Disagree Strongly Disagree

5.2 I believe the Internet allows for better individualised instruction of children in my class.

Strongly Agree Agree Not Sure Disagree Strongly Disagree

5.3 I find that boys tend to dominate the Internet learning experiences in my class.

Strongly Agree Agree Not Sure Disagree Strongly Disagree

5.4 I believe the Internet has positively affected my way of teaching.

Strongly Agree Agree Not Sure Disagree Strongly Disagree

5.5 I think teachers need to be very cautious about using the Internet in education.

Strongly Agree Agree Not Sure Disagree Strongly Disagree

5.6 I believe it is important that teachers have access to email and the web at home if schools are to make effective use of the Internet.

Strongly Agree Agree Not Sure Disagree Strongly Disagree

5.7 I believe that teachers need a lot of technical knowledge in order to make effective use of the Internet in their teaching.

Strongly Agree Agree Not Sure Disagree Strongly Disagree

5.8 I believe that teachers need a sound knowledge of contemporary learning theory to make effective use of the Internet in their teaching.

Strongly Agree Agree Not Sure Disagree Strongly Disagree

5.9 Rank the eight following types of Internet activities in order of their educational value. That is, place **1** beside the activity you consider to have most educational valuable, **2** beside the next most valuable and so forth.

- ☐ To support key pal exchanges between children
- ☐ To access up-to-date information on a current topic
- ☐ To experience a virtual field trip to another country
- ☐ To participate in an online challenge or Internet adventure
- ☐ To investigate problems and share findings with a wider audience
- ☐ To connect with an expert and/or ask questions of an electronic guest
- ☐ To build and construct web pages about the school or local community
- ☐ To acquire new insights by becoming a member of online learning community

(Please do not use the same number more than once)

5.10 Rank the six following reasons for children using the Internet in New Zealand schools in order of their educational significance. That is, place **1** beside the reason you consider most important, **2** beside the next most important, and so forth.

☐	To develop children's basic skills and computer literacy.	To develop children's thinking and problem solving skills.	☐
☐	To give children more responsibility and control over their own learning.	To develop skills useful for future jobs and meet parent expectations	☐
☐	To support the individualised and more personal instruction of children.	To develop social skills for collaboration and working with others.	☐

(Please do not use the same number more than once)

5.11 Rank from the list below, the <u>five</u> main barriers that inhibit the Internet being effectively used for learning and teaching. That is, place **1** beside the barrier you consider most significant, **2** beside the next most significant, and so forth.

☐ Cost of equipment

☐ Lack of teacher time

☐ Obsolete technology

☐ Lack of teacher interest

☐ Availability of equipment

☐ Teacher knowledge of equipment

☐ Teacher understanding about value of use

☐ Cost and availability of technical support

☐ Principal and BOT understanding about value of use

☐ Teacher knowledge and philosophy about good teaching

☐ Other *[specify]* . . .

(Please do not use the same number more than once)

5.12 Rank the following computer applications in order of their educational value. That is, place **1** beside the application or software that you consider most valuable, **2** beside the next most valuable, and so forth.

☐	DATABASE PROGRAMS	ELECTRONIC MAIL	☐
☐	WORLD WIDE WEB	INTERACTIVE FICTION	☐
☐	EDUCATIONAL GAMES	WORD PROCESSING	☐
☐	LOGO PROGRAMMING	DRILL & PRACTICE SOFTWARE	☐

(Please do not use the same number more than once)

6.0 Additional Information

6.1 Are you be prepared to be interviewed if any further information is required? ☐ Yes ☐ No

6.2 Do you have any other comments you wish to make about using the Internet for education?

When you have completed the questionnaire, please return it in the stamped addressed envelope to:

Mark E. Brown
Department of Learning and Teaching
Massey University
Private Bag 11 222
Palmerston North.

THANK YOU VERY MUCH FOR YOUR COOPERATION

APPENDIX C

Phase Two:
Perceived Accomplished Internet-using Teachers

[Letterhead]

[Name]
[Address]
[Location]

15 November, 1999

Dear [Name]

I am writing to let you know that I have nearly completed Phase One of my PhD research on Internet use in New Zealand schools. The research is studying a purposive sample of teachers who are considered proficient, accomplished or experienced in their use of the Internet for learning and teaching. The research objective is to investigate how teachers believe the Internet has affected learning and teaching—for better and worse. A multi-dimensional research framework is being adopted over three phases utilizing both qualitative and quantitative data sources.

Earlier in the year, you agreed to be a member of my Research Advisory Group. The purpose of this group is to help select a refined sample of teachers for further study. At the moment, I am in the process of analyzing the questionnaire responses from Phase One. So, this letter is an advanced organiser to let you know that I will be calling a meeting of the Research Advisory Group toward the end of January to review the results and select the sample for Phase Two. See the attached Information Sheet for this phase of the study.

I will telephone you in January to arrange a mutually convenient time and venue for the meeting. I do not expect that this first meeting will involve a lot of your time. Hopefully it will take a couple of hours where we need to first review the selection criteria and then go on to select the teachers most suitable for further study.

I look forward to your contribution in the selection of the internet-using teachers for this phase of the research.

Best wishes

Mark E. Brown

Wired Schools: A Study of Internet-Using Teachers

SELECTION CRITERIA – Phase Two

The following core principles underpin the selection of "accomplished" internet-using teachers for this phase of the study. Teachers will:

1. Have a critical philosophy of education anchored by a strong sense of social justice.
2. Have a lot of knowledge acquired through a blend of theory, research and practical experience.
3. Have a disposition toward innovation, risk taking and the promotion of active and meaningful learning across the curriculum.
4. Demonstrate a strong commitment toward critical self-reflection supported by their school culture and professional relationships.

Above all, the accomplished internet-using teachers will be "trusted" and "learned" professionals with a critical understanding of pedagogy. These two concepts and the core principles will be explained in more detail by the researcher. At a practical level, it is proposed that the above principles are operationalised through the following selection criteria:

i) The teacher has at least three years teaching experience.

ii) The teacher has at least two years teaching experience with computers.

iii) The teacher has regular access to the Internet in their classroom and/or school.

iv) The teacher makes use of a computer in the classroom and/or school most days of the week.

v) The teacher makes use of more than one computer and/or Internet application most weeks of the year.

vi) The teacher is knowledgeable about learning and teaching and is aware of recent developments pertaining to the use of ICT in New Zealand schools.

vii) The teacher is enthusiastic toward innovation and has emerging skill, knowledge and experience at using the Internet for learning and teaching.

viii) The teacher can clearly articulate their reasons for using the Internet and recognises the opportunities that computers provide (and do not) for the development of active and meaningful learning across the curriculum.

ix) The teacher can critically reflect on how their teaching has been affected by the use of different educational technologies—for better and worse—and generally feels supported by colleagues and school.

x) The teacher is confident about using computers in the classroom and has completed a formal educational computing course and/or some type of professional development on using the Internet for learning and teaching.

Finally, the criteria are intended to be as inclusive as possible. Each criterion is informed by the literature on good pedagogy and prior research on the experiences, perceptions and practices of computer using-teachers.

Wired Schools: A Study of Internet-Using Teachers

BACKGROUND INFORMATION – Phase One

I first started the research in April 1999 when I invited principals, BOT representatives and experts in the field to nominate teachers in their region who they considered to be proficient at using the Internet for learning and teaching. After sending out a follow up letter, 76 teachers were identified as nominated proficient internet-using teachers. Three of these teachers worked in schools outside the area selected for study. In August, the remaining 73 teachers were sent a letter and formal Information Sheet explaining the purpose of the study. Included with this letter was a questionnaire for the teachers to complete. The questionnaire addressed the following research questions:

i) *What are the background characteristics of internet-using teachers?*

ii) *How do teachers use the Internet for learning and teaching?*

iii) *What perceptions and beliefs do internet-using teachers have about the learning and teaching process?*

iv) *What changes to their practice and work culture do teachers report from using the Internet for learning and teaching?*

v) *What perceptions and beliefs do teachers have of how the Internet supports the learning and teaching process?*

vi) *What factors do teachers believe inhibit and/or enable the use of the Internet for learning and teaching?*

After sending out a follow up letter and another copy of the questionnaire, a total of 56 questionnaires were returned—a 76% response rate.

All those who completed and returned the questionnaire were sent a letter of thanks. The next stage is to select a group of teachers for more in-depth study. The participants who we decide to select for follow up research will be referred to as "perceived accomplished internet-using teachers". Your role as an Advisory Group member is to assist with this selection process. I will need to convince you which teachers should be invited to participate in Phase Two of the study. I have included with this background information a revised copy of the criteria that will used to guide the selection process and a preliminary analysis of the questionnaire results. The raw data will be available for you to examine during the meeting. The questionnaire information is confidential and I ask that you treat it in this manner. You should not be able to identify any teacher or school from the raw data.

Finally, I value your assistance with this study and I look forward to working with you as we select the teachers most suitable for further study.

Wired Schools: A Study of Internet-Using Teachers

SAMPLE SELECTION – Phase Two

Research Advisory Group Meeting

(6:30pm 20th March, 2000)

AGENDA

1. Introduction
2. Appointment of a Chairperson
2. Background Information
3. Selection Criteria
4. Preliminary Analysis of Questionnaire Results
5. Selection of Perceived Accomplished Internet-Using Teachers
6. Looking Ahead
7. AOB

[Letterhead]

[Name]
[Address]
[Location]

25 March, 2000

Dear [Name]

I writing to express my appreciation for your time and effort the other night in helping me to select the internet-using teachers for further study. I value your membership on my Research Advisory Group and I am grateful for your support during the selection process. Once again, I apologize for underestimating the time it took to select a smaller group of teachers for further study.

I was delighted, however, with the way the group considered the merits of each individual internet-using teacher. Your thorough analysis of the questionnaire responses helped to identify 43 teachers for the next phase of the study.

I am committed to making the study as valuable as possible. I hope that I can collect important information on how teachers believe the Internet has affected learning and teaching—for better and worse. The research should help to uncover some of the conditions and factors important if teachers are to effectively use the Internet for educational purposes.

I will contact you again for your further assistance when I have completed the next phase of the study.

Regards

Mark E Brown

[Letterhead]

[Name]
[School]
[Address]
[Location]

1 April, 2000

Dear Principal

I am writing to seek your further assistance with my research on Internet use in New Zealand primary and intermediate schools. This research seeks to study teachers in your region who are considered proficient, accomplished and experienced in their use of the Internet for learning and teaching.

In the process of identifying the research sample, at least one teacher from your school has been selected as suitable for participation in the second phase of this study. I would like your permission to contact the teacher(s) inviting them to complete a follow up questionnaire, which gathers information that is more detailed on the ways in which they are using the Internet for educational purposes.

The study of these teachers aims to provide valuable information on the conditions and factors that are important in the design of successful internet-based learning experiences in schools. It is hoped that the research findings will help teachers, principals and Boards of Trustees to make more informed decisions about the role of the Internet in their school.

I guarantee that neither the teacher nor your school will be identified in any report of the study. The attached Information Sheet provides more details about the identity of the researcher, nature and purpose of the study, issues relating to anonymity, confidentiality and the rights of the research participants. Please read this information carefully.

I am mindful that this request is yet another demand on your time. However, I am committed to making this study as valuable as possible. I trust that you will see the value of the research and that you have no objection to one or more of your staff participating in the study.

If you do not wish to participate or have questions concerning the research, please contact me as soon as possible. I can be contacted at Massey University, College of Education, telephone 356 9099, extension 8626. If I do not hear back from you by **24th April** then I will assume that I can go ahead and send out the questionnaires. The teachers can then decide for themselves whether they wish to participate in this phase of the study.

Thank you for your co-operation. I value your ongoing support. As already indicated an executive summary of the results will be available on request at the end of the study.

Regards

Mark E Brown

[LETTERHEAD]

[Name]
[School]
[Address]
[Location]

28 April, 2000

Dear [Name]

I am writing to invite you to participate in Phase Two of my research on Internet use in New Zealand primary and intermediate schools. This research is designed to study a special group of teachers who have been selected as proficient, accomplished or experienced in their use of the Internet for learning and teaching.

The study aims to provide valuable information on the conditions and factors that are important in the design of internet-based learning experiences. It is hoped that the research findings will help other teachers, principals and Boards of Trustees to make more informed decisions about the role of the Internet in their school.

You have been selected [Name] from your original questionnaire response as a teacher who is suitable for participation in the second phase of the study. This phase aims to collect more detailed information about the ways in which you are using the Internet for educational purposes. The first questionnaire responses have already provided me with some interesting baseline data and this phase attempts to build on this information.

The Internet is still very new in schools and there is a lot we can learn from your early experience. Accordingly, I would be grateful if you could find time to complete the enclosed follow up questionnaire. This questionnaire is designed to collect additional information about your background experience and your use of the Internet for learning and teaching. Once again, it will involve about 30 minutes of your time.

There is a separate Information Sheet attached to the questionnaire that outlines the identity of the researcher, nature and purpose of the study, issues relating to anonymity, confidentiality and your rights as a research participant. Please read this information carefully before agreeing to complete the second questionnaire.

If you complete the questionnaire, you need to be aware that I would also like to interview you later in the year. However, you are under no obligation to participate in the interview even if you complete the questionnaire. There is space on the questionnaire to indicate if you are willing to be interviewed but your response does not commit you to further research. A separate formal consent process will be followed closer to the time.

Thank you for your co-operation. I really value your support, as the research would not be possible without your participation.

Yours sincerely

Mark E. Brown

PS Please return the questionnaire in the stamped addressed envelope by the **22nd May** 2000.

[LETTERHEAD]

[Name]
[School]
[Address]
[Location]

29 May, 2000

Dear [Name]

I wrote to you a few weeks ago seeking your assistance with a study that I am doing on Internet use in New Zealand primary and intermediate schools. This research is designed to study a special group of teachers who have been selected as proficient, accomplished or experienced in their use of the Internet for learning and teaching. I would really value your participation, as my research is highly dependent upon a small number of internet-using teachers.

The study aims to provide valuable information on the conditions and factors that are important in the design of internet-based learning experiences. It is hoped that the research findings will help other teachers, principals and Boards of Trustees to make more informed decisions about the role of the Internet in their school.

I know this is a very busy time of the year, but I would be grateful if you could find a few spare minutes to complete the enclosed questionnaire. This questionnaire is designed to collect additional information about your use of the Internet for learning and teaching. It will involve about 30 minutes of your time. There is a separate Information Sheet attached to the questionnaire that outlines the identity of the researcher, nature and purpose of the study, issues relating to anonymity, confidentiality and your rights as a research participant. Please read this information carefully.

If you complete the questionnaire, you need to be aware that I would also like to interview you later in the year. However, you are under no obligation to participate in the interview even if you complete the questionnaire. There is space on the questionnaire to indicate if you are willing to be interviewed but your response does not commit you to further research. A separate formal consent process will be followed closer to the time.

Thank you for your co-operation. I really value your support, as the research would not be possible without your participation.

Yours sincerely

Mark E. Brown

PS Please return the questionnaire in the stamped addressed envelope by the **19th June** 2000.

[LETTERHEAD]

Wired Schools: A Study of Internet-Using Teachers

INFORMATION SHEET – Phase Two

1. Identity of the Researcher:

Mark E. Brown (Lecturer, Department of Learning and Teaching).

This research is part of Mark's Doctoral Study (PhD) at Massey University. If you have any questions about the research please do not hesitate to contact Mark and/or one of his research supervisors.

2. Identity of the Supervisors:

Associate Professor Ken Ryba (Chief Supervisor)
Professor William Tunmer (Second Supervisor)

3. Contact Information:

The Researcher and/or Supervisors can be contacted at the following address:

Massey University		
College of Education	Mark Brown:	Telephone (06) 356 9099, Extension 8626
Private Bag 11 222	Dr Ken Ryba:	Telephone (06) 356 9099, Extension 9606
Palmerston North	Prof William Tunmer:	Telephone (06) 356 9099, Extension 8962

4. The Nature and Purpose of the Study:

The objective of this study is to investigate how teachers believe the Internet has affected learning and teaching—for better and worse. The research aims to document the experiences, perceptions and practices of a sample of nominated proficient, accomplished and experienced internet-using teachers to collect valuable information on the conditions and factors important if teachers are to effectively use the Internet for educational purposes.

There are three phases to the research and this second phase—the completion of a follow up questionnaire and interview—involves a refined sample of perceived accomplished internet-using teachers. In the last phase, a Research Advisory Group will assist to select a small number of experienced internet-using teachers for more in-depth investigation. This will involve another interview along with a case study of the experiences, perceptions and practices of no more than five teachers.

5. Your Involvement and Time Commitment:

Teachers were identified originally as suitable for participation in this study through a nomination process. The sample for this phase of the study then was selected with the help of a Research Advisory Group based on the questionnaire responses. If you agree to participate in Phase Two, teachers will be asked to complete a follow up questionnaire requiring a commitment of approximately 30 minutes of your time. A stamped, addressed envelope has been provided in which to return the questionnaire.

On completion of the questionnaire, you will be invited also to participate in a follow up interview. However, you are under no obligation to participate in the interview even if you complete the second questionnaire. There is space on the questionnaire to indicate if you are willing to be interviewed but your response does not commit you to further research. A separate formal consent process will be followed for the interview closer to the time. The interview will take place at a time and place of your convenience and will require between 30 and 60 minutes of your time.

6. What you can Expect of the Researcher:

The information that you provide will be treated as confidential and will only be accessible to those immediately involved in the research. All research data will be kept secure and the researcher will take all reasonable steps to protect your identity. The main risk associated with your participation in this research relates to your anonymity. While no teacher or school will be directly identified in the research findings, it is impossible to guarantee absolute anonymity. The researcher can only give an assurance of anonymity based on a personal guarantee and to the extent allowed by law. In addition to these assurances, the researcher will:

- Attempt to honestly represent the participants' experiences, perceptions and practices.
- Explain all procedures throughout the research process and obtain informed consent at each phase of the study.
- Endeavour to treat all participants in an open, courteous and respectful manner throughout the study.
- Store all data in a locked cabinet or password protected electronic folder and will either destroy or return all information gathered throughout the research process.
- Provide participants with an executive summary of the results or make this available to those involved on request.

7. The Rights of the Participants:

It is assumed that completion and return of the questionnaire implies consent. However, you are under no obligation to complete the questionnaire or participate in the follow up interview. If you agree to take part in Phase Two, the purpose of the interview and the interview process will be fully discussed with you prior to the interview itself. In addition, you have the right to:

- Ask further questions about the study arising from your participation.
- Decline to answer any particular question(s) and are free to withdraw from the study at any time.
- Expect that no other teacher will be involved in the study without having given their informed consent. All participation is entirely voluntary.
- Provide information on the understanding that it will be treated as completely confidential to the researcher and it will not be possible to identify you, your school or any of the other teachers in the dissemination of the results.
- Be given access to an executive summary of the research findings when the study is completed.

This research abides by the regulations in the Handbook for Doctoral Study and the Code of Ethical Conduct for Teaching and Research Involving Human Subjects at Massey University. If you have any concerns or further questions about the study please do not hesitate to contact the researcher and/or one of the research supervisors.

Thank You Very Much For Your Time
And Help In Making This Study Possible

[LETTERHEAD]

[Name]
[Address]
[Location]

[Date]

Dear [Name]

I am writing to thank you for your assistance with the study I am doing on Internet use in New Zealand primary and intermediate schools. I am very grateful for your co-operation in returning the follow up questionnaire, and I particularly value the information that you provided. It will be treated as confidential and the information will only be accessible to those immediately involved in the research.

In the next stage of the study, I will contact those teachers who indicated their willingness to participate in a follow up interview to gather even more in-depth information. Thank you for indicating this on the questionnaire. You are not obliged to participate in any further aspects of the research but your participation thus far has been crucial in contributing to the success of the study.

I hope that from the study I will be able to provide schools with some potentially useful information on how teachers can make the most effective use of Internet in the classroom. Thank you again [Name] for your co-operation and I will send you an executive summary of the results at the end of the study. If I can help in the future on any matter related to the use of Internet in your school, please do not hesitate to contact me.

Best wishes

Mark E. Brown

MASSEY UNIVERSITY
College of Education

Wired Schools:
A Study of Internet-Using Teachers

Teacher Questionnaire II

(2000)

On Completion

When you have completed the questionnaire, please return in the stamped addressed envelope to:

Mark E. Brown
Department of Learning and Teaching,
Massey University,
Private Bag 11 222,
Palmerston North

THANK YOU VERY MUCH FOR YOUR COOPERATION

MASSEY UNIVERSITY
College of Education

Wired Schools: A Study of Internet-Using Teachers

Instructions

This is a follow up questionnaire to the one you completed last year. Please read each question carefully and respond accordingly. Where appropriate tick the box, circle the response, or write a short answer in the space provided. The questionnaire should take about 30 minutes to complete. Please answer the questions as accurately as possible. The value of this research is highly dependent on the quality of the information that you provide.

1.0 Background Information

1.1 Your Name: _____

1.2 Name of School: _____

1.3 Teaching Position *(e.g. AP, Scale A, etc):* _____

1.4 Current Teaching Level *(e.g. NE, Year 5, etc):* _____

2.0 Your Personal Internet Experience

2.1 Do you have personal Internet access at home? Yes ☐ No ☐

2.2 If yes, what do you mainly use the Internet at home for?

_____

_____

_____

2.3 Do you have any special responsibility for the use of computers and/or the Internet in your school? Yes ☐ No ☐

2.4 If yes, what is the nature of your responsibility? _____

_____

_____

2.5 In the last six months have you attended any type of professional development course on the use of the Internet in education? Yes ☐ No ☐

2.6 If yes, briefly describe the nature of each course? _____

_____

_____

_____

2.7 In the last six months have you used the Internet for your own professional development? Yes ☐ No ☐

2.8 If yes, what do you mainly use the Internet for? _____

_____

_____

_____

2.9 In the last six months have you received any other training related to Internet use? Yes ☐ No ☐

2.10 If yes, what was the nature of this training? _____

_____

_____

_____

2.11 In the last six months have you been involved in the formal training of other teachers on the use of Internet in education? Yes ☐ No ☐

2.12 If yes, briefly describe the nature of the training and your involvement?

_____

_____

_____

_____

_____

2.13 In the last six months have you attended a conference, given a presentation or conducted a workshop on the use of the Internet in education? Yes ☐ No ☐

2.14 If yes, what was the nature of the conference, workshop and/or presentation?

_____

_____

_____

_____

2.15 In the last six months, have you or your school subscribed to any journals, magazines or online discussion groups about the use of the Internet in education? Yes ☐ No ☐

2.16 If yes, what are the names of these journals, magazines or groups? _____

_____

_____

_____

2.17 How often do you have informal discussions with colleagues where you offer advice about using the Internet for learning and teaching? *[circle the most appropriate answer]*

Never Some Weeks Most Weeks Every Week Most Days Every Day

2.18 How often do you provide informal or impromptu technical support for other staff who are trying to use the Internet with their class? *[circle the most appropriate answer]*

Never Some Weeks Most Weeks Every Week Most Days Every Day

2.19 In the last six months who or what has made the most significant contribution to your personal Internet experience?

_____

_____

_____

2.20 How would you rate your technical skills and knowledge in relation to the Internet?

☐ Novice ☐ Emerging ☐ Proficient ☐ Accomplished ☐ Expert

2.21 How would you rate your level of teaching experience at using the Internet in the classroom?

☐ Novice ☐ Emerging ☐ Proficient ☐ Accomplished ☐ Expert

2.22 How would you describe the level of support you receive from other staff for using the Internet within your teaching?

☐ Poor ☐ Adequate ☐ Good ☐ Very Good ☐ Excellent

2.23 How would you describe the level of support you receive from the Principal and Board of Trustees for using the Internet within your teaching?

☐ Poor ☐ Adequate ☐ Good ☐ Very Good ☐ Excellent

2.24 How would you rate your current knowledge of recent ICT developments in New Zealand education?

☐ Poor ☐ Adequate ☐ Good ☐ Very Good ☐ Excellent

2.25 How would you rate your current knowledge of recent ICT developments in other OECD countries?

☐ Poor ☐ Adequate ☐ Good ☐ Very Good ☐ Excellent

2.26 In the last six months, is there anything else to report about your personal Internet experience?

_____

_____

_____

_____

_____

3.0 Your Use Of The Internet For Learning And Teaching

3.1 Do children have regular access to the Internet in your classroom? Yes ☐ No ☐

3.2 If yes, how many Internet capable computers are available in your classroom?

Number: _____

3.3 Do children have access to the Internet in a school computer suite? Yes ☐ No ☐

3.4 If yes, how many Internet capable computers are available in this suite?

Number: _____

3.5 Do children have access to the Internet in the school library? Yes ☐ No ☐

3.6 If yes, how many Internet capable computers are available in the library? Number: _____

3.7 Do you have Internet access through a network between classrooms? Yes ☐ No ☐

3.8 If yes, what percentage of the total computers in the school is networked? _____%

3.9 How often do children in your class use the Internet for their learning?

☐ Never ☐ Most Weeks ☐ Every Week ☐ Most Days ☐ Every Day

3.10 How many hours did children in your class use the Internet last week? _____ hrs

(e.g. 2 hours of the school day x 5 days of the school week = 10 hours).

3.11 Compared to 12 months ago, are you using the following computer applications in your teaching more frequently, or less frequently?

(circle the most appropriate answer for each type of software)

Word Processing	Much Less	Less	Same	More	Much More
Educational Games	Much Less	Less	Same	More	Much More
Interactive Fiction	Much Less	Less	Same	More	Much More
Drill and Practice Software	Much Less	Less	Same	More	Much More
Databases and Spreadsheets	Much Less	Less	Same	More	Much More
Multimedia Presentations	Much Less	Less	Same	More	Much More
E-mail	Much Less	Less	Same	More	Much More
World Wide Web	Much Less	Less	Same	More	Much More

3.12 During a typical school week, what percentage of computer time in your class is devoted to each of the following software applications?

Email: _____% Web: _____% Word Processing: _____% Educational Games: _____%

3.13 In the last six months, how often have you used the Internet for lesson planning and preparation?

☐ Never ☐ Most Weeks ☐ Every Week ☐ Most Days ☐ Every Day

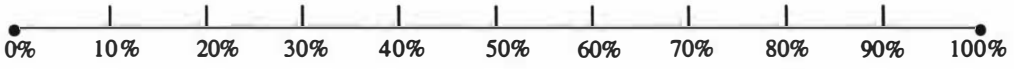
3.14 In the last 12 months which of the following type of Internet applications have been used by your class?

(circle the most appropriate answer for each Internet use)

Electronic Mail	Never	Some Weeks	Most Weeks	Every Week
Web Page Browsing	Never	Some Weeks	Most Weeks	Every Week
Internet Search Engines	Never	Some Weeks	Most Weeks	Every Week
Internet Chat	Never	Some Weeks	Most Weeks	Every Week
Discussion Lists (Listserv)	Never	Some Weeks	Most Weeks	Every Week
Discussion Groups (USENET)	Never	Some Weeks	Most Weeks	Every Week
Web Page Construction	Never	Some Weeks	Most Weeks	Every Week
FTP	Never	Some Weeks	Most Weeks	Every Week
Telnet	Never	Some Weeks	Most Weeks	Every Week
Other *[specify]* . . .	Never	Some Weeks	Most Weeks	Every Week

3.15 Do children in your class have a specific email address? Yes ☐ No ☐

3.16 What percentage of children use e-mail per week in your class? *(circle the appropriate percentage)*

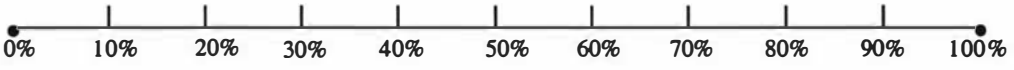


3.17 What is the most common use of email by children in your class?

_____

_____

3.18 What percentage of children use the Web per week in your class? *(circle the appropriate percentage)*



3.19 What is the most common use of the World Wide Web by children in your class?

_____

_____

3.20 Do you have a procedure or written policy to ensure Internet safety? Yes ☐ No ☐

3.21 Does your class or school have an Internet homepage? Yes ☐ No ☐

3.22 If yes, who is responsible for updating the information on the homepage?

_____

_____

_____

3.23 Typically student access and Internet use is under my direction and supervision.

Strongly Agree Agree Not Sure Disagree Strongly Disagree

3.24 Typically student access and Internet use is initiated by children and under their own direction.

Strongly Agree Agree Not Sure Disagree Strongly Disagree

3.25 The Internet is already making major improvements to the quality of curriculum delivery at our school.

Strongly Agree Agree Not Sure Disagree Strongly Disagree

3.26 In the last 12 months which of the following type of Internet experiences have been used by children in your class?

(circle the most appropriate answer for each Internet use)

Web Quests	0 Days	1-5 Days	6-14 Days	15-24 Days	25 + Days
Information Searches	0 Days	1-5 Days	6-14 Days	15-24 Days	25 + Days
Internet Investigations	0 Days	1-5 Days	6-14 Days	15-24 Days	25 + Days
Information Exchanges	0 Days	1-5 Days	6-14 Days	15-24 Days	25 + Days
Key/Pen Pal Exchanges	0 Days	1-5 Days	6-14 Days	15-24 Days	25 + Days
Ask an Expert	0 Days	1-5 Days	6-14 Days	15-24 Days	25 + Days
Electronic Guests	0 Days	1-5 Days	6-14 Days	15-24 Days	25 + Days
Virtual Field Trips	0 Days	1-5 Days	6-14 Days	15-24 Days	25 + Days
Online Adventures	0 Days	1-5 Days	6-14 Days	15-24 Days	25 + Days
Internet Competitions	0 Days	1-5 Days	6-14 Days	15-24 Days	25 + Days
Sequential Stories	0 Days	1-5 Days	6-14 Days	15-24 Days	25 + Days
Electronic Publishing	0 Days	1-5 Days	6-14 Days	15-24 Days	25 + Days
Author/Book Raps	0 Days	1-5 Days	6-14 Days	15-24 Days	25 + Days
Travel Buddies	0 Days	1-5 Days	6-14 Days	15-24 Days	25 + Days
Social Action Projects	0 Days	1-5 Days	6-14 Days	15-24 Days	25 + Days
Other *[specify]* . . .	0 Days	1-5 Days	6-14 Days	15-24 Days	25 + Days

3.27 How would you rate your success at integrating the Internet into the school curriculum?

☐ Excellent ☐ Very Good ☐ Good ☐ Adequate ☐ Poor

3.28 In the last six months, do you have anything else to report about your use of the Internet for learning and teaching?

_____

_____

_____

4.0 Your Approach To Teaching With The Internet

4.1 Which one of the following terms best describes your current approach to teaching with the Internet?

Instructor Guide Coach Facilitator Manager

4.2 Which one of the following terms best describes your current experience at implementing the Internet for learning and teaching? *(circle the most appropriate term)*

Enthusiastic Beginner Committed Innovator Cautious Integrator
Struggling Adopter Accomplished Achiever

4.3 Which one of the following stages best describes your level of Internet adoption for learning and teaching? (tick the most appropriate stage)

- ☐ ENTRY (Learning to use the Internet)
- ☐ ADOPTION (Using the Internet to Support my Teaching)
- ☐ ADAPTATION (Using the Internet to Extend the Curriculum)
- ☐ APPROPRIATION (Integrating the Unique Capabilities of the Internet)
- ☐ INVENTION (Discovering New and Creative Uses for the Internet in my Teaching)

4.4 The following scenarios describe observations from two teachers' classes. Read the observations and answer each question below by circling the response that best answers that question for you.

Chris	Sam
Chris was talking to the class in an animated way, asking questions that the students could answer quickly; based on the work they had done the day before. After this review, Chris taught the class new material, again using simple questions to keep students attentive and listening to what was being said.	Sam was having a discussion with the class where many of the questions came from the students themselves. Though Sam could clarify students' questions and suggest where the children could find relevant information about the topic, the teacher could not really answer most of these questions.

a) Which type of class discussion are you most comfortable having in class?

☐ Definitely Chris ☐ Probably Chris ☐ Not Sure ☐ Probably Sam ☐ Definitely Sam

b) Which type of discussion do you think most students would prefer to have?

☐ Definitely Chris ☐ Probably Chris ☐ Not Sure ☐ Probably Sam ☐ Definitely Sam

c) From which type of class discussion do you think students gain more knowledge?

☐ Definitely Chris ☐ Probably Chris ☐ Not Sure ☐ Probably Sam ☐ Definitely Sam

d) From which type of class discussion do you think students gain more useful skills?

☐ Definitely Chris ☐ Probably Chris ☐ Not Sure ☐ Probably Sam ☐ Definitely Sam

4.5 Rank the eight following characteristics of accomplished teachers in order of their educational importance. That is, place **1** beside the characteristic you consider to be most important, **2** beside the next most important and so forth.

- ☐ They have a lot of flair and imagination are are highly passionate people.
- ☐ They define clear objectives and have well developed classroom management skills.
- ☐ They are highly intelligent people who have a lot of knowledge about education.
- ☐ They meet the core professional standards for New Zealand teacher registration.
- ☐ They have a strong social conscience and deep understanding of socio-political issues.
- ☐ They have well developed computer and Internet skills for use in the classroom.
- ☐ They have clear philosophies of education and critically reflect on their practice.
- ☐ They have a sound knowledge of the New Zealand National Curriculum Framework.

4.6 Since using the Internet, my students are now working more in groups.

Strongly Agree Agree Not Sure Disagree Strongly Disagree

4.7 Since using the Internet, my students are now undertaking longer projects.

Strongly Agree Agree Not Sure Disagree Strongly Disagree

4.8 Since using the Internet, my students now have more choice over what they learn.

Strongly Agree Agree Not Sure Disagree Strongly Disagree

4.9 Since using the Internet, my students are now studying more real-world problems.

Strongly Agree Agree Not Sure Disagree Strongly Disagree

4.10 Has the advent of the Internet changed your teaching philosophy? Yes ☐ No ☐

4.11 If yes, briefly explain the type of changes that have taken place? _____

_____

_____

_____

4.12 How would you rate your knowledge of contemporary learning theory?

☐ Excellent ☐ Very Good ☐ Good ☐ Adequate ☐ Poor

4.13 How would you rate your knowledge of learning and teaching in relation to the Internet?

☐ Excellent ☐ Very Good ☐ Good ☐ Adequate ☐ Poor

4.14 How would you rate your level of confidence at using the Internet for learning and teaching?

☐ Excellent ☐ Very Good ☐ Good ☐ Adequate ☐ Poor

4.15 Since using the Internet, I have become more creative and inventive in my teaching.

Strongly Agree Agree Not Sure Disagree Strongly Disagree

4.16 Since using the Internet, I have become more critical and reflective about my teaching.

Strongly Agree Agree Not Sure Disagree Strongly Disagree

4.17 Since using the Internet, I use more complex and challenging activities in my teaching.

Strongly Agree Agree Not Sure Disagree Strongly Disagree

4.18 Since using the Internet, I use more authentic and interdisciplinary activities in my teaching.

Strongly Agree Agree Not Sure Disagree Strongly Disagree

4.19 What is the single most significant contribution the Internet has made to your teaching?

_____

_____

_____

4.20 Which one of the following terms best describe your current response to the use of the Internet in education? (please tick only one response)

- ☐ Booster (I am a general proponent of the Internet in education)
- ☐ Doomster (I am a general opponent of the Internet in education)
- ☐ deschooler (I am a strong advocate for using the Internet to reform traditional schools)
- ☐ Critic (I am highly critical of the claims about the Internet's potential to transform school)

4.21 I feel enthusiastic about using the Internet in my teaching.

Strongly Agree Agree Not Sure Disagree Strongly Disagree

4.22 I believe the Internet has positively affected my way of teaching.

Strongly Agree Agree Not Sure Disagree Strongly Disagree

4 23 I find the Internet helps to increase the social interaction between children in my class.

Strongly Agree Agree Not Sure Disagree Strongly Disagree

4.24 I believe the Internet allows for better individualised instruction of children in my class.

Strongly Agree Agree Not Sure Disagree Strongly Disagree

4.25 Do you have any other comments to make about your approach to teaching with the Internet?

_____

_____

_____

_____

5.0 Your Opinion About The Internet

5.1 I think some of the best teachers are not yet using the Internet in their teaching.

Strongly Agree Agree Not Sure Disagree Strongly Disagree

5.2 I think teachers need to be very cautious about using the Internet in education.

Strongly Agree Agree Not Sure Disagree Strongly Disagree

5.3 I believe that students must use the Internet if they are to get good jobs in the future.

Strongly Agree Agree Not Sure Disagree Strongly Disagree

5.4 I believe that teachers must use the Internet for the future success of our knowledge economy.

Strongly Agree Agree Not Sure Disagree Strongly Disagree

5.5 I think that other teachers are a long way behind me in their use of the Internet in education.

Strongly Agree Agree Not Sure Disagree Strongly Disagree

5.6 I think the priority being given to Internet is at the expense of other educational innovations.

Strongly Agree Agree Not Sure Disagree Strongly Disagree

5.7 I think the priority being given to the Internet is at the expense of other computer applications.

Strongly Agree Agree Not Sure Disagree Strongly Disagree

5.8 I find that boys tend to dominate the Internet learning experiences in my class.

Strongly Agree Agree Not Sure Disagree Strongly Disagree

5.9 Rank the following computer applications in order of their educational value. That is, place **1** beside the application or software that you consider most valuable, **2** beside the next most valuable, and so forth.

☐	DATABASE PROGRAMS	ELECTRONIC MAIL	☐
☐	WORLD WIDE WEB	INTERACTIVE FICTION	☐
☐	EDUCATIONAL GAMES	WORD PROCESSING	☐
☐	LOGO PROGRAMMING	DRILL & PRACTICE SOFTWARE	☐

(Please do not use the same number more than once)

5.10 I believe the ICT Strategy for New Zealand schools has been very effective.

Strongly Agree Agree Not Sure Disagree Strongly Disagree

5.11 I have found Te Kete Ipurangi (TKI) to be a very effective online resource for my teaching.

Strongly Agree Agree Not Sure Disagree Strongly Disagree

5.12 I believe that all teachers should be required to meet a basic set of ICT competency standards.

Strongly Agree Agree Not Sure Disagree Strongly Disagree

5.13 I believe that all students should be required to meet a basic set of ICT competency standards.

Strongly Agree Agree Not Sure Disagree Strongly Disagree

5.14 Rank the eight following types of Internet activities in order of their educational value. That is, place **1** beside the activity you consider to have most educational valuable, **2** beside the next most valuable and so forth.

- ☐ To support key pal exchanges between children
- ☐ To access up-to-date information on a current topic
- ☐ To experience a virtual field trip to another country
- ☐ To participate in an online challenge or Internet adventure
- ☐ To investigate problems and share findings with a wider audience
- ☐ To connect with an expert and/or ask questions of an electronic guest
- ☐ To build and construct web pages about the school or local community
- ☐ To acquire new insights by becoming a member of online learning community

(Please do not use the same number more than once)

5.15 Rank from the list below, the <u>five</u> main barriers that inhibit the Internet being effectively used for learning and teaching. That is, place **1** beside the barrier you consider most significant, **2** beside the next most significant, and so forth.

- ☐ Cost of equipment
- ☐ Lack of teacher time
- ☐ Obsolete technology
- ☐ Lack of teacher interest
- ☐ Availability of equipment
- ☐ Teacher knowledge of equipment
- ☐ Teacher understanding about value of use
- ☐ Cost and availability of technical support
- ☐ Principal and BOT understanding about value of use
- ☐ Teacher knowledge and philosophy about good teaching

(Please do not use the same number more than once)

5.16 Do you have any comments to make about the main barriers to the effective use of the Internet in education?

_____

_____

_____

_____

5.17 Rank the six following reasons for children using the Internet in New Zealand schools in order of their educational significance. That is, place **1** beside the reason you consider most important, **2** beside the next most important, and so forth.

☐	To develop children's basic skills and computer literacy.	To develop children's thinking and problem solving skills.	☐
☐	To give children more responsibility and control over their own learning.	To develop skills useful for future jobs and meet parent expectations	☐
☐	To support the individualised and more personal instruction of children.	To develop social skills for collaboration and working with others.	☐

(Please do not use the same number more than once)

6.0 Additional Information

6.1 Are you be prepared to be interviewed in order to collect further information? ☐ Yes ☐ No

6.2 Do you have any other comments you wish to make about using the Internet in schools?

_____

_____

_____

_____

_____

_____

_____

When you have completed the questionnaire, please return it in the stamped, addressed envelope and returned to:

Mark E. Brown
Department of Learning and Teaching
Massey University
Private Bag 11 222
Palmerston North.

THANK YOU VERY MUCH FOR YOUR COOPERATION

[Letterhead]

[Name]
[School]
[Address]
[Location]

15 June, 2000

Dear Principal

I am writing to seek your further assistance with my research on Internet use in New Zealand primary and intermediate schools. This research seeks to study teachers in your region who are considered proficient, accomplished and experienced in their use of the Internet for learning and teaching.

Earlier in the year, you allowed one or more teachers in your school to complete a questionnaire on their use of the Internet for learning and teaching. I would now like your permission to contact the same teacher(s) inviting them to participate in a follow up interview, which gathers more detailed information on the ways in which they are using the Internet for educational purposes.

The study of these teachers aims to provide valuable information on the conditions and factors that are important in the design of successful internet-based learning experiences in schools. It is hoped that the research findings will help teachers, principals and Boards of Trustees to make more informed decisions about the role of the Internet in their school.

I guarantee that neither the teacher nor your school will be identified in any report of the study. The attached Information Sheet provides more details about the identity of the researcher, nature and purpose of the study, issues relating to anonymity, confidentiality and the rights of the research participants. Please read this information carefully.

I am committed to making this study as valuable as possible. I trust that you will see the value of the research and that you have no objection to your staff participating in the study. If you do not wish to participate or have questions concerning the research, please contact me as soon as possible.

I can be contacted at Massey University, College of Education, telephone 356 9099, extension 8626. If I do not hear back from you by **30th June** then I will assume that you have no objection to me contacting the teachers concerned. Of course, the teachers can then decide for themselves whether they wish to participate in the interview phase of this study.

Thank you for your co-operation. As already indicated an executive summary of the results will be available on request at the end of the study.

Regards

Mark E Brown

[LETTERHEAD]

[Name]
[School]
[Address]
[Location]

30 June, 2000

Dear [Name]

I am writing to formally invite you to participate in the second part of Phase Two—that is, the follow up interview. A month or so ago you indicated on your questionnaire response that you would be willing to participate in a face-to-face interview. You are under no obligation to do so but the interview will give me the opportunity to gather the type of rich information not possible through a written questionnaire.

I will contact you by telephone in the next couple of weeks to check that you are still agreeable to the interview and, if so, to arrange a suitable time and venue for the interview to take place. The precise nature of the study will be explained to you prior to the interview and your written informed consent will also be obtained at this time. In other words, you are still free to withdraw from the interview even if you agree to meet with me.

I anticipate the interview will require between 30 and 60 minutes of your time. The interview will be taped with your permission and these tapes will be stored in a locked cabinet until they are transcribed. The researcher will transcribe the tapes personally. A copy of the interview transcript will be provided for you to check and you will be free to request changes as you would like. The interview tapes will then be destroyed once the transcripts have been validated.

The Internet is still very new in schools and there is a lot we can learn from your early experience. As I have already mentioned, the study aims to provide valuable information on the conditions and factors that are important in the design of internet-based learning experiences. I hope that the research findings will help other teachers, principals and Boards of Trustees to make more informed decisions about the role of the Internet in their school.

Thank you for your co-operation. I really value your support, as the research would not be possible without your participation.

Yours sincerely

Mark E. Brown

[Letterhead]

[Name]
[School]
[Address]
[Location]

3 July, 2000

Dear Principal

I am writing to let you know that I will be shortly contacting at least one of your staff to seek their permission to participate in the interview phase of my research on Internet use in New Zealand primary and intermediate schools.

Last month, I wrote to you seeking your approval to contact one or more of your staff and since I have not heard back from you it would appear that you have no objection to me contacting the teachers concerned. If you do not wish them to participate in this study or have questions concerning the research, please contact me as soon as possible.

I can be contacted at Massey University, College of Education, telephone 356 9099, extension 8626.

Thank you for your co-operation.

Regards

Mark E Brown

[Letterhead]

Wired Schools: A Study of Internet-Using Teachers

INTERVIEW CONSENT FORM – Phase Two

I have read the Information Sheet for this phase of the study and I have had the procedures of the research explained to me. I am satisfied that I have been fully informed about the nature and purpose of the study. My questions have been fully answered to my satisfaction. I therefore agree to participate to an interview on the condition that:

- All the information I provide remains confidential to the researcher.
- No information which may identify me or my school is published or referred to in any presentations or reports that are prepared from the study.
- I can refuse to answer any particular questions and I understand that I am free to withdraw from the study at any time.
- I can ask further questions about the study at any time during my participation.
- I agree / do not agree [DELETE ONE] to the interview being taped. I also understand that I have the right to ask for the tape to be turned off at any time during the interview.
- I understand that I will be given a copy of the interview transcript to check and that all data will be either destroyed or returned to me on completion of the study.
- I will be sent an executive summary of the results when the study is finally completed.

I formally agree to participate in the study under the conditions set out on the Information Sheet.

_____

PARTICIPANT'S SIGNATURE

_____

PARTICIPANT'S NAME

_____

DATE

Wired Schools: A Study of Internet-Using Teachers

INTERVIEW SCHEDULE– Phase Two

Code: _____

Date: _____

Time: _____

Consent: _____

Tape No: _____

Introduction:

I would like to start the interview by giving you the chance to elaborate on some of the answers that you have already provided in the second questionnaire. I have the questionnaire that you returned with me (hand completed questionnaire to participant). Please feel free to discuss any matter that you think is important in relation to using the Internet for educational purposes (wait for response). Are there any questions that you think I should have asked but did not in the questionnaire (wait for response). Then go to explore interview themes...

Interview Themes

The following themes act as only a guide. Remember the aim is to give the locus of control to the interviewee rather than yourself.

1. The use of the Internet to support learning and teaching.

   Tell me about how you use the Internet for learning and teaching...

2. Beliefs about learning and teaching processes.

   Tell me about what you believe about the learning and teaching process ...

3. Beliefs about how the Internet supports learning and teaching processes.

   Tell me about how you believe the Internet supports learning and teaching...

4. Changes to teaching practice as a result of using the Internet for educational purposes.

   Tell me about the changes that have taken place to your teaching...

5. Factors that inhibit and/or enable the use of the Internet in schools.

   Tell me about the factors that inhibit and/or enable the use of the Internet...

[LETTERHEAD]

[Name]
[Address]
[Location]

[Date]

Dear [Name]

I am writing to thank you for the time you spent in your recent interview for the study I am doing on Internet use in New Zealand primary and intermediate schools. I am very grateful for the information you shared with me and for the insight I have gained from your experience on the adoption and implementation of information and communication technology (ICT) in New Zealand schools. I particularly value the information that you provided as it has added another dimension to the study of Internet use beyond the questionnaire responses. Your interview data will be treated as confidential and the information will only be accessible to those immediately involved in the research.

I now have the job of transcribing the interviews. This is a time consuming task and I will send you a copy of the interview transcript in the next couple of months once this work is complete. I would like you to check the transcript and indicate on the transcript itself any changes you would like me to make. The interview tapes will then be destroyed once the transcripts have been validated by the research participants.

In the final stage of the study, I will contact a small number of experienced internet-using teachers for even more in-depth investigation. This will involve another interview along with a case study of the experiences, perceptions and practices of no more than five teachers. You are not obliged to participate in any further aspects of the research but your participation thus far has been crucial in contributing to the success of the study.

Thank you again [Name] for your co-operation. If I can help in the future on any matter related to the use of Internet in your school, please do not hesitate to contact me.

Best wishes

Mark E. Brown

[LETTERHEAD]

[Name]
[Address]
[Location]

[Date]

Dear Principal

I am writing to thank you for allowing me to recently interview one of your staff for the study I am doing on Internet use in New Zealand primary and intermediate schools. I am very grateful for the information shared with me on the use of the Internet in your school. The interview has provided me with a rich insight into the adoption and implementation of information and communication technology (ICT) by teachers beyond the questionnaire responses. I promise that the interview data will be treated as confidential and the information will only be accessible to those immediately involved in the research.

Thank you again for your co-operation. If I can help in the future on any matter related to the use of Internet in your school, please do not hesitate to contact me.

Regards

Mark E. Brown

[LETTERHEAD]

[Name]
[Address]
[Location]

[Date]

Dear [Name]

I trust all is well and you are looking forward to the end of the year.

It has now been several months since I interviewed you for the study I am doing on Internet use in New Zealand primary and intermediate schools. I have now completed transcribing your interview and this letter invites you to check the attached transcript for mistakes. It asks you to confirm that what is written is an accurate account of the questions and responses discussed during the interview. You are also free to make changes to the transcript and expand upon your views by either writing on the transcript itself or ruling a line through any relevant comments.

Could you please complete, sign and then return in the stamped addressed envelope the transcript cover sheet noting any of the changes you would like me to make. If you return the transcript to me with requested changes a revised copy will be sent to you in due course. The interview tapes will then be destroyed once the transcripts have been validated by this process.

Thank you again [Name] for your co-operation.

Best wishes

Mark E. Brown

[Letterhead]

Wired Schools: A Study of Internet-Using Teachers

INTERVIEW TRANSCRIPT – Phase Two

I confirm that what is recorded on the transcript is an accurate account of the questions and responses discussed during the interview. I am satisfied that my questions have been fully answered to my satisfaction and that I have been given the opportunity to make changes to the transcript as I deem appropriate.

- ☐ The transcript is free of mistakes and is acceptable in its present format.
- ☐ The transcript contains minor mistakes but there are no substantial changes.
- ☐ The transcript requires a number of changes to my original interview response.

Please return this form in the stamped return addressed envelope.

_____

PARTICIPANT'S SIGNATURE

_____

PARTICIPANT'S NAME

_____

DATE

APPENDIX D

Phase Three:
Experienced Internet-using Teachers

[Letterhead]

[Name]
[Address]
[Location]

6 November, 2000

Dear [Name]

I am writing to let you know that I have nearly completed Phase Two of my PhD research on Internet use in New Zealand schools. The research investigates a purposive sample of nominated proficient, accomplished and experienced internet-using teachers. You may recall the main research objective is to investigate how teachers believe the Internet has affected learning and teaching—for better and worse. A multi-dimensional research framework is being adopted over three phases utilizing both qualitative and quantitative data sources.

Earlier in the year, as a member of my Research Advisory Group, you helped with the sample selection process for Phase Two. I would now like to request your assistance with the final phase of the study. This phase seeks to identify a refined sample of experienced internet-using teachers for further in-depth investigation. At the moment, I am in the process of analyzing the questionnaire and interview responses from Phase Two. So, this letter is an advanced organiser to let you know that I will be calling a meeting of the Research Advisory Group before Christmas to review the results and select the sample for Phase Three (see the attached criteria).

I will telephone you in the next week or so to arrange a mutually convenient time and venue for the meeting. I hope this meeting will not involve too much of your time as I know that this is a very busy time of year. The purpose of the meeting is to review the selection criteria and then select a handful of teachers suitable for further study.

I look forward to your further contribution in the selection of the experienced internet-using teachers for this phase of the research.

Best wishes

Mark E. Brown

Wired Schools: A Study of Internet-Using Teachers

SELECTION CRITERIA – Phase Three

The following core principles underpin the selection of "experienced" internet-using teachers for this phase of the study. Teachers will:

1. Have a critical philosophy of education anchored by a strong sense of social justice.
2. Have a lot of knowledge acquired through a blend of theory, research and practical experience.
3. Have a disposition toward innovation, risk taking and the promotion of active and meaningful learning across the curriculum.
4. Demonstrate a strong commitment toward critical self-reflection supported by their school culture and professional relationships.

Above all, the experienced internet-using teachers will be "trusted" and "learned" professionals with a critical understanding of pedagogy. These two concepts and the core principles will once again be explained in more detail by the researcher. At a practical level, it is proposed that the above principles are operationalised through the following selection criteria:

(i) The teacher has at least five years teaching experience.

(ii) The teacher has at least two years teaching experience with the Internet.

(iii) The teacher has good access to the Internet in their classroom and/or school.

(iv) The teacher makes use of the Internet in their classroom and/or school most weeks of the year.

(v) The teacher makes use of more than one Internet application and/or Internet-related classroom activity most school terms.

(vi) The teacher is very knowledgeable about learning, teaching and the wider socio-political factors that influence the educative process.

(vii) The teacher is very well-informed about recent developments pertaining to the use of ICT and the Internet in New Zealand schools.

(viii) The teacher has a sound understanding of the different ways that computers can be used across the curriculum and advanced skill, knowledge and experience at using the Internet for learning and teaching.

(ix) The teacher is highly articulate in explaining their reasons for making use (or not) of the Internet and can identify, with examples, the opportunities new educational technologies provide for better learning and teaching.

(x) The teacher is innovative and very confident about their ability to use computers in the classroom and perceives there is a wide level of support from colleagues and their school for using the Internet for educational purposes.

(xi) The teacher adopts a deep and critically reflective approach toward their pedagogy and demonstrates a high level of analysis when discussing positive and negative changes to their teaching practice framed by a strong sense of social justice.

(xii) The teacher has an intrinsic commitment toward becoming a better educator and is either participating in some type of ICT professional development or has completed an advanced educational qualification in this area.

The criteria are intended to be as inclusive as possible but overall this phase of the study aims to study experienced teachers with a critical orientation towards the use of the Internet in schools.

Wired Schools: A Study of Internet-Using Teachers

SAMPLE SELECTION – Phase Three

Research Advisory Group Meeting

(6:30pm 14th December, 2000)

AGENDA

1. Introduction
2. Update on Progress
3. Review of Selection Criteria
4. Preliminary Analysis of Questionnaire and Interview Responses
5. Selection of Experienced Internet-Using Teachers
6. AOB

[Letterhead]

[Name]
[Address]
[Location]

19 December, 2000

Dear [Name]

I writing to thank you for your time and effort in helping me to select the experienced internet-using teachers for further study. I truly value your membership on my Research Advisory Group and I am grateful for the professionalism you displayed in the selection process. I apologize that the meeting took longer than anticipated but I very feel confident about the integrity of the selection process. Indeed, I am delighted with the sample we have selected for further study.

I am committed to making the study as valuable as possible and you have been a great to me in this regard. I hope that I can collect important information on how these experienced teachers believe the Internet has affected learning and teaching—for better and worse. The research should help to uncover some of the conditions and factors important if teachers are to effectively use the Internet for educational purposes.

I will send you an executive summary of the results once I have completed the study. Bear in mind it may take me another year or so to fully analyze and document the results.

Warm regards

Mark E Brown

[LETTERHEAD]

[Name]
[School]
[Address]
[Location]

5 February, 2001

Dear [Name]

I am writing to let you know that I would like you to participate in Phase Three of my research on Internet use in New Zealand primary and intermediate schools. As you already know, this research is designed to study a special group of teachers who have been selected as proficient, accomplished or experienced in their use of the Internet for learning and teaching.

The study aims to provide valuable information on the conditions and factors that are important in the design of internet-based learning experiences. It is hoped that the research findings will help other teachers, principals and Boards of Trustees to make more informed decisions about the role of the Internet in their school.

You have been selected [Name] from the responses in Phase Two as an experienced teacher suitable for participation in the final phase of the study. This phase aims to collect even more detailed information on your Internet use for educational purposes by way of an in-depth case study. The Internet is still very new in schools and there is a lot we can learn from your wealth of professional experience.

This letter is not yet a formal request for you to participate in the study, as initially I will need to contact your principal to obtain their informed consent. However, I will telephone you in the next week or so to check whether you are still willing to be involved and that you are happy for me to contact the school principal. The case study and biographical narrative phase will involve informal discussions and the researcher observing your teaching practice at different times over a period of one week in the second school term. It will also require you to write a brief personal story of your teaching experience and may involve a number of follow up discussions over the preceding months to clarify points of interest.

There is a separate Information Sheet attached to this letter that outlines the identity of the researcher, nature and purpose of the study, issues relating to anonymity, confidentiality and your rights as a research participant. Please read this information carefully before I contact you next week. I will be happy to answer your questions. Beyond the PhD dissertation, the results will be disseminated through appropriate presentations and academic publications in both research and practitioner journals.

If you accept the informal invitation over the phone, you are still under no obligation to participate in the case study phase. Once I have the written permission from the principal, a formal consent process will be undertaken in which the precise nature of the study and full implications of your participation will be explained. You will then be in a better position to decide whether you wish to participate.

Thank you for your co-operation. I continue to value your support as the research would not be possible without your participation.

Warm regards

Mark E. Brown

[Letterhead]

[Name]
[School]
[Address]
[Location]

19 February, 2001

Dear [Name]

I am writing to seek your further assistance with the final phase of my research on Internet use in New Zealand primary and intermediate schools. You may recall this research seeks to study teachers in your region considered proficient, accomplished and experienced in their use of the Internet for learning and teaching.

One teacher from your school has been selected from their previous questionnaire and interview responses as suitable for participation in the final phase of the study. This phase endeavours to obtain in-depth information on their use of the Internet for educational purposes through a case study. The case study and biographical narrative phase will involve the researcher observing and interviewing the teacher concerned at different times over a period of one week in the second school term. It will also require teachers to write a brief personal story of their teaching experience and may involve a number of follow up discussions over the preceding months to clarify points of interest.

I guarantee that neither the teacher nor your school will be identified in any report of the study. Beyond the PhD dissertation, the study may be disseminated through appropriate presentations and academic publications in both research and practitioner journals. There is a separate Information Sheet attached to this letter that outlines the identity of the researcher, nature and purpose of the study, issues relating to anonymity, confidentiality and your rights as a school and those of the research participants. Please read this information carefully before allowing me to contact [Name1] to see if he/she is willing to participate in this study.

I will contact you by telephone in the next week or so to further explain the research and answer any questions you may have. Once you have considered my request, if you are willing for me to contact [Name1] then I would be grateful if you would sign and complete the enclosed formal consent form. Bear in mind that [Name1] will then be given the opportunity to decide whether or not they wish to participate in the case study. They are under no obligation to do so.

Once again, I am committed to making this study as valuable as possible. I trust that you will see the value of the research and that you have no objection to one of your staff participating in the study. The Internet is still very new in schools and there is a lot we can learn from experienced teachers.

Thank you for your co-operation.

Yours Sincerely

Mark E Brown

[LETTERHEAD]

Wired Schools: A Study of Internet-Using Teachers

INFORMATION SHEET – Phase Three

1. Identity of the Researcher:

Mark E. Brown (Lecturer, Department of Learning and Teaching).

This research is part of Mark's Doctoral Study (PhD) at Massey University. If you have any questions about the research please do not hesitate to contact Mark and/or one of his research supervisors.

2. Identity of the Supervisors:

Associate Professor Ken Ryba (Chief Supervisor)
Professor William Tunmer (Second Supervisor)

3. Contact Information:

The Researcher and/or Supervisors can be contacted at the following address:

Massey University		
College of Education	Mark Brown:	Telephone (06) 356 9099, Extension 8626
Private Bag 11 222	Dr Ken Ryba:	Telephone (06) 356 9099, Extension 9606
Palmerston North	Prof William Tunmer:	Telephone (06) 356 9099, Extension 8962

4. The Nature and Purpose of the Study:

The objective of this study is to investigate how teachers believe the Internet has affected learning and teaching—for better and worse. The research aims to document the experiences, perceptions and practices of a sample of nominated proficient, accomplished and experienced internet-using teachers to collect valuable information on the conditions and factors important if teachers are to effectively use the Internet for educational purposes.

There are three phases to the research and this final phase—the participation in a case study and biographical narrative—involves a refined sample of three experienced internet-using teachers. The purpose of this phase is to gather in-depth information on the way teachers are using the Internet for educational purposes.

5. Your Involvement and Time Commitment:

Teachers were identified originally as suitable for participation in this study through a nomination process. In Phase Two of the study, a refined sample of accomplished internet-using teachers was invited to participate based on their questionnaire responses. The sample for Phase Three was selected with the help of a Research Advisory Group drawing on both previous questionnaire and interview responses. If you and your school agree to participate in the case study and biographical narrative phase it will involve the researcher observing and interviewing the participants concerned at different times over a period of one week in the second school term. The case study will involve a number of data collection techniques including a brief questionnaire and the use of archival information from the classroom. It will also involve the participants writing a brief personal story of their teaching experience and a number of follow up discussions over the preceding months to clarify points of interest.

6. What you can Expect of the Researcher:

The information that you provide will be treated as confidential and will only be accessible to those immediately involved in the research. All research data will be kept secure and the researcher will take all reasonable steps to protect your identity. The main risk associated with your participation in this research relates to your anonymity. While no teacher or school will be directly identified in the research findings, it is impossible to guarantee absolute anonymity. The researcher can only give an assurance of anonymity based on a personal guarantee and to the extent allowed by law. In addition to these assurances, the researcher will:

- Attempt to honestly represent the participants' experiences, perceptions and practices.
- Explain all procedures throughout the research process and obtain informed consent at each phase of the study.
- Endeavour to treat all participants in an open, courteous and respectful manner throughout the study.
- Not collect data from children and gather information in an unobtrusive manner as possible causing the least disturbance to the regular classroom programme.
- Not remove any documents from the school or copy these without the participant's prior permission.
- Store all data in a locked cabinet or password protected electronic folder and will either destroy or return all information gathered throughout the research process.
- Provide participants with an executive summary of the results or make this available to those involved on request.

7. The Rights of the Participants:

You are under no obligation to participate in the final phase. If you do agree to take part in this phase, the purpose of the case study and biographical narrative will be fully discussed with you prior to the research commencing itself. In addition, you have the right to:

- Ask further questions about the study arising from your participation.
- Decline to answer any particular question(s) and are free to withdraw from the study at any time.
- Expect that no other teacher will be involved in the study without having given their informed consent. All participation is entirely voluntary.
- Provide information on the understanding that it will be treated as completely confidential to the researcher and it will not be possible to identify you, your school or any of the other teachers in the dissemination of the results.
- Be given access to an executive summary of the research findings when the study is completed.

This research abides by the regulations in the Handbook for Doctoral Study and the Code of Ethical Conduct for Teaching and Research Involving Human Subjects at Massey University. If you have any concerns or further questions about the study please do not hesitate to contact the researcher and/or one of the research supervisors.

Thank You Very Much For Your Time
And Help In Making This Study Possible

[Letterhead]

Wired Schools: A Study of Internet-Using Teachers

PRINCIPAL CONSENT FORM – Phase Three

I have read the Information Sheet for this phase of the study and I have had the procedures of the research explained to me. I am satisfied that I have been fully informed about the nature and purpose of the study. My questions have been fully answered to my satisfaction. I therefore agree to [SchoolName] participating in the study and give you permission to contact [Name] on the condition that:

- All the information provided remains confidential to the researcher.
- No information that may identify the school or the teacher is published or referred to in any reports or presentations that are prepared from the study.
- We can refuse to answer any particular questions and I understand that the school is free to withdraw from the study at any time.
- We can ask further questions about the study at any time during our participation.
- No documents or archival information will be removed from the school or copied without prior permission.
- Interviews and research notes may be taped but we have the right to ask for the tape recorder to be turned off at any time.
- No data will be collected from children and information will be gathered in an unobtrusive manner as possible causing the least disturbance to the regular classroom programme.
- All data will be stored in a locked cabinet or password protected electronic folder and will either be destroyed or returned to the school/teacher on completion of the study.
- We will be sent an executive summary of the results when the study is finally completed.

I formally agree to [Schoolname] participate in the study under the conditions set out on the Information Sheet.

_____ _____

PRINCIPAL'S SIGNATURE PRINCIPAL'S NAME

DATE _____

[Letterhead]

Wired Schools: A Study of Internet-Using Teachers

TEACHER CONSENT FORM – Phase Three

I have read the Information Sheet for this phase of the study and I have had the procedures of the research explained to me. I am satisfied that I have been fully informed about the nature and purpose of the study. My questions have been fully answered to my satisfaction. I [Name] therefore agree to participating in the study on the condition that:

- All the information provided remains confidential to the researcher.
- No information that may identify the school or the teacher is published or referred to in any reports or presentations that are prepared from the study.
- I can refuse to answer any particular questions and I understand that the school is free to withdraw from the study at any time.
- I can ask further questions about the study at any time during our participation.
- No documents or archival information will be removed from the school or copied without my permission.
- No data will be collected from children and information will be gathered in an unobtrusive manner as possible causing the least disturbance to the regular classroom programme.
- I agree / do not agree [DELETE ONE] to interviews and research notes being taped and I have the right to ask for the tape recorder to be turned off at any time.
- All data will be stored in a locked cabinet or password protected electronic folder and will either be destroyed or returned to me on completion of the study.
- I will be sent an executive summary of the results when the study is finally completed.

I formally agree to participate in the study under the conditions set out on the Information Sheet.

_____ _____

TEACHER'S SIGNATURE TEACHER'S NAME

_____

DATE

Wired Schools: A Study of Internet-Using Teachers

RESEARCH PROTOCOL – Phase Three

1. Research Objective:

To investigate how teachers believe the Internet has affected learning and teaching—for better and worse.

2. Research Questions:

i) What are the background characteristics of internet-using teachers?

ii) How do teachers use the Internet for learning and teaching?

iii) What perceptions and beliefs do internet-using teachers have about the learning and teaching process?

iv) What changes to their practice and work culture do teachers report from using the Internet for learning and teaching?

v) What perceptions and beliefs do teachers have of how the Internet supports the learning and teaching process?

vi) What factors do teachers believe inhibit and/or enable the use of the Internet for learning and teaching?

3. Specific Research Techniques:

i) Biographical Interview Schedule

ii) Participant Observation

iii) Research Diary

iv) Self-Reflection Memos

v) Documentation Schedule

vi) ICT Capability Schedule

vii) Teacher Interview Schedule

viii) Autobiographic Schedule

4. Research Plan:

i) Pilot research techniques

ii) Write letter to school principal followed by telephone call

iii) Write letter to internet-using teacher followed by telephone call

iv) Obtain formal written consent from both the principal and teacher

iii) Conduct biographical interview before fieldwork commences

v) Commence participant-observation (days 1-5) as appropriate

vi) Record noteworthy observations in research diary and as electronic memos

vii) Informally converse with teacher about their Internet use

viii) Source archival data following the Documentation Schedule

ix) Collect data on teachers' personal ICT skills using ICT Capability Schedule

x) Conduct post-observation interview

xi) Explain requirements of personal story as per Autobiographic Schedule

xii) Assist with preparation of autobiographical story

xiii) Send letter of thanks to both the principal and teacher

5. Note Additional Requirements

Wired Schools: A Study of Internet-Using Teachers

BIOGRAPHICAL INTERVIEW SCHEDULE– Phase Three

Code: _____

Date: _____

Time: _____

Consent: _____

Tape No: _____

Introduction:

I would like to start the interview by giving you the chance to elaborate on some of the answers that you provided in the previous interview. I have the interview transcript with me (hand to participant) and I would be interested to hear your thoughts since the last interview. Please feel free to raise any matter that you think is important in relation to using the Internet for educational purposes (wait for response). Are there any questions that you think I should have asked but did not in the previous interview (wait for response). Then go to explore interview themes...

Interview Themes

The following themes act as only a guide. Remember the aim is to give the locus of control to the interviewee rather than yourself.

1. Why I became a teacher.

   Tell me about why you became a teacher...

2. What teaching means to me.

   Tell me about what teaching means to you...

3. What the Internet means to me.

   Tell me about what the Internet means to you...

4. How my teaching and use of educational technology has changed over the years.

   Tell me about how your teaching and use of technology has changed...

5. The most significant effects of Internet use—both good and bad.

   Tell me about the most significant effects of the Internet...

Wired Schools: A Study of Internet-Using Teachers

AUTOBIOGRAPHICAL SCHEDULE– Phase Three

Introduction:

The purpose of the autobiographical story is to give you the opportunity to tell their own story in your own words. By taking the time to think about your responses, I hope that you will provide me with a much better insight into your teaching experience and your use of new educational technology over your teaching career. In the past, the teachers' voice has often been missing from discussions relating to the adoption and implementation of ICT in schools. This is your chance to have a say! There are no right or wrong answers and you are free to respond as you think appropriate. The following questions are designed to simply get you started and you can interpret these and go beyond them in whatever way you like. I look forward to reading your personal story.

My Personal Story

This task invites you to write a brief personal story or collection of short vignettes reflecting on crucial moments and defining experiences in your teaching career. I would like you to share some of the important experiences that have helped to shape your approach to teaching and your use of educational technology. The following questions act as a guide only:

i) What have been some of the crucial moments or defining experiences in shaping your identity as a teacher?

ii) What have been some of the crucial moments or defining experiences in shaping your use of educational technology for learning and teaching?

iii) What key event, person or single incident has most significantly changed or contributed to your understanding of educational technology in the learning and teaching process?

iv) What impact or contribution has the growth of the Internet had on your life and how is it influencing your work as a teacher -- for better and worse?

v) What lessons or guiding principles have you learnt over the years about the role of new educational technologies in the learning and teaching process?

I am mindful that this yet another request on your time. Therefore, you are free to take as long as you like but it would be helpful if your completed story could be returned within the next month or so. Please return in the stamped address envelope provided for this purpose. Please do not hesitate to contact me if you have nay questions or require further assistance with this task. Many thanks.

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RESEARCH DIARY – Phase Three

Day: _____ Code: _____

1. The Teacher

Questions to Follow Up:

Wired Schools: A Study of Internet-Using Teachers

RESEARCH DIARY – Phase Three

Day: _____ Code: _____

1. The School

Questions to Follow Up:

Wired Schools: A Study of Internet-Using Teachers

RESEARCH DIARY – Phase Three

Day: _____ Code: _____

1. The Students

Questions to Follow Up:

Wired Schools: A Study of Internet-Using Teachers

RESEARCH DIARY – Phase Three

Day: _____ Code: _____

1. The Internet

Questions to Follow Up:

Wired Schools: A Study of Internet-Using Teachers

RESEARCH DIARY – Phase Three

Day: _____ Code: _____

1. General Observations

Questions to Follow Up:

Wired Schools:
A Study of Internet-Using Teachers

DOCUMENTATION SCHEDULE – Phase Three

The following files, correspondence and archival records will be requested and reviewed during the case study:

1. School ICT Policy
2. Internet Safety Policy
3. Teacher's Daily Work Plan
4. Teacher's Long-Term Plan
5. Software Packages Available in the Classroom
6. Internet Sites Accessed and Stored as Favourites
7. Wall Charts and Classroom Displays
8. Lesson Plans and Work Samples
9. Misc Computer Files and Documents
10. Professional Development Materials

Wired Schools: A Study of Internet-Using Teachers

ICT CAPABILITY SCHEDULE

Instructions

I would like to remind you that filling in this ICT Capability Schedule implies consent. You have the right to decline to answer any particular questions and are free to withdraw from the study. The information that you provide will be treated as confidential and the researcher will take all reasonable steps to protect your identity. It is impossible, however, to guarantee *absolute* anonymity. The attached Information Sheet explains the purpose of the research and the rights and risks associated with your participation.

This questionnaire is intended to tell me what you can do. Please read and/or listen to each question carefully and respond accordingly. Where appropriate tick the box or provide a short answer in the space provided. The capability questionnaire should take about 10 minutes to complete. Please answer the questions as accurately as possible. The value of this instrument is highly dependent upon the quality of the information that you provide.

==========

1.0 Basic Computer Operations

1.1 How would you describe your ability to use a computer?

☐ Beginner ☐ Adequate ☐ Proficient ☐ Accomplished ☐ Expert

I can... (tick the box if you can do the relevant operation)

- ☐ 1.2 Start up and close down a computer properly.
- ☐ 1.3 Name, save, retrieve and revise a document and/or folder.
- ☐ 1.4 Open and work with more than one application at the same time.
- ☐ 1.5 Insert and eject disks (floppy and ZIP) and CD-ROMs.
- ☐ 1.6 Copy documents and/or files from one disk to another.
- ☐ 1.7 Organise files or icons in folders on the hard drive or disk (floppy or ZIP).
- ☐ 1.8 Adjust and use the printing options available to the computer.

2.0 Word Processing

2.1 How would you describe your ability to use a word processor?

☐ Beginner ☐ Adequate ☐ Proficient ☐ Accomplished ☐ Expert

I can... (tick the box if you can do the relevant operation)

- ☐ 2.2 Enter and edit text as appropriate.
- ☐ 2.3 Copy, paste and move block(s) of text.
- ☐ 2.4 Change text style and document format as appropriate.
- ☐ 2.5 Use the grammar, spell-check and thesaurus functions.
- ☐ 2.6 Open and insert clip art into word processed documents.

3.0 Database and Spreadsheets

3.1. How would you describe your ability to use a database and/or spreadsheet?

☐ Beginner ☐ Adequate ☐ Proficient ☐ Accomplished ☐ Expert

I can... (tick the box if you can do the relevant operation)

- ☐ 3.2 sort and manipulate information in a database.
- ☐ 3.3 create a new database with multiple fields and records of information.
- ☐ 3.4 enter data in an existing spreadsheet.
- ☐ 3.5 create a simple spreadsheet with rows, columns, formula, and headings.
- ☐ 3.6 create a chart or graph which best represents data.

4.0 Telecommunication Applications

4.1. How would you describe your ability to use the Internet?

☐ Beginner ☐ Adequate ☐ Proficient ☐ Accomplished ☐ Expert

I can... (tick the box if you can do the relevant operation)

- ☐ 4.2 Send and receive electronic mail.
- ☐ 4.3 Attach files and/or documents to an email message.
- ☐ 4.4 Use a Web browser to locate a specific Internet address.
- ☐ 4.5 Use a search engine to locate a specific Internet resource.
- ☐ 4.6 Copy and download information and/or images off the Web.
- ☐ 4.7 Use a Web authoring package to design an Internet homepage.

5.0 Multimedia and Other New Educational Technologies (e.g. TV, VCR, Digital Camera, etc)

5.1. How would you describe your ability to use other media and new educational technologies?

☐ Beginner ☐ Adequate ☐ Proficient ☐ Accomplished ☐ Expert

I can... (tick the box if you can do the relevant operation)

- ☐ 4.2 Operate a TV and video recorder.
- ☐ 4.3 Use a video camera to record original tapes.
- ☐ 4.4 Use a digital camera and transfer images to a computer.
- ☐ 4.5 Use a scanner and then transfer and manipulate images on the computer.
- ☐ 4.6 Design and present a slide show using a computer and beam projector.

6.0 Do you have any other comments you wish to make about your ability to use a computer?

Thank You Very Much For Your Co-operation

Wired Schools: A Study of Internet-Using Teachers

POST OBSERVATION INTERVIEW SCHEDULE

Code: _____

Date: _____

Time: _____

Introduction:

What I would like to do in this final interview is give you the opportunity to reflect on your Internet use over the past week. I will ask some general questions but I would rather hear your views on how the Internet contributes to learning and teaching—for better and worse. Please share any information or make any additional comments that you would like about the use of ICT in education.

Starter Questions:

The following questions are intended as starters only and the interview should be as natural and spontaneous as possible.

1. Was this a typical week using the Internet in the classroom?

2. What, if anything, was different or unusual about the week?

3. What was the highlight of the week's teaching?

4. Was there anything you were not happy with about the week?

5. What would you differently in the future?

6. At the school level, what do you think needs to be done to better support the use of ICT in education?

9. At the national level, what do you think needs to be done to better support the use of ICT in education?

10. Do you have any other comments you would like to make about using ICT or the Internet in schools for educational purposes?

[LETTERHEAD]

[Name]
[Address]
[Location]

[Date]

Dear [Name]

I am writing to sincerely thank you for the opportunity you gave me to spend time in your classroom. I thoroughly enjoyed the experience and I believe that you provided me with invaluable information on how the Internet has affected learning and teaching—for better and worse. I am most grateful for the willingness you showed to participate in the research and I trust that it did not inconvenience you too much. In fact, I hope you found the experience enjoyable and professionally rewarding. The research would not have been possible without your involvement.

It will take me several months to fully document and analyse the results. I may contact you again if I need to clarify any points of interest. Of course, I also look forward to reading your personal story when this is completed. I would like to accurately reflect your "voice" in the presentation of the results and I promise to collaborate with you in the process of compiling the narrative and case study material. As I suggested at the end of the last interview, I propose that we continue to communicate with one another by email as this is the most way of sharing information. Send me an email if you have any questions about the autobiographical story.

In the meantime, I wish you all the best for the remainder of the term.

Best wishes

Mark E Brown

[LETTERHEAD]

[Name]
[Address]
[Location]

[Date]

Dear [Principal]

I am writing to sincerely thank you for the opportunity you gave me to spend time in your school. I thoroughly enjoyed the experience and I believe that I have acquired invaluable information on how the Internet has thus far affected learning and teaching—for better and worse. I am most grateful for the willingness you showed for [Name] to participate in the research and I trust that the study did not inconvenience you too much. The research would not have been possible without your co-operation.

It will take me several months to fully document and analyse the results. I may need to contact [Name] again if I need to clarify any points of interest, as I would like to accurately reflect [his/her] views in the presentation of the results. The final report is still some time away but I promise to provide you with an executive summary of the results once the study is completed.

Thank you again for your co-operation. If I can help in the future on any matter related to the use of Internet in your school, please do not hesitate to contact me.

Regards

Mark E. Brown

[LETTERHEAD]

[Name]
[Address]
[Location]

15 October

Dear [Name]

I am writing once again to formally thank you for the time and effort you spent on my behalf in preparing the autobiographical story. I know this task took much longer than I anticipated and I am extremely grateful that you took the time to refine the original story. The end result is well worth the effort and I am sure that other people will be interested and slightly challenged by what you have to say. You raise some very important points for principals and policy-makers and I will do my best to reflect these in the presentation of the results.

The final report is still some time away but I promise to provide you with an executive summary of the results once the study is completed. As I have said on more than one occasion, the study would not have been possible without your participation. I have thoroughly enjoyed working with you and I hope we can continue to work together in the future. Clearly, we share some important concerns about the future direction of education and the use of educational technology in the current environment.

Thank you again. If I can help in the future on any matter related to the use of ICT or the Internet in your school, please do not hesitate to contact me. I owe you one!

Warm regards

Mark E. Brown