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# **Teachers On-Line:**

**A Survey of Primary School Teachers'  
Perceptions of the Internet**

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Thesis presented in partial fulfilment of the requirements for  
the degree of Master of Education

**Massey University**

1999

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## Abstract

The widespread promotion of the Internet as a medium with the potential to change the nature of education has indicated a need to investigate teachers' impressions of it. This study aimed to describe and analyse primary school teachers' perceptions of the Internet as a resource for teaching and learning. The research questions concentrated on teachers' intentions for use of the Internet in lessons, on factors enhancing and inhibiting the use of the Internet, teachers' roles, and uses of the Internet by teachers who had already begun incorporating it into their lessons.

The study used a two-phase approach, comprised of a questionnaire distributed to all teachers in 18 NetDay 97 schools, followed by personal interviews of six teachers who had used the Internet in lessons. The data was gathered during terms two and three, 1998.

The results indicate that most teachers think that the Internet has potential to enhance teaching and learning. They expect that it will help students learn more, research better, and enjoy learning. Most teachers showed an intention to use the Internet for lessons within the next year or two, but this study suggests caution in accepting this data. Teachers need time to become familiar with the Internet, and time will also be needed to build up a reliable technical base.

The results suggest that teachers wish to make their own decisions about how to utilise the Internet, but at present they have a wide range of experience levels. Many who have not used the Internet for teaching are unsure about several issues related to Internet use. This study proposes that a choice of implementation models be introduced to teachers to give them options for different starting points for using the Internet for teaching and learning, and for improving their own information literacy skills. Four models are described in the report - the Support Model, the Activity Model, the Research Model and the Publishing Model.

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# Chapter One

## Introduction

### 1.1 Introduction

The Internet is now an established part of the worldwide telecommunications system. For many years the Internet has enabled users to use e-mail to send and receive messages by computer. In the 1990's the Internet has become more popular due to the development of the World Wide Web (WWW), an Internet service that enables users to see magazine-like pages held on computers around the world.

The World Wide Web has grown into a massive collection of information, published as millions of files spread across thousands of computers. Many organisations and individuals offer information as a publicity device or as a public service. The information ranges from advertising and government information to education and entertainment. With so much information available, it is understandable that some rather hyped-up descriptions have appeared:

Want access to more information and entertainment than you could ever use in a lifetime? Well, just connect your PC to the Internet and it's all there waiting for you (PC World, 1995, p.61).

Publicity about the Internet has also spread to education. The point-and-click operation of the World Wide Web has prompted claims that the Internet is now simple enough for children to use (Teachers@Work, 1997), and it has been promoted as a valuable resource for schools, both for teachers and for pupils (Sanchez, 1995). Claims have been made that the Internet could contribute to the improvement of education (Spender, 1995), and some authors have predicted that in the future it will change the very nature of education (Tiffin & Rajasingham, 1995). In many countries, including New Zealand, government policy has been in support of the use of information and communications technology (ICT) in schools (Ministry of Education, 1994), and books have been written to help teachers incorporate the Internet into their lessons (Lai, 1996; Haughland & Wright, 1997).

By 1996, 28% of New Zealand primary schools had at least one computer connected to the Internet, either in administration or a classroom, and 56% stated an intention to be

connected by 1998 (Owens, 1996). Newspaper and journal articles described individual classes and Internet projects (Leeuwenberg, 1996), giving the impression that a revolution was under way. NetDay projects, initiatives to involve communities in the networking of their schools, were helping some schools to get connected (Zwimpfer, 1997).

However there was a need to understand teachers' perceptions of the relevance of the Internet to teaching and learning, and how Internet-using teachers were making use of it. Some users were identifying shortcomings of the Internet and difficulties in implementing its use in a teaching/learning situation (Beadle, 1996), and reports appeared claiming that few teachers were using the Internet (Evening Post, 1998). Perhaps there was a danger that the Internet was being imposed on teachers rather than chosen by them as a resource for teaching and learning needs.

Earlier technological innovations, such as film, radio, television, and video, had disappointing results in education (Cuban, 1986). The first generation of computer usage in schools that began in the 1980s also failed to reach the potential that had been envisaged (Collis, 1996). Many factors have been identified as contributing to these innovations failing to be effective – such as the high cost of equipment, rapid obsolescence, complexity of operation, and insufficient training (Gawith, 1995). But central to the process of uptake of a new technology is the perception of potential adopters that it meets a need they have identified (Rogers, 1995). Teachers' opinions and perceptions of educational technologies have been largely overlooked in research and in the application of innovation diffusion theory to education.

This study makes a start to the process of gathering teachers' views about the Internet, and hearing the experiences of those who have already used it in their lessons.

## **1.2 Overview of this Study**

This study aims to determine primary school teachers' perceptions of the Internet as a resource for teaching and learning, and their intentions for using it. It will also record the ways that the Internet has already been used by some teachers, including teachers' perceptions of their roles in the classroom while this was taking place.

### **1.3 Summary**

This chapter has outlined the Internet's potential as a world-wide information source, and has described a movement promoting the use of the Internet for educational purposes. But, most pertinent to this study, it has identified that teachers are the vital link between the new technology and its incorporation into classroom use. We need to know teachers' opinions and intentions in order to understand whether the Internet meets their needs or whether it is another innovation considered superfluous to education.

The next chapter will describe the features and background of the Internet. Chapter three will review the literature related to the use of the Internet education. The methodology of the study will be described in chapter five, and the results in chapters six and seven. The data will be discussed in chapter seven, and chapter eight will reach conclusions and discuss implications.

## **Chapter 2**

# **Background to the Internet**

### **2.1 Introduction**

This chapter describes the scope of information and communications technology (ICT) and then concentrates on describing the features and potential of the Internet. The educational context will be examined in chapter three.

### **2.2 Information and Communications Technology**

The Internet is becoming the hub of the World's information and communications technology (ICT). It has been argued that the origins of ICT can be traced back to the earliest human efforts to record ideas manually on stone and papyrus (Brown, 1995). The invention of the printing press revolutionised the spread of knowledge by making information available in a mass-distributed form (Spender, 1995). An "information age" has been created in the 20<sup>th</sup> Century by the development of media such as photography, film, radio and television, and the telecommunications system (telephone, fax, Internet, etc).

Currently the convergence of all media into a digital form is making it possible for computers to take on a central role in their production and distribution (Negroponte, 1996). This is making it possible for the Internet to become an option for the distribution of information, with the potential to challenge the domination of printing and broadcasting. The nature and development of the Internet is discussed in the next section.

### **2.3 Description of the Internet**

The Internet has been called a "network of networks" (Lai, 1996). It is a worldwide system of computers connected to each other largely by means of the telephone system. This enables users to gather information from other computers or communicate with other computer users.

The Internet began in the US in the 1960's as a series of communications connections for sending information between military computers. During the 1970's and 80's many universities and government agencies joined the Internet and began connecting their

local area network (LAN) computers to it, giving individual users access from desktop computers (Brown and Ryba, 1996). The use of modems has enabled individual members of the public to join the Internet through subscription services from Internet service providers (ISPs).

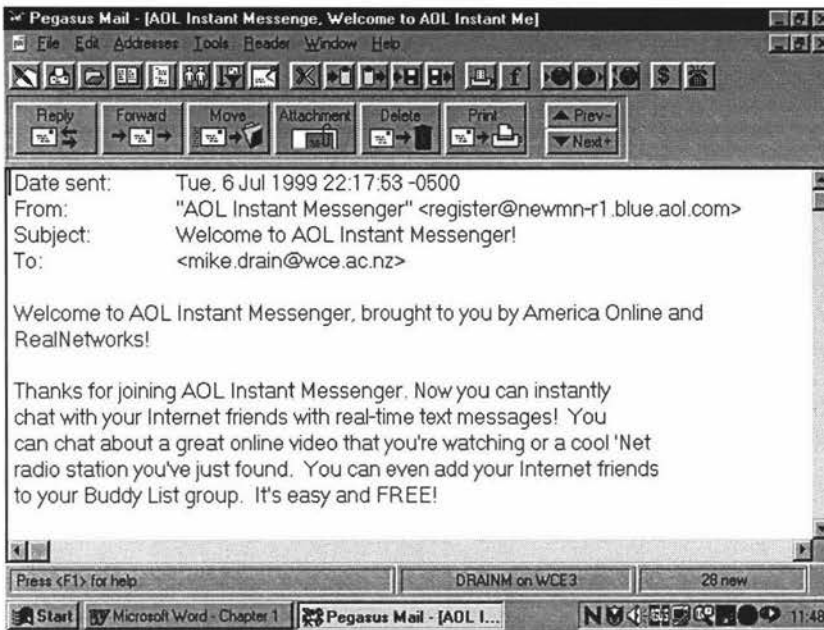
Internet usage grew rapidly once users found they were able to access information from thousands of server computers around the world. At first the Internet was slow, clumsy in operation and purely text-based. But it was modernised with the development of the World Wide Web (WWW), based on hypertext markup language (html), which enables point and click operation and attractive features such as colour pictures, animations, and to a limited extent at present, audio and video. The new web browsers introduced in the mid 1990's (Netscape Navigator and Microsoft Internet Explorer) sparked a wave of growth due to the ease of use and attractive features made available. Developments under way at present, such as ISDN, ADSL and new cables to Australia and the USA, promise to enhance the speed and quality of the multimedia aspects of the WWW in the near future.

## **2.4 Internet Services**

There is a range of services available on the Internet, some of which are widely used (especially e-mail and the World Wide Web) and others that are of minority interest:

### **2.4.1 E-mail (electronic mail)**

This is a system of sending and receiving messages via an intermediary computer that acts as a "post office", holding messages until they are collected. The messages can be collected and read at any time. They can also have other files (pictures, documents, software, etc) attached or sometimes imbedded. Figure 2.1 shows the screen view of a typical e-mail program, with a message from America On-Line.



**Figure 2.1**  
Pegasus Mail

## 2.4.2 World Wide Web (WWW)

This is the service that has caused rapid popularisation of the Internet. The WWW uses hypertext links to allow non-linear navigation. The user can jump to another WWW page by clicking on a hyperlink on the screen (a marked word, usually underlined, or a button or hot-spot). The WWW has the added attraction of multimedia capability (text, pictures, animation, audio, video), and is served by a wide choice of search engines and directories (Fig. 2.2).



**Figure 2.2**  
Netscape Internet browser, showing the Yahoo search engine and Internet directory. <http://www.yahoo.com>

### **2.4.3 Mailing Lists (Listservs)**

These are discussion groups that use e-mail to share ideas and information with other subscribers interested in their topic. Messages are sent to all group members – forming a “virtual community” (Brown and Ryba, 1996, p. 24). The discussion can also be archived (e.g. as a Web site) to allow the thread of the discussion to be re-read.

### **2.4.4 Chat**

This allows communication in real time by e-mail message. It involves two individuals or more replying to each other in writing in a manner much like a conversation.

### **2.4.5 Usenet (Bulletin Board)**

A bulletin board is a place to post and read messages. The Usenet bulletin board system has thousands of “newsgroups” on different topics.

### **2.4.6 Telnet**

This allows a user to connect to another computer, and then (with appropriate access privileges) access a database or transfer files. Most computers need a password, but some allow public access – for example library catalogues.

### **2.4.7 FTP (File transfer protocol)**

This gives access to files that have been made available for public access. Before the WWW it was the main way of using the Internet to transfer files (containing information or programs).

### **2.4.8 MUDs and MOOs**

These acronyms stand for "multi-user dungeons (or domains)" and "MUD -object oriented". MUDs and MOOs are methods of producing an imaginary environment through text descriptions, mainly for the purpose of game-playing. Users type descriptions of their imaginary surroundings and actions, which are read by other players and thus become added to the ongoing scenarios.

## 2.5 Internet Search Techniques

With millions of pages available, there is a need for fast and reliable information search services. There are several methods provided by an Internet browser program (such as Netscape Navigator or Microsoft Internet Explorer) for searching the Internet.

1. The basic connection method is to type a known URL (uniform resource locator) into the "Location" space provided in the browser program. This will connect to the computer hosting the named page, and down-load (obtain) the page for viewing on screen and printing out.
2. For an automated search, connect to a search engine site (by clicking the browser's Search button) and enter relevant search terms into the small box provided (see Fig. 2.2). This will down-load a list of titles matching the search terms. Any of the pages can be viewed by pointing and clicking the titles. The main search engines are AltaVista, Yahoo, Lycos, Excite, Infoseek, and HotBot.
3. For a more selective result, use a subject directory to search through lists of topics. Several of the search engine sites, such as Yahoo and Lycos, provide lists of recommended sites arranged as hierarchical lists of subject categories which can be easily browsed by users.
4. For specialised searches use link pages. These are pages of links to sites related to a particular topic, provided by people or organisations with knowledge of that topic.

There are also many information and education services available to only on subscription, with password access. These include encyclopedias such as Britannica, and course work for students, particularly those involved in distance education.

Business corporations also make use of the Internet to provide information to their branches around the world, but much of this is pass-worded to deny public access.

The World Wide Web's magazine-like appearance and its powerful search engines and subject indexes have made it an attractive way to search for information. Trewern (1996) considers the search skills needed are "similar to those for finding what you want in a library" (p.39).

Subject directories have the advantage that the selected pages have been included because of their quality, whereas the search engines use much bigger databases of pages

found by automated computers. Pfaffenberg (1996) recommends Yahoo as the most comprehensive and reliable subject directory. Yahoo now searches its subject directory at the same time as searching its Web page database, and produces a 5-part search result (Categories, recommended Web Sites, Web Pages, related News and related Events). This makes it easier to access sites recommended by Yahoo staff, with the option of also looking through the much longer list of Web page hits. Yahoo also has a junior section called Yahoooligans which may be more appropriate for children.

It can be seen then that the Internet has great potential as an information source and communications system. Information is provided at no charge by thousands of contributors, and many more provide information to subscribers. The World Wide Web service of the Internet provides a wide variety of sites which are designed for educational use. The next section of this chapter will show a small selection of examples.

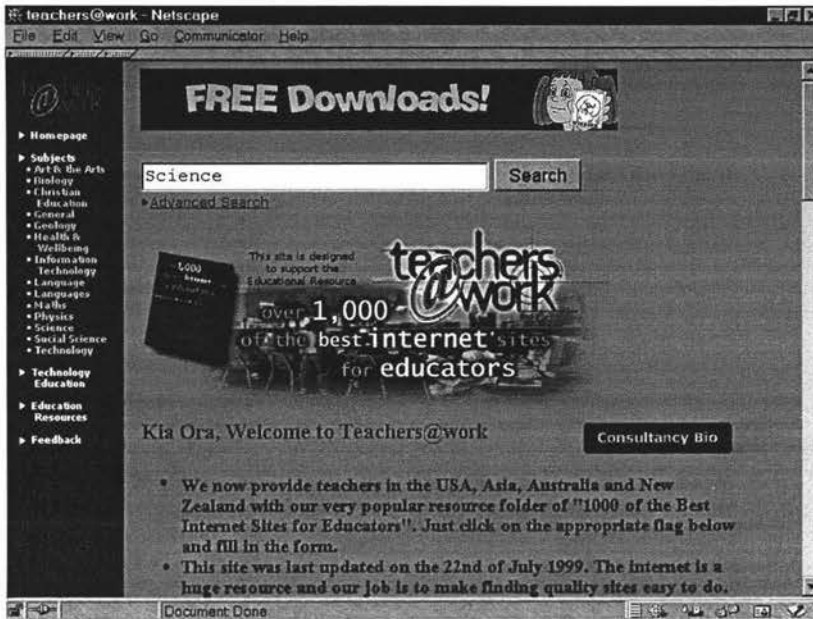
## **2.6 Examples of Educational Web Sites**

The material on the World Wide Web is too varied to be categorised into a simple set of categories (Yahoo needs 2500 categories), but there are several types that may be of particular interest to teachers. Many sites have been designed specially for teachers and students to use, but most WWW material has been provided for the public in general. Usually there is some pay-off such as publicity to the provider of the site, or advertising sponsorship to fund the site.

To demonstrate the types of resources available to teachers and students some basic categories have been used in this section, but these are very general. Some sites meet several of these purposes, and there are many unique sites that defy categorisation. However, for the purpose of illustration, here are some of the types of sites available to teachers and students:

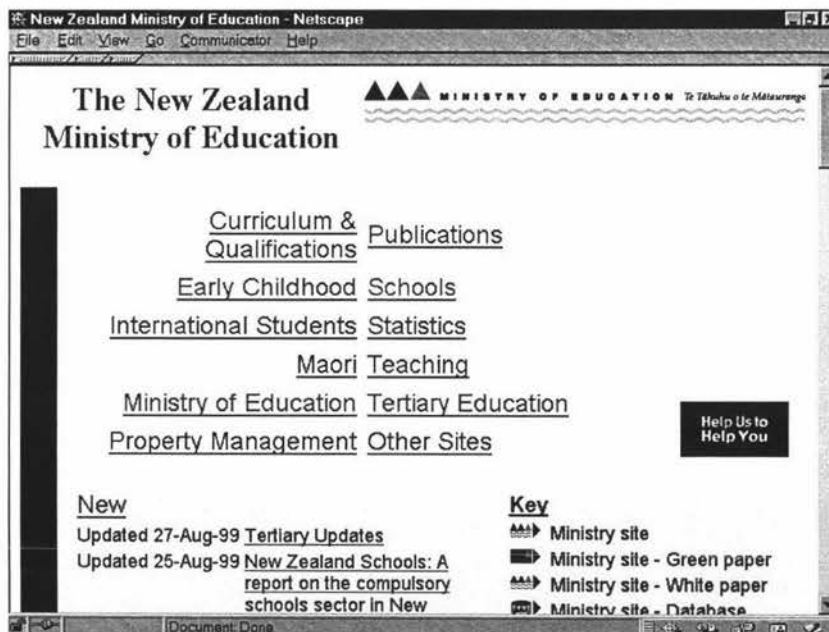
### **2.6.1 Teacher Support Sites:**

These are sites that provide assistance to teachers, such as unit plans, lesson plans, educational information, and links to other educational sites. For example the "Teachers at Work" site (Figure 2.3) provides a searchable list of links to sites which have relevance to New Zealand curriculum areas.



**Figure 2.3**  
"Teachers at Work" Web site.  
<http://teachers.work.co.nz/>

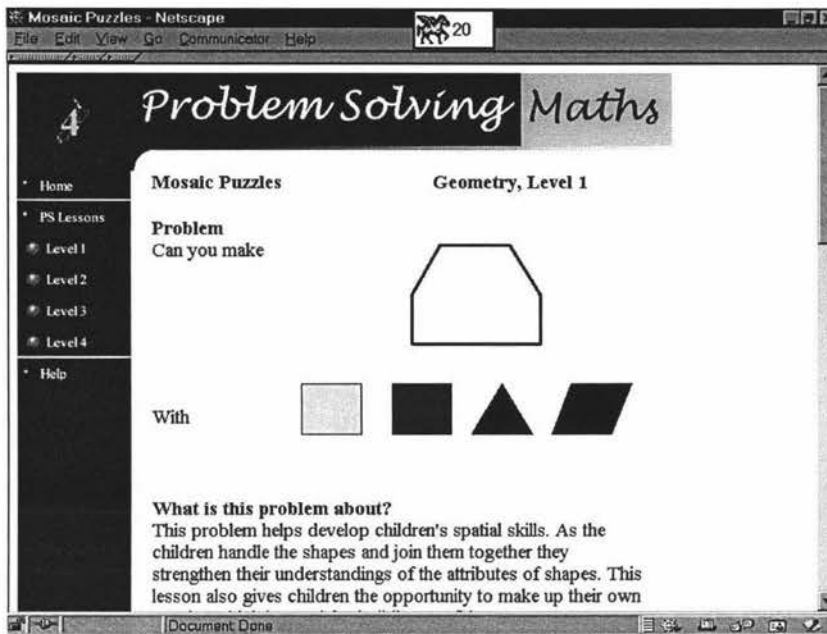
The Ministry of Education provides a site with information relevant to school management as well as teaching (Fig.2.4).



**Figure 2.4**  
Ministry of Education Web site.  
<http://www.psmaths.co.nz/>

## 2.6.2 Teaching Resource Sites

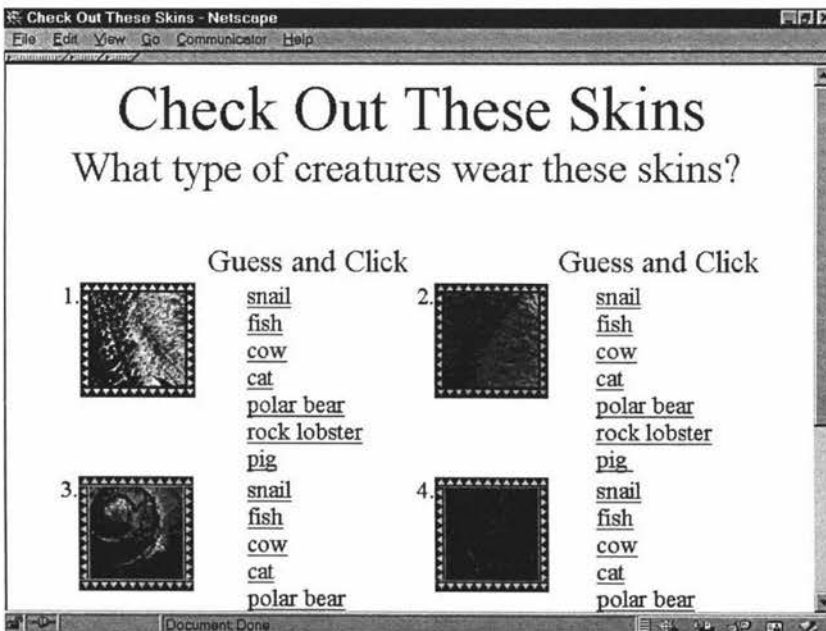
These are Web sites with specific materials and information to help teachers plan and teach units of work or individual lessons. These sites are not usually intended to be viewed by students, although some sites combine student materials with teacher guidance. A good example of a teaching resources site is Mathematics Problem Solving (Fig. 2.5).



**Figure 2.5**  
Problem Solving  
Maths Web site.  
[http://www.psmaths.co.n  
z/](http://www.psmaths.co.nz/)

### 2.6.3 Interactive Learning Sites

These are Web sites that provide classroom learning activities. Typically they have been designed to respond to childrens' exploration. They might ask questions that the children answer, and give the children choices to make, as in the Cancer Society's "Healthy Lifestyles" site (Fig. 2.6).



**Figure 2.6**  
Cancer Society  
Healthy Lifestyles Web  
site.  
[http://www.wce.ac.nz/su  
n/index.html](http://www.wce.ac.nz/sun/index.html)

Some sites show pictures or animations to demonstrate concepts, and a few are programmed with Java (a system that produces active mini-programs that down-load over the Internet as needed). This enables them to perform the sort of actions normally associated with CD-ROM based programs.

### 2.6.4 Information Sites

These are Web sites that provide information intended for the general public or for specialist users. It cannot be assumed that the information is intended for students, but many sites give links to material designed for childrens' use. Many reputable institutions such as universities, museums, magazines and newspapers, as well as interested individuals, provide information that could be used in a classroom context. How this material is used is much more subject to the teacher's own lesson design than the teaching and learning activities described above. An example of an information site, specialising in American history, is The History Place (Fig. 2.7).



**Figure 2.7**

The History Place

<http://www.historyplace.com/>

## 2.7 Shortcomings of the Internet

The Internet has some shortcomings, ranging from those of a technical nature to others related to the difficulties of fitting the Internet into our existing culture.

Internet users can find the lack of logical organisation of information to be frustrating when using the Internet for research (Quinlan, 1996). However, use of Web subject directories such as that provided at the Yahoo Web site can help provide a sense of organisation.

Some authors have doubts about the quality of the information on the Internet compared with the quality of material in libraries:

Researchers naturally save their best work to publish in journals and books, realising that the review process ensures better papers make it into print...It's the not-so-good stuff that gets onto the network (Stoll, 1995, p. 39).

Stoll goes on to recommend libraries as the most reliable source of authoritative information, due to the rigorous editing process that books go through..

It may be possible to get into trouble on the Internet simply because it encourages participation with the outside world. The Internet user is vulnerable to abuse by pranksters, criminals or just by sharp businesses who can obtain personal information (Banks, 1997). In some ways the Internet has become an new environment for antisocial behaviour, such as offensive chat comments, E-mail mass-advertising (spam), mailing lists which are hard to remove yourself from, pornographic sites indexed with irrelevant key-words, and free offers with hidden costs (Banks, 1997). It seems that some users take advantage of the anonymity of the Internet in their dealings with strangers.

It is possible for children to discover Internet sites that are inappropriate to their age, such as those containing pornographic, offensive or violent material. The Internet is uncensored, and this is an issue of great concern to parents and schools, with many considering it a good reason to keep children off the Internet. Current legislation does not make it clear who is responsible for censorship, and many governments, including our own, have wrestled with the law-making difficulties involved (White, 1996). However it may be possible to keep Internet usage reasonably safe by means of a content filter such as Net Nanny, or insisting that children use appropriate subject indexes such as Yahoooligans.

The Internet also has some technical shortcomings. It has been superimposed on a telephone system that was originally designed for voice traffic, and with which it still needs to co-exist. This results in speed and reliability variations which users may find frustrating (Consumers Institute, 1996). The current low data transfer rates (bandwidth) restrict audio and video quality to standards that do not yet match radio and television. However, such technical deficiencies may be temporary, with fully digital telecommunications systems seeming to be on the agenda of telecommunications suppliers (Negroponte, 1996).

## **2.8 Summary**

It can be seen that, despite its great potential for searching for, obtaining and interacting with information, the Internet has shortcomings that need to be addressed. It is being recommended as a resource for teachers and students by authors and government ministries, with connection under way in schools, and teachers beginning to make use of it in their lessons (Lai, 1996). But experience of the Internet's shortcomings, or even rumours of such deficiencies, may be hindering its uptake in education. It was therefore considered appropriate to include technical matters in this study, as well as pedagogical issues. The next chapter reviews the literature related to educational and implementation aspects of the Internet.

## Chapter Three

### Literature Review

#### 3.1 Introduction

The literature concerned with the use of ICT in schools reveals conflicting views of the value and potential of the Internet for education. These views range from promoting the use of the Internet to warning against it. As Bigum (1995) writes:

...they either herald some kind of utopian information age, or expound the threats this technology poses for the morals of the young (p. 13).

However, there is also another group waiting to see the results of research and early implementation, and the development of a theoretical foundation for ICT in schools.

This chapter summarises the theories of ICT use in education and how they might apply to the Internet. The various possibilities for educational reform based on the influence of the Internet are described, including expected effects on teachers and the education system. Theories of innovation are examined to throw light on the process of change. Current uses of the Internet in schools are summarised, and the results of some research studies of the use of the Internet in schools are examined. Finally, the problem underlying this study will be described.

#### 3.2 The Objectives of ICT in Education

Two main reasons are given for the integration of ICT into the school curriculum:

1. to prepare students to be highly paid, highly skilled workers in the economy of the future, and ...
2. for reforming schools into institutions that will produce students who can think and solve problems (Neill, 1995, p. 181).

The first argument is that students should use ICT in a similar way to adults – as a tool for information handling, problem solving and communication. In this way students will be ready for participation in the modern economy, ready to work smarter and contribute to economic growth. However, educational reform seems to be the real agenda of some interest groups. The next section will examine the educational reform possibilities in more detail.

### 3.3 The Internet and Educational Reform

There have been many calls for the reform of schooling over the past two or three decades. The restructuring of the New Zealand education system during the 1990's has been dramatic, but still falls short of the changes that are envisaged by the more radical advocates of reform. The traditional education system has been labelled an "industrial model". Its planned step by step process has been linked to the mass production ideas and needs of the Industrial Revolution (Spender, 1995). Another description that shows the dated nature of traditional education is that of a "broadcast model", with the notion of knowledge being selected by a few experts and being distributed to the masses, mainly through books, but mediated by teachers (Tapscott, 1998). Viewed either way, traditional education has been criticised for failing to prepare students for a changing world (Knapp & Glenn, 1996).

The modern economy is being increasingly called an "information economy" or "knowledge economy". This is an extension of the process in which economies develop from reliance on the primary sector (agricultural), through secondary (industrial), and finally to tertiary sector dominance (services) (Moore et al, 1998). The tertiary sector is becoming increasingly information-intensive, with the accompanying requirement for greater information literacy in our school leavers. The New Zealand Government has shown that it believes the New Zealand economy would benefit from improved ICT training for students, and has offered this as a strong reason for its inclusion in education. But it also acknowledges the benefits of using ICT to support learning within all curriculum areas (Ministry of Education, 1994).

Butler and Zwimpfer (1997) offer two scenarios for the future of ICT in New Zealand education: it could be used as either a contribution to greater efficiency of teaching and learning, or as a catalyst for greater reform. Both scenarios are put forward as beneficial – the former causing little change to present practices and allowing gradual change to occur, while the latter implies a revolutionary rethink of education (its nature, its delivery and its organisation).

Many proponents of ICT in education now advocate change to both what students learn and how students learn. Reformers argue that students need to learn how to find information, think about it and synthesize it, rather than how to memorize it, and that

this should be done through exploration, rather than acquiring information primarily from teachers and textbooks (Knapp & Glenn, 1996).

Some authors see the need for a new educational paradigm – meaning the “established set of procedures that takes place in schools and classrooms” (Tiffin & Rajasingham, 1995, p. 11). This new paradigm is envisaged as one that includes the utilisation of ICT as a vital component.

The Internet is expected to be the core of an electronic information revolution even more significant than the invention of printing and the rise of book-based information (Sculley, 1989; Spender, 1995). Books have enabled generations to store their accumulated information, and the rise of libraries has made it widely accessible, but this is expected to be superseded by a more efficient system that is being constantly updated rather than just added to. The Internet has the potential to introduce a new egalitarianism in a system where users will be able to be contributors as well as consumers (Ryder, 1996).

Schools are being encouraged to take advantage of the electronic information revolution that is under way – making use of multimedia CD-ROMs and the Internet. The students would be involved in “doing” rather than “knowing” – solving problems and researching rather than memorising. There would need to be many adjustments to the organisation of teaching and learning to accompany such a change, and re-structuring would be necessary for “everything from age-based classes to chronological progression and content-based curriculum, through to subject-oriented education, class periods and examinations” (Spender, 1995, p. 116).

It is expected that the Internet will enable students to explore the real information that adults use, and thus remove the boundary between the simplified facts provided in schools and the conflicting multiple sources of information available to adult professionals (Kay, 1991). Teachers will be expected to support and guide their students as they explore the real world from within the classroom.

It is argued that teachers should not expect to be able to maintain traditional teaching styles if they are to incorporate the use of the Internet. Brown and Ryba (1996) maintain

that “advanced technologies need to be linked to advanced teaching practice” (p.29). Teachers who utilise computers for teaching are expected to operate a less teacher-centered programme, with more emphasis on child-centered collaborative or independent activities (Hannafin & Savenye, 1993).

Some authors have seen a need for a shift in the role of the teacher in a classroom using computers to construct knowledge. More responsibility and independence is given to the learners, and the teacher becomes a facilitator, model, and guide rather than an instructor and source of knowledge:

The increasing availability of information has required a change in the teacher’s role from provider-of-information to facilitator-of-learning (Brown & Ryba, 1996, p. 29).

The potential for the reform of teachers’ practices and the education system as a whole has prompted some authors to attempt predictions of the future, as shown in the following scenarios.

### **3.3.1 Scenarios**

The most radical predictions of technology-based educational reform come from authors who have described a science-fiction-like future in which students do not have to attend school at all. Such a scenario might involve students studying from home via Internet-based virtual reality (VR) technology, which uses a binocular headset to produce the illusion of a real learning location (Tiffin & Rajasingham, 1995). This could simulate a classroom or take students on location anywhere in the world. Schools would be responsible for providing and supporting the “virtual class” that takes place, but teachers would not need to meet their students face to face. They could discuss progress by e-mail or Internet video conference.

Such a scenario offers possibilities for dramatic reforms of the education system. “Schools” would not need land and buildings to accommodate students, class sizes would not be restricted, and students could be enrolled from around the world. Dramatic curriculum reforms would presumably be possible, since in a virtual environment students could see many places and procedures previously denied to them. And perhaps most importantly, teaching and learning methods could be reformed to enable interactive learning based on constructivist principles, discussed later in this chapter.

The technology needed for a scenario like this is available today. At present its effectiveness is limited by its high cost and the lack of bandwidth (data transfer capacity) of the Internet, but if advances continue at the current rate these problems may be overcome within a few years.

Another prediction depicts a scenario where teachers help children research a real-life problem (pollution of a local stream) by facilitating discussions which lead to the students designing and implementing their own investigation. The students have access to e-mail to contact other schools near the river and World Wide Web news services to get reports about accidents contributing to the pollution. The students make notes on their own pocket computers or PDA's (personal digital assistants). They sit around a full-sized computer to use a spreadsheet to record and graph stream acidity, and then use a multimedia presentation program to design their report. They incorporate video clips and digital photos they have recorded during their visit to the river. The students have shown the cause of the pollution and have a plan for correcting it. Their multimedia presentation is then made available to the public on a community access cable TV channel (Kozma & Schank, 1998).

The scenario just described is not far beyond the possibilities that already exist in many classrooms today. Although the technology involved seems central to the activities, it is actually subservient to the needs and goals of the students and teacher. The viability of the scenario depends on the commitment of the teacher to the student-centred learning approach. The teacher has determined learning outcomes for the activities, and acts as facilitator and guide, but is flexible in the way these are achieved.

The real unknowns are not the availability and affordability of the technology (which are likely to be overcome in the future), but the reactions of students and teachers to such scenarios. In the case of the first scenario: will students welcome the ability to study at home in an immersive and interactive multimedia environment? Or will they reject the technology in favour of socialising, getting out of the house and participating in real life activities? And will teachers welcome a new system of teaching at a distance and never meeting their students in person, or will they prefer to preserve the face to face contact of the traditional classroom? Will the second scenario be more acceptable? Or will

teachers and students find it too complex technically, preferring to keep to the simplicity of discussion, pen and paper?

These are not the only questions about the desirability of an ICT-based education system. There have been many warnings to the public about the dangers of the Internet, as seen in the following section.

### **3.4 Warnings**

Some authors see dangers in the use of the Internet in education. Often they have logical arguments, but at times they seem to present pessimistic viewpoints that verge on moral panic.

The most common warnings are about the availability to children of “adult” material such as pornography and violence. There are thousands of pornography sites on the World Wide Web, but normally they only appear when search terms related to sex are used. Some have registered keywords which cause them to be included in innocent searches (Banks, 1997), but this is effectively overcome by using a search index designed for children, such as Yahoooligans. Some adult search engines have parental controls that enable filtering of objectionable material.

It has been argued the lack of quality control on the Internet causes it to fall into disrepute as a source of information for any topic. There is no editorial control, just as there is no censorship, and anyone can put anything on the Internet for the world to see. Most writers and publishers continue using traditional printing methods, simply because the Internet does not yet provide a simple method for them to be paid for their work. So only second-rate material is put on the Internet, to be given away free (Stoll, 1995).

Roszak (1994) is worried that the economics of teaching by computer or by network-connected tutors might be more attractive to administrators than having teachers and students meet in classrooms. He goes on to claim that there is no evidence of benefits to students to be found beyond the claims of the computer industry’s self-promotional literature, “filled with vague futuristic allusions to life in the Information Age” (Roszak 1994, p. 60).

Postman (1993) is alarmed at what he sees as the growth of our current “technocracy” into a “technopoly”, which he defines as “the submission of all forms of cultural life to the sovereignty of technique and technology” (p.116). He argues that the computer has strengthened bureaucratic institutions and stimulated information chaos at the expense of social progress.

Another perceived problem is the huge cost of giving all students full access to ICT. There is little prospect of increasing the existing New Zealand education budget, so increasing ICT “may require re-prioritising of existing expenditures” (Butler and Zwimpfer, 1997, p. 44), which seems to mean reducing budgets in other areas. However, this takes little account of likely cost reductions over the coming decades. Many other electronic goods are now a fraction of their introductory cost – e.g. calculators, which were too expensive for students to own in the early 1970’s.

There is also concern about inequalities based on gender, social class, ethnicity and wealth that seem to be exacerbated rather than levelled by the way ICT is deployed (Bromley, 1998). We should not assume that the computer is a neutral instrument, but rather, identify ways in which it is strengthening existing power relations. ICT has technical, training and cost overheads that restrict its use to institutions and individuals who can afford it and put in the time to integrate it. It has been shown that in the USA white middle-class students have better access to ICT both in classes and at home than other students (Bromley, 1998).

The arguments for and against the use of the Internet in education are part of the background against which teachers’ perceptions and decisions are built. Teachers’ responses to other technological innovations have established some patterns that may be relevant. The next section of this chapter examines the theories that have been developed for the uptake of innovation and relates them to the use of the Internet.

### **3.5 Theories of Innovation**

The Internet is yet another innovation in a long line of technologies that have been introduced to schools. Almost all educational technologies introduced to schools this century have had disappointing outcomes despite promising beginnings. This has

applied to such technologies as radio, film, television, video and computers (Cuban, 1986).

Greater understanding of the way innovations are chosen or rejected by potential adopters may be valuable in obtaining better results. Some theories have been developed that are of relevance to the introduction of educational technologies.

Rogers (1995) presents four theories for the diffusion of innovations. The Innovative Decision Process theory states that innovation is caused by a recognition that the status quo is not meeting expectations, and a subsequent search for improvement. It is represented by a five-stage time-based model of the diffusion of innovation:

- Developing knowledge of an innovative idea
- Forming an attitude persuasion towards this innovation.
- Deciding to adopt or reject.
- Implementing the idea.
- Confirming the decision to implement. (Rogers, 1995)

In his theory of Individual Innovativeness, Rogers (1995) states that people who are predisposed will adopt an innovation earlier than others. He calls these people the Innovators, and those who resist innovation the Laggards.

The theory of Rate of Adoption states that diffusion of an innovation begins slowly before entering a period of rapid growth and then slowing down again, producing a S-shaped growth curve (Rogers, 1995).

The theory of Perceived Attributes (Rogers, 1995) states that potential adopters base their judgement of an innovation on their own perceptions of it. Five attributes of an innovation are judged:

- can it be trialled?
- does it have observable results?
- does it have an advantage?
- is it complex?
- is it compatible with existing practices and values?

Cuban (1986) extended Rogers' ideas in his examination of how teachers have resisted the implementation of most technological innovations (such as radio, film, television and computers). He has developed a model showing a cycle of dissatisfaction with technology in education:

- **Step one:** Acceleration, pioneering, implementing new technology
- **Step two:** Academic studies or statements prove the effectiveness of this technology; actually most of the time they prove it is as efficient as traditional education.
- **Step three:** Teachers use it and complain about logistical problems, some technical imperfections, incompatibility with current programmes or curricula.
- **Step four:** Reports see teachers' use as very disappointing.
- **Step five:** Harsh criticism of administrators who keep technology in the closet, and stubborn teachers who are reluctant to use the new tools.
- **Step six:** A new technology appears - go to step one! (cited in Chaptal, 1995, p. 15).

Chaptal (1995) recommends that we avoid the past mistake of introducing a technology that is "still immature and incomplete" and that we don't expect teachers to jump at technology that needs adaptation to meet their needs or devote "hours of personal commitment" to making technology work (p. 15).

Surry & Farquhar (1997) describe two main approaches to the introduction of educational technology. The first is the "top down" approach, based on the "determinist" philosophy that technology is the main cause of social change, and hence promoting the expectation that appropriate new technology will produce the desired results. The second is the "bottom up" approach, based on the "instrumentalist" philosophy that technology is under human control, which implies that teachers are able to choose the technology they think is appropriate.

Teachers have considerable discretion in choosing whether to use computers in each lesson or unit of work they plan. So teachers can be seen as filtering educational innovations in the light of their own beliefs and routines (MacArthur & Malouf, 1991). In considering the use of computers in schools, Adams et al (1992) consider that "the success of any educational innovation is largely determined by the knowledge, skills, attitudes and confidence of the teachers involved" (p. 10). They also note:

...the resistance of teachers to technological (or any other) change is often attributable to difficulties in changing habits, fear, and a sense of futility in attempting to adopt yet another new idea (Adams et al, 1992, p. 10).

It seems then that teacher decision-making has a critical role in the uptake of ICT in education, and related to this are teachers' educational approaches and their beliefs about computers.

What is needed is the involvement of teachers in the process of choosing and designing innovations. Burkman's User Oriented Instructional Development process (UOID) provides a plan for incorporating teachers' needs into the process of introducing new technology:

1. Identify the potential adopter
2. Measure relevant potential adopter perceptions
3. Design and develop a user-friendly product
4. Inform the potential adopter (of the product's user-friendliness)
5. Provide Post Adoption Support (Surry & Farquhar, 1997).

Although the Internet has been introduced to the general public without consultation, this process may still be suitable for the implementation of the Internet in schools. There are many possibilities for the provision of Internet applications designed to suit teachers' needs.

Another path for involving teachers in innovation in schools is the "grass-roots" approach. This involves an individual trying out a new idea and showing it to a few colleagues. However, it may not work for introducing computing innovation into schools, which requires simultaneous changes in attitude, classroom practice and knowledge base as well as financial commitment (Casey, 1996).

Teachers need to feel ownership of a new innovation before they will incorporate it into their teaching practice: Morimoto (1973) expresses this personally:

When change is advocated or demanded by another person, we feel threatened, defensive, and perhaps even rushed. We are then without the freedom and time to understand and to affirm the new learning as something desirable, and as something of our own choosing (p. 255).

It seems then, that teachers need to be able to trial an innovation freely without commitment before deciding on whether or not to take it up. They need to feel that they have chosen it as the best solution for a need they have identified. The next section considers this premise in the case of the use of ICT in education, and extends it to consider the Internet in particular.

### 3.5.1 The Internet as an Innovation

Computers were originally introduced to schools by teachers who were enthusiasts willing to put in time and effort in this area beyond that expected of the majority of classroom teachers (Bigum, 1995). Usually they saw themselves as pioneers who would be followed by their colleagues once they had demonstrated the value of what they were doing, but often the lone effort turned out to be “just one more innovation leading to burnout” (Alexander, 1997, p. 15). The Internet may also turn out to be another lost opportunity if teachers are not properly introduced to its possibilities, and supported with training and technical assistance. The lack of fulfilment of the early promises made for computer use has been attributed partly to the low quality hardware and software of the time, and also to the fact that “teachers themselves did not recognise their changing roles when the new technology was introduced into the system” (Lai, 1996, p. 11). It seems that teachers expected the computer in their classroom to fit into their established practice.

Collis (1996) calls the current phase of network and Internet implementation into schools the “second wave” of computers-in-education innovation. She finds some interesting similarities between this second wave and the first wave (the initial introduction of microcomputers into schools). Both innovations were initiated by a technological breakthrough and propelled by subsequent social expectations and commercial impetus (Collis, 1996).

Collis’s summary of the events of the first wave expands on Cuban’s (1986) model:

1. **Into the system** - computers installed.
2. **First-level problems affect everyone** - computers and software difficult to work, unreliable.
3. **Second-level problems are also persistent** - how to integrate them into the curriculum?
4. **Good things are happening** - anecdotal evidence of good experiences.
5. **Diffusion is difficult** - diffusion into mainstream practice has not yet much occurred.

6. **Different policies and strategies come to similar ends** - whether planned or ad hoc, the result is the same.
7. **Cost-effectiveness is not demonstrated** - no evidence of expenditure producing a difference in student achievement.
8. **Not to Fear** - life in the school goes on.
9. **Not to Gain** - little market for educational software - students mainly use standard adult software.
10. **From subsidised exploration to... its withdrawal** - the pendulum has swung away.
11. **The teacher is the critical variable in computer use in the school setting** - having teachers "on board" the initiative is vital.
12. **The computer has been a solution in search of a problem** - teachers did not see a need for computers. (Collis, 1996, p. 23-25).

Collis advises that we should learn some lessons from the negative experiences of the first wave, and has some recommendations for the second wave, the introduction of the Internet. Firstly, support the enthusiasts to explore. She has faith that some will always lead. Provide simple useful WWW activities for the average teacher – preferably activities that solve a real classroom problem. She has confidence that “a powerful idea will find its way”, and maintains that it is not necessary to find a single best approach. Schools want free materials, so a commercial market will not likely develop, but rather a culture of sharing ideas and resources will grow. And finally, don’t expect all teachers to see the Internet as something they need or want (Collis, 1996, p. 26-29).

Some authors claim that there is no good evidence that most uses of computers significantly improve teaching and learning (Oppenheimer, 1997), and this may be a tacit feeling in the experience of many teachers. However, the potential of the Internet continues to be recognised, with the caveat that it is matched to teacher skills:

...in the hands of a skilled teacher the Internet is likely to offer many possibilities for creating a more socially interactive and reflective learning environment (Brown & Ryba, 1996: 28).

There seems to be pressure to give Internet access to students rather than to teachers, but Bigum (1995) suggests that we reverse this order, learning from the error of the 80’s of giving students access to computers before teachers had become familiar with them. The attractiveness and ease of use of the WWW may give it a wider popularity than the software of the original stand-alone computers allowed. The search engines of the

WWW allow user freedom and choice, giving teachers independence and allowing them to retain the ability to operate in personal and individualistic ways.

Rarely has the freedom of choice of teachers been accepted as their right, but rather, teachers' perceptions and decisions have been viewed as impediments to the process of innovation. However Haugland and Wright (1997) urge that teachers be empowered to play an active role in technological developments. They have proposed a Bill of Rights giving teachers' interests a place in the decision-making related to incorporating computers into their practices:

#### **A TEACHERS' BILL OF RIGHTS**

1. To choose whether an innovation will become part of the classroom.
2. To be introduced to the innovation through site observations, demonstrations, or video presentations.
3. To participate in the decision making related to acquiring equipment and materials needed to implement the innovation.
4. To receive hands-on training and sufficient time for individual exploration.
5. To receive on-going support and technical assistance that will lead to self-confidence in using the technology.
6. To be offered opportunities to preview and then select quality software programs that support developmentally appropriate practice.
7. To be part of a group support which provides sharing of ideas and problems.
8. To be encouraged to try new ways of implementing the innovation.
9. To have fun! (Haugland & Wright 1997, p. 69)

It seems then that we should bear teachers' intentions and practices in mind when attempting to predict or understand the effects of innovation:

...we should consult teachers' intentions through an analysis of their ongoing practice if we are to make sense of practice. It is in relation to these intentions that the critical analysis of practice, which new technologies might precipitate, can go forward (Miller & Olson 1994, p. 137).

Teachers intentions and perceptions can be seen to be central to the uptake of new technologies such as the Internet. These perceptions need to be considered in the light of theories about educational uses of ICT. The next section of this chapter reviews the theories of ICT use in education, and extends them to include the Internet.

### 3.6 Educational ICT Theories

There has been some progress in developing models or theories of educational ICT use, although these have yet to be fully substantiated by research. The first models were developed in the early period of non-networked computers, and relate to the behaviourist-constructivist debate. Later, in the period of networking, they have been extended to include information processing and communication.

Two categories of potential gain in using computers in education have been identified:

1. Use of computers...making teaching as it presently exists easier, faster or more convenient.
2. ...emphasis upon the cognitive processes...problem-solving, thinking skills, and such information-handling skills as data-collection, analysis and synthesis (Sewell, 1990).

Sewell (1990) identified a shift of control from computer to user occurring during the first decade of educational computer use. Computer usage in schools began with an emphasis on drill and practice or CAI (computer-assisted instruction) software which had pre-set facts or answers for the children to identify – i.e. the computer acted as *tutor*. The next phase, explored only by the most ICT-confident teachers, was one of using the computer to model situations or problems using simulations or programmable “microworlds” such as Logo (Papert, 1993) – that is, with the computer as *tutee* being taught by the student. The third phase emphasises the use of the computer as a *tool*, where the child works with a high degree of freedom using open-ended software, much as an adult does.

The ideas of Sewell and Papert continue to be extended into the Internet era. Gawith (1995) recommends that teachers with access to “information-source computers” (using CD-ROMs or the Internet) should “create classrooms as knowledge construction environments” (p. 4). She suggests extending the range of operations as follows:

- tutor
- tool
- explore information
- construct knowledge
- communicate knowledge (Gawith, 1995)

ICT is seen as having potential to support teachers in being facilitators of learning rather than deliverers of information. This requires teachers to try new strategies and take on new roles. However teachers may not automatically behave as facilitators in the presence of computers, being so used to teacher-centered roles (Carey, 1993).

Lai (1996) sees in computer-mediated communication the potential “to create a peer-supported learning community”. He supports the idea of students becoming researchers who can “accept responsibility for their own educational journey” (p. 4).

This shift of control to the learner represents a movement away from behaviourist principles of instruction, to constructivist principles of exploring, interpreting and constructing knowledge. The potential for the Internet to support constructivist learning is examined in the next section.

### **3.6.1 Constructivism and the Internet**

The use of the Internet in education seems to support constructivist learning methods. Constructivism has been defined as the view that:

1. learning is an active process of constructing rather than acquiring knowledge, and
2. instruction is a process of supporting that construction rather than communicating knowledge to the learner (Duffy & Cunningham, 1996, p. 171).

Constructivism is a cognitive approach that is usually offered as the main alternative to “behaviourism” and its associated Skinnerian “programmed instruction” methodology, which is pre-occupied with correct answers to closed questions (Woolfolk, 1990, p. 182).

It has been observed that it is becoming more common for teachers to act as a “guide on the side” rather than a “sage on the stage” (Duffy and Cunningham, 1996, p. 185). Collaborative and cooperative group-work gives a good environment for learners to develop alternative points of view. To support this, educational technology has made it possible to access authentic contexts through the use of video and the Internet, in addition to traditional print-based media.

Constructivist tasks may ask students to cope with very complex situations, and Perkins (1991) considers that learners might feel they have been thrown in the deep end. The

use of coaching or scaffolding strategies is recommended to lessen the high cognitive load.

It is the job of the constructivist teacher (or interactive technology) to hold learners in their zone of proximal development by providing just enough help and guidance, but not too much (Perkins, 1991, p. 20).

An example of a constructivist strategy is “resource-based learning”, which has been defined as “a learning mode in which the student learns from his or her own interaction with a wide range of learning resources rather than from class exposition” (Rakes, 1996, p. 52). This involves researching a topic in order to answer questions or solve problems, which have ideally been formulated by the students themselves. The research is usually done from print and non-print media, such as books, articles, videos, CD-ROMs and the Internet, but original research and raw data can also be used.

Rakes (1996) considers that the Internet provides the ideal infrastructure for a paradigm shift from the traditional learning model to a resource-based learning model. The traditional learning model has limitations that were set in an earlier age: based on teacher as expert, facts as the primary basis of learning, and the textbook as the main source. It packages simplified information for students, and emphasises product and quantitative assessment. In contrast to this, resource-based learning places the teacher in the role of facilitator and guide, and questions rather than facts are the primary basis of learning, with a variety of sources consulted. Information is discovered by research, rather than provided. This introduces the likelihood of contradictory viewpoints being discovered, but an important part of the resource-based learning process is the development of skills to evaluate sources and make systematic comparisons.

The resource-based learning approach develops and utilises students’ information literacy skills to investigate problems or issues. They learn that gathering and organising information is not sufficient on its own – they must analyse the facts, recognise bias, and form and defend an opinion. In this way they are able to find answers and solutions independently. This is intended to develop skills that will enable them to become life-long learners.

The Internet has become a valuable information and communication resource for students involved in resource-based learning. It enables rapid searching and retrieval of

information, and can act as a way to share new insights or knowledge. But Rakes (1996) offers a warning to teachers that planning is essential. The Internet is disorganised, and its content is variable in quality.

Aimless wandering through the Internet's vast resources will accomplish little toward mastery of instructional objectives and waste valuable time (Rakes, 1996, p. 54).

Constructivist learning still requires full teacher involvement, with the teacher teaching and modelling the research process, and scaffolding it just sufficiently to match to the level of the students. The intention is for students to go beyond simply finding information. Bromley (1998) reminds us that information is merely data and facts. We need to make sense of information for it to become knowledge – but ideas are even better than knowledge – ideas are concepts or creative uses of knowledge, which allow us to produce new knowledge.

Hannafin and Savenye (1993) have put forward an interesting proposition which uses the theoretical foundations above to explain teachers' resistance to using computers. These authors accept that constructivism is the preferred theoretical basis for the use of ICT in education, but sense a lack of readiness for society to accept a move away from the traditional model of education. Society may not be ready to believe that children can learn by exploring, and that a teacher can learn new things with them. So teachers may feel a responsibility to be conservative and thus resist new roles and the associated technology.

This chapter has so far considered predictions and theories of educational Internet usage. The next section examines the current practices of teachers, as reported in the literature.

### **3.7 Current Internet Use in Schools**

Despite some literature predicting the radical reform of education as we know it, so far descriptions of educational use of the Internet show that teachers seem to be simply enhancing their current practices. A typical list of school activities utilising the Internet includes:

- Access a variety of resources not available elsewhere
- Obtain hundreds of ready-to-use lesson plans
- Get copies of software applications for grading, tutoring, games etc

- Obtain educational documents, reports and articles
- Log on to library catalogues
- Enable class to communicate with a distant community
- Share ideas and resources with teachers around the world
- Work as a mentor or tutor
- Replace some current classroom activities with Internet resources.

(Benson and Fodemski, 1996: 8)

Some of these activities support the teacher in teaching traditionally (lesson plans, grading, tutoring, educational reports, classroom activities). Others add to the students' classroom resources and make it less necessary to leave the classroom or school.

Some more specific New Zealand examples have been observed, and these seem to be more supportive of students' learning:

- Students around the world comparing rainwater samples in an acid rain project.
- Students forming a writing apprenticeship with a professional writer.
- Students questioning experts in Antarctica by e-mail.
- Maori students sharing cultural issues with Native Americans. (Lai, 1996)

Skomars (1998) provides a number of sample lessons based on the use of the Internet. Some are lessons designed to introduce students to the World Wide Web, giving practice in browsing, searching, and using URLs. The practice lessons are no doubt entertaining and motivating, but most seem to have the formula of a "Trivial Pursuit" quiz: e.g. "What is the odd one out in this list?" (Skomars, 1998: 113). However, some lessons are more extended activities based on topics in different curriculum areas. These have starter URLs and some scaffolding questions and suggestions to help students explore the topics. The intention is to use the existing curriculum areas as starting points, with Internet use expanding topics into cross-curricular studies because of the hyperlinks leading to related sites.

Internet access, whether at home or in the classroom, has been identified as a particular benefit for gifted children. Often these children need to work independently on research projects, investigating topics at a level beyond the rest of the class, and often beyond the experience of the teacher. The Internet gives them access to world-wide information

sources when needed, without being restricted to the times and resources of their school or community library. The Internet also gives them the opportunity to publish their projects to a world-wide audience, increasing the opportunity to find other students or adults who share their interest (Westberg, 1997).

The case of Room 2C at Kavanagh College, Dunedin, illustrates the use of the Internet for publishing. The students all produced work for a class home page, based on their own interests, such as sport and music. They were well-motivated to research and write their material, and many produced photographs and art work to include with their text, which their teacher placed on pages of their class Web site. This was a cross-curricular unit of work, integrating Technology, English and Science, but their teacher considers that most benefits were in the areas of written and visual language (Ryan, 1997). A possible future development is for the students to construct their own pages.

Using the Internet in the classroom does not guarantee or necessitate a constructivist environment. Internet sites also provide behaviourist activities such as drill and practice, quizzes, and instructional material, both interactive and non-interactive. How teachers and students use the Internet is the determining factor, rather than the Internet content.

The likelihood of teachers utilising the Internet for lessons depends not just on their recognition of the pedagogical possibilities, but also on their ICT skills and ability to design and support appropriate learning activities.

### **3.8 Teachers' ICT Skills**

A New Zealand survey by the Telecom Education Foundation (1996) found that 93% of responding primary teachers accepted that telecommunications technology can enhance learning and teaching. However they reported that schools considered that only 10-16% of their staff were highly skilled with IT or confident in using it in learning activities.

Another New Zealand survey (Zwimpfer, 1997) found less than 20% of responding schools considered that most of their staff were confident in using World Wide Web search engines. The survey showed that although 65% of the responding schools had access to the Internet, it was usually on a single machine – with less than 10% reporting widespread access (Zwimpfer 1997).

Lack of teacher development has been seen as an obstacle to technological innovation (Brown and Ryba, 1996; Alexander, 1997). An Open Polytechnic study of 40 teachers in four primary schools found that “more than two-thirds of teachers have never used the Internet” (Evening Post, 1998: 3). The Internet has been seen as an opportunity for teachers to build their own network of support (Lai (1996), but it is clear that more participation will be needed for such a community to become mainstream.

It seems clear from past experience that teachers will only use an innovation like the Internet if they are supported by professional development that goes beyond mere technical instruction. They need to re-evaluate their attitudes and philosophies, and consequently their teaching styles. For too long, technological innovations have been used to simply support their old teaching styles (Lai, 1996).

It has been argued that students and teachers will need to develop information literacy skills related to Internet use (Roberts, 1997). Rakes (1996) considers that information literacy involves the abilities to:

- know when there is a need for information
- identify information needed to address a given problem or issue
- locate the needed information
- evaluate the information
- organise the information, and use the information effectively to address the problem or issue. (p. 52)

“Cyberspace”, the world of computer usage and communication, particularly the Internet, has special text and image reading and writing skills of its own:

Digital texts can be manipulated almost endlessly. Writing, composing, drawing, constructing - all become intertwined with multi-media computing. (Roberts, 1997, p.2)

Teachers at present may be suffering a feeling of illiteracy, as they encounter the unfamiliar new skills of digital communication – such as the ability to work with hypertext, on-line writing, digital images, and a surfeit of information (Roberts, 1997). The skills needed also include social skills, technical skills, research skills and critical thinking skills (Brown, 1996).

The Internet already has some multimedia ability, and it is expected that multimedia will be its standard form in the future (ie combining text, pictures, audio, video and interactivity). This may require some new skills to be learned – such as simulation literacy, which includes the ability to discriminate between reality and apparent reality (Turkle, 1997).

However, for the present, teachers will be most aware of the need to help children develop research skills. There is a worry that children will simply cut and paste material from the Internet and pass it off as their own:

The difference between being able to do a sophisticated electronic pastiche of **information**... and building **knowledge**...seems to relate to the explicit and active role of the teacher in ensuring that the students have the skills and competencies, not just to use technology, but to succeed in this type of learning. (Gawith, 1995, p. 6)

McGregor's (1994) study of unintentional plagiarism by secondary school students supports the argument that teachers need to teach them information skills. She found that students who simply copied from sources tended to reproduce information rather than construct new knowledge. Teachers should emphasise critical thinking skills of selecting, analysing, organising and evaluating information.

In addition to the training of teachers to develop the skills necessary, there are other obstacles to be overcome in the implementation of Internet usage for teaching and learning.

### **3.9 Implementation**

For most schools the massive cost of ICT is an impediment. It has been estimated at \$200,000 for an average primary school to meet the Government's guideline of 1 computer to 5 students (O'Hare, 1996). This includes not just the hardware cost, but also maintenance, training, cabling, technical support, telecommunication costs, consumables, software and depreciation. And because of the rapid rate of improvement, "that cycle of spending will have to begin again in five years" (O'Hare, 1996, p. 19). Few schools are likely to be able to meet such a commitment, but the pressure will remain. Many schools have been using part of their technology curriculum budget for ICT equipment, but they are now finding that the technology curriculum has other needs. According to Graeme Pollock, principal of Naenae College, as far as dedicated

ICT funding is concerned “the Ministry of Education has provided zero dollars” (O’Hare, 1996, p. 20).

The cost of an ideal solution is beyond even government budgetary ability at present. So development is left to schools:

In accommodating the interactions of IT and education to the best advantage, schools must work out their own models for restructuring and changes will probably occur relatively slowly (Butler & Zwimpfer, 1998, p. 12).

Although the implementation of the Internet in schools seems to be similar to the implementation of micro-computers in the 1980s, that is, with teachers inadequately supported, there is one important difference – the Internet itself can be a source of both technical and curriculum support. Hence the suggestion that schools should “wire their teachers before they wire their buildings” (Bigum, 1995: 13).

Many factors have been identified which are hindering the widespread development of proficient computer use in New Zealand schools. Not all classrooms have computers installed, and many have obsolescent computers dating back to the 1980s. There has been insufficient teacher training – teachers need long-term training to allow time for practice or personal/professional computer usage. But most of all, there has been a “lack of models integrating technology into the curriculum” (Gawith, 1995, p. 5).

Teachers should ideally have sufficient equipment installed in their schools and properly maintained to allow them to have confidence that it will work correctly and will be there in the long term. Present funding is not sufficient to allow this ideal scenario to be achieved in the immediate future, and even if this were to change, providing resources is not enough in itself. Familiarisation with the possibilities of the technology in a teaching situation is also necessary. Alexander (1997) suggests that even more effective than in-service courses or development contracts is exploration by the teacher with a computer and an Internet connection at home at the school’s expense.

A number of other problems have been identified that may inhibit Internet usage. Equity is an issue – both the gap between the haves and have-nots and the fears that “cyberspace will become a male-dominated zone” (Brown & Ryba, 1996). The possibility of access to pornography and other inappropriate material leads to censorship

concerns. Teachers need to solve problems of classroom organisation to reduce the difficulties of monitoring Internet access.

The Ministry of Education has supported the implementation of IT technology in schools in policy rather than in practice. It has stated that it is desirable to increase computer levels to one per five students by 2001, and has estimated the cost at \$276 million, plus ongoing costs of \$157m per year in 2001. But it calls this “a challenge for the community” and states “there are no guarantees that the programmes described will proceed” (Ministry of Education 1994, p. 43).

Although teachers talk about their technical difficulties amongst themselves, it is quite unusual for teachers to report their practical problems in the literature. Beadle (1996) describes some of the problems encountered with Internet usage with tertiary students. She found using the Internet for the first time in a computer lab a stressful experience for herself and the students. There were new software programs to learn, and a large number of technical malfunctions, such as failure to make connections, incorrect e-mail addresses, and evolving changes that made reliability impossible to achieve. On top of this she had to keep track of student usage, and found students intolerant of delays (Beadle, 1996). One student evaluated the experience thus:

The Internet seems like information should be available quickly, but just the opposite is true (Beadle, 1996, p. 20).

However this may have been due to the teething troubles of a newly set up computer lab and a new course. Despite the problems encountered, Beadle seemed pleased with the outcomes, and some positive student comments were voiced at the end:

It was...neat how you could virtually go around the world...via a computer screen. (Beadle, 1996, p. 20)

Although there has been some encouragement from the government, the main driving force for use of the Internet in education has been from within schools and their communities. Perhaps the most favorable sign of planning for Internet implementation in a school is the design and publication of an Internet policy by the staff or trustees.

### **3.9.1 Internet Policies**

There is a need for both teachers and parents to be involved in policy formulation. Lai (1996) considers this to be a time for “vision building” and taking ownership of the

developments, so that they do not appear to be foisted on teachers and parents for purposes that are unclear.

The Telecom Education Foundation (1996) found that approximately three quarters of school boards recognised IT as a strategic priority, and approximately half had a comprehensive IT plan. Many schools summarise their intentions for Internet use by writing an Information Technology Policy or Internet Policy. This sets out the school's:

- reasons for IT and/or Internet use.
- plans for future IT development.
- philosophy and plans for integration into the curriculum.
- plans for teacher development.
- methods of ensuring child safety.

One consequence of a school policy is an “Acceptable Use Policy and Student Agreement” which sets out clearly the does and don'ts of Internet conduct. It covers such problems as sharing passwords, accessing offensive material, using offensive language, harrassment, disclaimers, copyright, and divulging home addresses (White 1996). A typical agreement has separate sections with responsibilities for student, parent and teacher to agree to and sign.

Many schools need expert assistance to make the step from policy to implementation. The Net Day programme has been an opportunity for schools to obtain this assistance.

### **3.9.2 Net Day**

This has been an annual event involving the community in setting up computer networks in schools, modelled on a US initiative. NetDay-97 was a pilot project involving the cabling of classrooms in 36 Wellington schools and connecting computers in these rooms with each other and with shared network resources (Zwimpfer, 1997). The main cabling effort was completed by volunteers in a single day; Saturday 28 June 1997, with school staff and industry or polytech workers completing the technical aspects. The cost to each school was \$1000 (for a NetDay kit of cables, an 8-port hub and 8 network cards) – but some schools arranged sponsorship or fundraising for these.

Most schools intended to use the network for sharing information between computers on the network, connecting to the Internet and accessing centralised learning resources (e.g. library, CD-ROMs). The main aims were to improve access for students to IT resources, to make better use of IT equipment, and to improve access for staff to IT resources. Other benefits expected included improving teachers' understanding and confidence, and the up-dating of IT in the school (Zwimpfer, 1997).

Zwimpfer (1997) identified some implementation difficulties related to the NetDay-97 project in Wellington. The cost of the NetDay kit (\$1000 for cables, fittings, network cards and hub) and the time commitment to attend meetings/training sessions were disincentives. Some schools found incompatibility with existing equipment and some technical confusion. Very few IT industry sponsors came forward, and there was no involvement or direction from the Ministry of Education.

Some unintended benefits were identified after NetDay-97, such as a higher profile amongst parents and staff of IT needs, greater confidence that the school can access the skills needed, and access to new cohorts of volunteers (Zwimpfer, 1997). Zwimpfer recommends that a follow-up survey be taken to assess progress and benefits. This study will partially fulfil this need, although concentrating on teacher perceptions rather than data about computer connections and technical success.

NetDay-98 expanded the NetDay-97 concept to allow the participation of schools from throughout New Zealand. During the writing of this report it was announced that Telecom New Zealand would sponsor Netday-99, and the Ministry of Education would also officially support it.

It can be seen that initiatives are under way to help schools get connected, both within the school and also to the outside world through the Internet. Research should accompany this innovation to ascertain its nature and its effects. The following section explores recent research and recommended directions.

### 3.10 Research Studies

An ERIC search of the literature revealed only a few published studies of teacher perceptions of the Internet. However some studies of teachers working with students using the Internet have included a section on teachers' impressions.

In a Wellington study, a group of student teachers using the Internet kept records of their activities and described their impressions (Smits, 1997). The students were impressed by the scope and features of the Internet, but generally considered it to be an inefficient and time-consuming medium, and not very useful for their own studies. The most frequent users seemed to gain more pleasure from it – e.g. using 'chat' – and became the most enthusiastic about its use. The most common view of the Internet was as a form of library or encyclopedia, but the student teachers showed recognition of the need for evaluation of the information provided. They thought the Internet should be one of the tools available in the classroom, and that the skills involved were the skills of the future, but were reluctant to accept that it could play a part in educational reform.

A survey of West Virginia teachers, library specialists and students showed that the respondents believed that the Internet did have an impact on teaching and learning. The preferred use of the Internet was for information retrieval, and it was considered a great motivational tool for students. The respondents also perceived a revolution beginning in education, affecting how learners learn and how teachers teach (Richards, 1996).

A study of 250 children using the Internet was conducted in the USA by the Centre for Applied Special Technology (CAST, 1996). The goals of the study were to measure the effects of on-line computer use on student learning, including information processing, communication and presentation skills, and to gain insights into what it takes to use on-line communications effectively in school. The results showed that, compared with control groups, students with online access

- produced better projects
- became more confident in carrying out and presenting a research project.
- used more sources, found information more quickly, and learnt more from the community at large (CAST, 1996).

Teachers in the on-line classes tended to emphasise the use of computers for adult-like purposes (gathering, organising and presenting information), while the control class teachers increased computer use for reward and basic skills. Also, the on-line teachers reported enjoying their teaching more and learning more themselves about the civil rights topic. However it is possible that the CAST study results may have been blurred somewhat by the confounding effect of the extra support that was given to the participating teachers.

Atmore (1995) and Harris (1996) have completed two phases of a New Zealand study of teachers' and students' on-line computer use. The study was limited to users of the Ministry of Education's "Schools Network" (Schoolsnet), a pilot project which provided e-mail, real-time chat, Internet, and access to information on the Schoolsnet computer, such as noticeboards and curriculum-related material.

Atmore (1995) identified three phases of user activity: "exploratory", "discovery" and "promotion". Harris (1996) reported that a year later most teachers, previously in the "exploratory" phase, had moved on to the "discovery" phase. This showed that regular involvement was producing a gradual increase in confidence and usage of on-line computers.

The study found that the most common use of Schoolsnet was for e-mail, followed by information from the Schoolsnet directories and noticeboard. Over half had used it to access the Internet, but it seems that this did not include the World Wide Web, since Schoolsnet was a text-only menu-driven service. This made Schoolsnet seem something of an anachronism in that it lacked modern features like a mouse-controlled interface and graphics capability, and offered an alternative to the Internet rather than integrating with it.

Nevertheless, the study covered some issues relevant to Internet usage:

- Charges: most schools thought Schoolsnet should be free. Many found that cost limited usage.
- Curriculum requirements: most wanted by teachers were lesson plans, Schoolsnet guidance, and teaching resources.

- Contribution to students' education: most teachers considered Schoolsnet contributed to students' education. Some examples were:
  - access information and improve research skills
  - learn about computer technology and networks
  - extending communications
  - enlarge their awareness of the world
  - help students' learning (Harris, 1996).

However there were indications that Schoolsnet was not fully satisfying the needs of teachers. Many disliked the menu-driven interface, and some showed an intention to compare alternative networks (presumably including commercial ISP access to the WWW). Some used the Schoolsnet service from home in the evenings due to lack of time at school. Many did not have good access in a suitable location in their school, which affected both their own use and their students' use (Harris, 1996). It seems likely that many of these factors will also be directly applicable to Internet usage in schools.

Although there has been a great deal of research related to ICT in schools, especially the use of stand-alone computers, the results have not been producing a clear message. Some possible causes for this are examined in the next section.

### **3.11 Research Issues**

Some studies have identified small positive effects in the use of ICT in education, but there has been difficulty in separating the ICT effects from other concurrent effects. The inconclusiveness of the results has been attributed to the inappropriate use of "scientific method" research in a social environment. People are too complex to control in an experimental way, so it is not possible to control all factors to measure an independent variable. A change to qualitative methods is recommended (Roblyer, 1996).

The introduction of ICT changes the whole learning environment, including resources and communication as well as what is learned and how it is learned (Rowe, 1995). Some of these changes may have effects, and these may be related indirectly to the introduction of ICT. Rowe recommends a holistic approach in which the relationships between the components of the learning environment are studied in order to discern changes. The perceptions of participants should be included as data to record changes in

such intangibles as satisfaction and motivation. These are important outcomes, adding to the quality and success of education, despite the attention given to improved scores in assignments and examinations.

Gawith (1995) identifies the following issues as those of key significance to New Zealand schools:

- the quality of student learning in a technology enhanced environment
- the cognitive skills needed by the students
- the role of the student in controlling the learning
- the role of the teacher in designing and facilitating that learning.

All of these are relevant to this study, which approaches them from the teachers' perceptions.

Some authors see research in this area as exploration of expected paradigm shifts:

How can the paradigms of the way we teach shift as a result of students and teachers having access [to the Internet]? Will they shift? What support mechanisms need to be in place to promote positive change? All of these questions demand further study. (Black, Klingenstein & Songer, 1995b: 55)

More attention should also be paid to teachers' views of educational technology (Miller and Olson, 1995). Teachers have the right to be consulted.

It can be seen, then, that the place of the teacher can be viewed as pivotal in the introduction of innovative technology into education. The goodwill and collaboration of teachers is necessary for any reform to take place, and the incorporation of the Internet as an educational resource depends on a great deal of extra time and professional development from individual teachers. The value of the Internet in education depends on what teachers perceive it to be, and whether they consider that it meets a need in their classrooms.

### **3.12 The Problem Underlying this Research**

The problem underlying this research is that of teachers' participation in the introduction of the Internet as an educational innovation. It has been shown in this chapter that the educational value of Internet is a subject of debate, and it is appropriate that teachers be given the opportunity to enter this debate in order to determine the

appropriateness of the Internet as an educational resource. This will require teachers to become familiar enough with the Internet and its pros and cons to make a judgement about whether it has a place in their classroom.

The literature shows that some teachers are already making occasional use of the Internet in an effort to enhance and extend their teaching practices. However, they are a minority at present, and some authors have begun to compare the introduction of the Internet to other technological innovations that have seemed so promising at first but ultimately proved disappointing. They were pioneered eagerly by a few teachers, but the majority chose not to follow.

The case for the introduction of the Internet in schools has been based on a change of educational paradigm to an approach which enables students to learn skills of life-long independent learning. The intention is to enable them to explore the real world to find answers and solve problems, creating new knowledge in the manner of adult researchers. The Internet is seen as the vital link between the students and the outside world which will make this possible. School students are not as mobile as adults, and ICT is seen as a technology that overcomes problems of distance, time and expense in getting information and communicating with people around the world.

However it has been shown in the literature that there are many obstacles to the Internet becoming an educational panacea. Despite the futuristic scenarios presented by some authors, others have brought us down to earth with more immediate problems that need to be overcome. Is the Internet affordable enough and reliable enough to enable students and teachers to use it regularly? Will schools have enough computers and Internet connections to allow students to have sufficient access? Can schools ensure that the Internet is a safe place for students?

Perhaps these problems will eventually be overcome, but should teachers be expected to engage with a technology while it is still so immature? One of the mistakes made with earlier educational technologies is that they were trumpeted and introduced before sufficient appropriately designed educational content was available. Teachers had to make do with material that did not suit their teaching methods, and so chose either to ignore it or to use it ineffectively.

To summarise, the aim of this research study is to obtain a snapshot of how teachers perceive this new technology, the Internet, at an early stage of its introduction. This study is not aiming to record the progress of the Internet as an innovation, but rather, to give teachers a chance to offer their opinions about whether it meets their needs and the needs of their students as a teaching and learning resource. Whether it becomes a central tool of education depends on how valuable it seems to teachers.

## Chapter Four

# Methodology

### 4.1 Introduction

It was shown in chapters one, two and three that the Internet has been promoted as an educational resource, but has yet to become a widespread innovation in New Zealand classrooms. Some aspects of the Internet seem to fit well with the theoretical and practical requirements of constructivist learning, but whether it becomes an established resource in schools depends on the reception it gets from teachers. In this study teachers were surveyed, using questionnaire and interview techniques, to ascertain their perceptions of the Internet as an educational resource.

The following sections outline the aim of the research, the research questions, the sample, and the justification of the use of questionnaire and interview methods. Ethical safeguards are outlined, and the two phases of the research are described, with limitations noted.

### 4.2 The Aim of this Research

This study originated with the researcher's informal observation that parents, teachers and teacher educators were far from unanimous about the value of the Internet for teaching and learning. It seemed that the uptake of the Internet in schools depended not on whether the Internet helps teachers and children to produce better learning outcomes, but whether teachers perceive that there are benefits and wish to pursue them. It has been suggested that new innovations are easily ignored by teachers (Cuban, 1986) and that teachers' uptake of innovations such as the Internet depends on their own perceptions of the benefits (Collis, 1996). A gap was identified in the published literature, so this study concentrated on listening to teachers' views and opinions about the Internet, as well as gathering descriptions of teachers' experiences.

The aim of this research is to describe and analyse the perceptions that teachers have of the Internet in terms of its suitability as a resource for teaching and learning. It was considered important to find out the impressions and opinions of teachers who had not

used the Internet as well as those that had, in order to find out whether they think the Internet is suitable for teaching and whether they intend to use it.

### 4.3 Research Questions:

The following questions guided the research:

1. What are the intentions of primary school teachers in relation to Internet use?
2. What are the factors that primary school teachers perceive inhibit or enhance the use of the Internet for teaching and learning?
3. How do Internet-using teachers utilise the Internet for teaching and learning?
4. What roles do teachers adopt during Internet-related activities in the classroom?

### 4.4 Justification for Methods

So far most experimental or analytic research into the effects of ICT on learning has been inconclusive (Rowe, 1996). This seems to be due to the complexity of the learning environment. It seems that we need to examine the effects of ICT in context within the learning environment rather than as an independent variable. The identification of causal correlations is elusive in the learning environment because of the multiplicity of interactions taking place. According to Rowe (1996) “a particular variable may fail to predict a specific outcome not because the two are genuinely unrelated, but because numerous other variables obscure the *visibility* of their relationship” (p.7).

One way recommended for overcoming the difficulties of confounding variables is to use teachers’ perceptions as a source of data for educational research:

Firstly, what is the most valid source of information about the learning environment, - outsiders’ views or insiders’ perceptions? On both methodological and theoretical grounds, there are reasons to employ the latter source of data, i.e. the perceptions of insiders. To paraphrase Kurt Lewin: An environment is what people experience and perceive it to be (Rowe, 1996, p. 4).

This study follows the philosophy that teachers’ perceptions of what they need, what children need, and what is happening in their classroom are vital components in understanding why certain practices are utilised or avoided. Rather than just observing and recording teachers’ actions, an effort has been made to listen to teachers’ views and opinions. This approach has an affinity with the interpretivist beliefs that our

understanding of reality, especially of social situations, is not absolute truth, but is interpreted in the light of relevant theories and experience (Smith, 1992).

It has been necessary in this research study to employ methods from both the quantitative and qualitative approaches. Cresswell (1994) favours a two-phase design, separating the quantitative and qualitative elements, with the result that if data overlaps there should be the added benefit of cross-checking data. He cites the combination of questionnaire and in-depth interview as an example.

This combination was also used in this study in a two-phase design:

Phase One: Questionnaire.

Phase Two: Interviews.

The reason for using a combination of quantitative and qualitative methodologies in this research study was:

- to enable both wide-scale and finer-grained contextual data to be gathered.
- to provide survey data to use in the selection procedure for interviews that followed.

Phase one used a self-administered questionnaire, considered an accepted method for obtaining information about a person's knowledge, values, preferences, attitudes, beliefs and biography (Tuckman, 1978). Some researchers consider the postal questionnaire to be frequently the best form of survey in education. There is no need to keep it short - this does not improve response level, and may make it seem trivial (Cohen and Manion, 1994). However there is some concern that the validity of questionnaire items is limited by the ways that questions can influence a respondent's answer, and the fact that respondents find it difficult to assess themselves (Tuckman, 1978). The questionnaire instructions allowed respondents to leave any questions unanswered, which would hopefully relieve some of the pressure to respond where questions were difficult.

#### **4.5 The Research Population and Sample**

Wellington schools were the research population. Schools that had participated in NetDay-97, which had been limited to the Wellington region, provided the sample used. This gave some confidence that the sample of teachers would have had adequate access to the Internet to participate meaningfully. Surveying the teachers approximately 12

months after Netday-97 would also serve the purpose of producing a descriptive and interpretive snapshot of the effects of NetDay after a year of exposure and use.

The Netday-97 schools were a group of 47 Wellington schools which had opted to take up the offer of the 20/20 Communications Trust to facilitate the installation of an 8-point network connecting classrooms (Zwimpfer, 1998). Several factors were acting to limit the membership of this group: each school had to consider a cost of approximately \$1000 for cables and network hardware, the need to train approximately 20 volunteers, and the usefulness of the final network.

#### **4.5.1 Sample Selection**

This study was aiming for a descriptive/interpretive approach rather than experimental or statistical, so a purposive sample has been used. Although random sampling is often recommended to ensure that the sample is representative of the population (Kerlinger, 1986), this is more vital in an experimental situation or where a hypothesis is being tested, and where statistical analysis is to be applied, and is often considered unmanageable in field work.

#### **4.5.2 Procedure**

Principals were sent a letter requesting permission to involve their schools in the study (see Appendix A). Permission was granted in eighteen schools out of 47 contacted, and enough questionnaires (with return envelopes) sent to each school for distribution to all of their teachers.

The distribution of school types was:

- Inner city primary            4
- Intermediate                    1
- Suburban primary            8
- country primary                1
- private school                 4

Principals were later asked to complete a form stating the number of teachers at their schools (see Appendix E ). The 18 schools had 229 full-time teachers (including principals) and 31 part-time teachers – a total of 260.

## **4.6 Phase One: Questionnaire**

This was a questionnaire-based survey of a sample of primary teachers to determine the impressions they had formed about the Internet and their perceptions of its usefulness, appropriateness and viability for them and to their pupils. One of the intentions of the questionnaire was to obtain a self-selected sample of teachers willing to be interviewed in depth about their use of the Internet for teaching. The intended number of interviewees was 6 – a figure that would be manageable and produce a wide enough range of data for comparisons and generalisations within the sample.

The questionnaires were distributed to ten participating schools in June 1998. When the returns had been received, it became apparent that too small a sample had been obtained (although approximately 70 questionnaires were returned, only 3 teachers volunteered to be interviewed). So in August a second group of eight schools was surveyed using the same instrument (with the result that the number of interviewees increased to the desired number of 6). This meant that all 18 schools that had given permission were now included.

### **4.6.1 The Questionnaire Design**

The questions in this questionnaire were designed to obtain data pertinent to the research questions in section 4.3 above. They were in several formats, including a response-keyed format to avoid respondents needing to answer questions that are not relevant to them. For example, a teacher who had only used the Internet on a personal basis did not have to answer the section on classroom use. Some of the questions were designed to provide suitable information for selecting the case study participants for phase two of the study.

Most of the questions were of the closed form. Closed and open question forms give similar information, so one is not inherently superior (Gall et al, 1996). But closed form makes quantification and analysis of results easier and also demands minimal effort from the respondents, which may favour a higher response rate (Gall et al, 1996). Response modes were mostly scaled checklist types, since these are quick for the respondent and easy to tally. There were a few unstructured-response questions where necessary.

The questionnaire makes wide use of Likert type scales, which have been recommended for collecting information about attitudes (Gall et al, 1996). A proven example is a five-point scale ranging from *strongly disagree* to *strongly agree*, as used in this study (Gall et al, 1996).

Questionnaires have been found to have a poor rate of return (Tucker, 1978), but it has been shown that follow-up letters can raise the return rate considerably (Gall et al, 1996). All questionnaires distributed in this study had addressed/paid return envelopes attached, and reminder letters were sent to principals with extra questionnaires and return envelopes approximately one month later (see Appendix E).

To help encourage a good response rate the following advice was followed. The questionnaire:

- looked easy and attractive - clear wording, simple design.
- allowed respondents to air their views rather than describe behaviour.
- started with simple questions.
- had clear instructions, including return method and thanks.
- included a stamped addressed envelope.
- included a short covering letter stressing the importance of the survey to the profession. (Cohen & Manion 1994).

The questionnaire was pilot-tested on a teacher and a College of Education lecturer, who have both used the Internet for teaching, before finalising its format. Their suggestions were used to improve clarity. This helped ensure that the questionnaire items were suitable in terms of discriminability and avoidance of ambiguity.

The questionnaire (Appendix D) was in 5 sections:

***Part A: Staff Position/Computer Use/Internet Use***

The purpose of this section was to gather data about the background of the respondents in terms of teaching experience, computer experience and Internet experience. It also

contained questions designed to identify teachers who had already used the Internet in lessons with children.

***Part B: Using the Internet for Teaching and Learning***

This section was answered only by teachers who identified themselves in Part A as having used the Internet for lessons with children. Its purpose was to gather descriptive data about educational Internet experiences.

***Part C: Your Opinions***

The purpose of this section (answered by all respondents) was to obtain data about teachers' perceptions of the value, usefulness and appropriateness of the Internet as an educational resource.

***Part D: Getting Connected***

This section concentrated on teachers' perceptions of the technical and operational aspects of the Internet.

***Part E: Children and the Internet***

This short section was included to obtain data about teachers' perceptions of the way children would respond to the Internet. The instrument used is derived from the "Personal Involvement Inventory" of Zaichkowsky (1994). The main changes have been the reduction of his 7-point scale to a 5-point scale, and the addition of an extra criterion – "complex/simple".

## **4.6.2 Ethics**

Recommendations of the Massey University *Code of Ethical Conduct for Research and Teaching* (1997) were followed. No questions were included that were intrusive, offensive or irrelevant to the study. Participation was voluntary, and no questions were compulsory. Participants had the right to withdraw at any time.

An information sheet for respondents was included with the questionnaire (see Appendix C), on Massey letterhead paper, covering the following recommended items:

- identity of researcher and supervisor(s), and contact details

- nature and purpose of the study
- statement about anonymity, confidentiality, right to decline to answer
- information about the selection process
- availability of results
- statement: “It is assumed that filling in the questionnaire implies consent.”

The design of the questionnaire allowed teachers to remain anonymous and not disclose their schools, apart from the six teachers who volunteered to be interviewed. These teachers have been assigned alphabet letters as pseudonyms to protect their identities.

### **4.6.3 Analysis**

The questionnaires were divided into two groups on the basis of the answers to question 12: *“Have you already used the Internet in lessons with children.”*

Group 1. Internet users

Group 2. Non-users.

The raw questionnaire data was tallied and then compiled as a set of Microsoft Excel spreadsheets. Computer analysis of questionnaire data has been recommended for calculations such as frequencies and percentages of respondents checking each response category on closed-ended questions (Gall, Borg & Gall, 1996). For analysis data was converted to a series of graphs and tables which have been included in chapter 4, along with explanatory notes.

It is recommended practice to include several comments from open-ended questions to provide the respondents’ perspectives (Gall, Borg & Gall, 1996), a technique that has also been applied in this study.

The results from the questionnaire are reported in chapter 5, and discussed in chapter 7.

## **4.7 Phase Two: Interviews**

Phase Two involved in-depth interviews with some of the teachers who answered the questionnaire in Phase One. Six teachers answered Yes to Question 6 of the questionnaire (see Appendix D), volunteering to have an interview about their Internet

experiences with children. They identified themselves by entering their name and school, but their names have been replaced by alphabet letters as pseudonyms throughout this report.

#### **4.7.1 Interview Design**

The teachers were contacted and appointments were arranged by telephone. All six teachers were interviewed in quiet rooms at their schools, with the questions and responses being recorded on audio tape.

A set of standard questions was used to provide some uniformity of coverage in the interviews. But teachers were encouraged to expand on these areas of discussion, or digress into issues that they thought were relevant, and subsidiary questions and prompts were used to clarify comments or gain more detail.

The standard questions were:

1. *Can you please describe how you have used the Internet with children?*
2. *What sort of work did the children produce as an outcome?*
3. *How did the Internet improve the lesson?*
4. *What difficulties did you and the children have?*
5. *What were your main roles in the lessons where children used the Internet?*
6. *Do you think the Internet is a suitable resource for all teachers to use?*
7. *Do you have any other comments to make about the Internet as an educational resource?*

#### **4.7.2 Ethics**

An ethical statement was provided to the teachers stating the purpose of the study and guaranteeing confidentiality and the opportunity to correct or remove from the transcript

any statements they had made. They were informed that at the conclusion of the study they would be invited to comment on the final report. Teachers were also assured that data would be confidential and that they could withdraw from the research at any time, and they were asked to sign a consent clause (see Appendix F).

### **4.7.3 Analysis**

The tapes were transcribed by Wellington College of Education typists, and a copy of the transcripts sent to the interviewees for corrections and deletions. These changes were incorporated into the final transcripts (2 teachers requested small changes to clarify their meaning in a few statements).

The interviews have been summarised to give a detailed picture of the experiences of each teacher. These summaries, included in chapter 6, provide detail about the programmes, outcomes, problems, perceptions and recommendations of the individual teachers.

The interviews were also coded by key words and phrases, and these were compiled into a matrix which compared similar statements and recorded their frequency of occurrence, thus identifying of common themes and problems. The themes and problems identified are also reported in chapter 6.

## **4.8 Limitations of the Methodology**

Although the questionnaire was distributed to all teachers at the NetDay 97 schools opting to participate, there was a possibility that a non-respondent effect would introduce bias. That is, there may have been a difference between the respondents and non-respondents. Ethical requirements made it impracticable to check this non-respondent effect because it would have required identifying the respondents.

This study did not gather directly any observational data about the use of the Internet in schools, and so is dependent on the accuracy of reporting by the participants in the questionnaire and interviews. This reduces the validity of data about the activities, problems and outcomes of the teachers and children using the Internet in the classroom. However, the interviews were an opportunity to cross-check the reporting in the

questionnaires. There was some overlap of question content, and an opportunity to follow up in the interviews any issues and problems that arose in the questionnaire.

#### **4.9 Summary**

This research study used both quantitative and qualitative methods in a two-phase design – a questionnaire followed by interviews. Influenced by the interpretivist philosophy, it aimed not to seek an absolute truth about the suitability of the Internet for education, but to gather data on teachers' perceptions about this. Teachers' experiences, roles and intentions were also surveyed, and six teachers interviewed in depth about their experiences and opinions. Wellington schools formed the population under study, and NetDay 97 schools the sample. Ethical considerations have been covered, and data analysis methods outlined.

## Chapter Five:

### Results: Phase One

#### 5.1 Introduction

This chapter presents the results of Phase One, a questionnaire distributed to all teachers at 18 of the Wellington schools that participated in NetDay97. The questionnaire is included as Appendix D.

The questionnaire was completed and returned by 132 of the 260 teachers in the 18 schools surveyed. This was a return rate of 51%.

#### 5.2 Classification

At the tallying stage the responses were divided into two groups:

- (a) the teachers who had used the Internet in lessons with children and
- (b) the teachers who had not (determined from question 12 of the questionnaire).

These two groups are called the "Internet users" and the "non-users" for the purposes of the analysis.

Separation of the results into Internet user and non-user groups has enabled comparisons to be made to determine similarities and differences in backgrounds, perceptions and opinions.

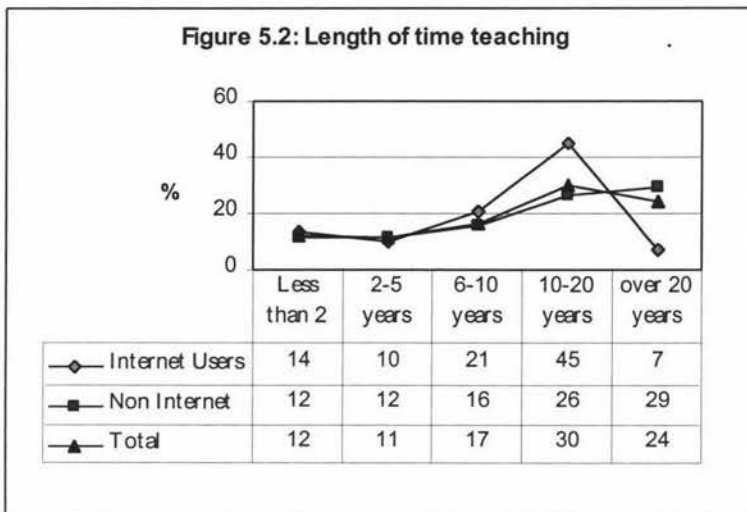
The results are presented here as tables and graphs. The use of line graphs implies data is of a ranked nature (stepped rather than continuous). Table and figure numbering has been integrated to match the questionnaire questions e.g. Figure 4.23 matches question 23.

#### 5.3 Questionnaire Part A: Background of respondents

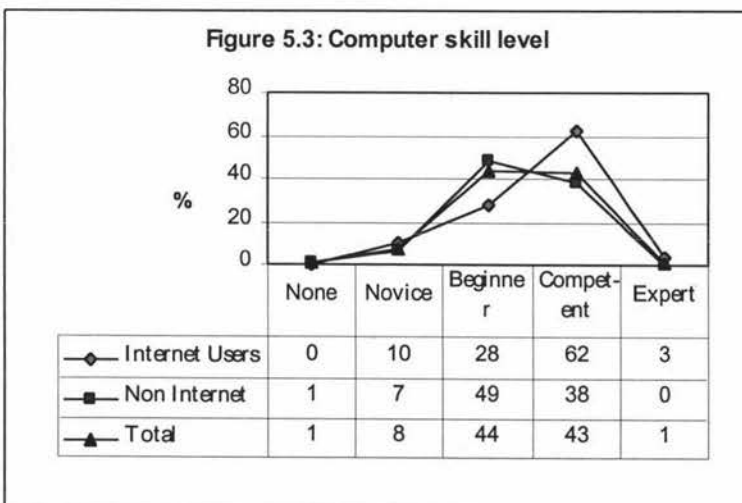
This section provides data from the first part of the questionnaire, which examined the backgrounds of the respondents, such as teaching position, computer use and Internet use. It includes questions that pertain to the research question: *What are the intentions of primary school teachers in relation to Internet use?*

	Scale A Teacher	Senior Teacher	Deputy Principal	Principal	Other
Internet Users (%)	59	14	10	7	10
Non Users (%)	51	17	8	8	14
Total (%)	53	17	8	8	13

Both groups had a majority of scale A teachers, which was slightly more pronounced in the Internet-using group, at 59% compared with 51% for the other group (Table 5.1).



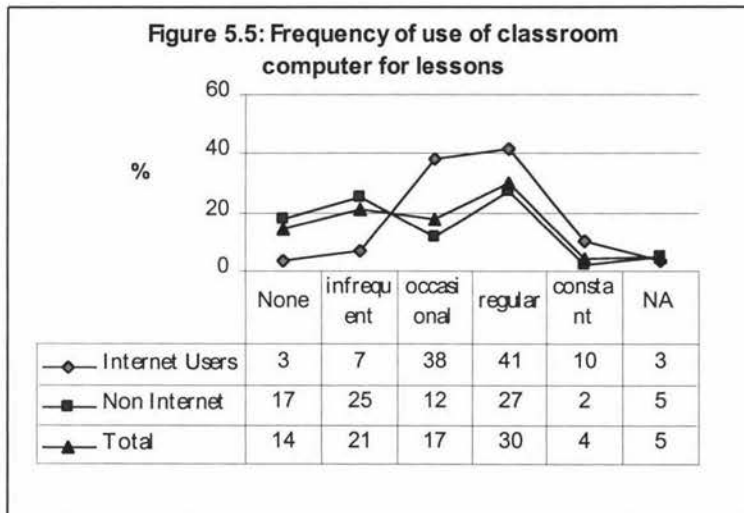
The Internet-users had a large group of teachers (45%) in the “10-20 year” band, and only 7% in the “over 20 years” band. The non-Internet users group were most commonly in the “over 20 years” service band (Fig 5.2).



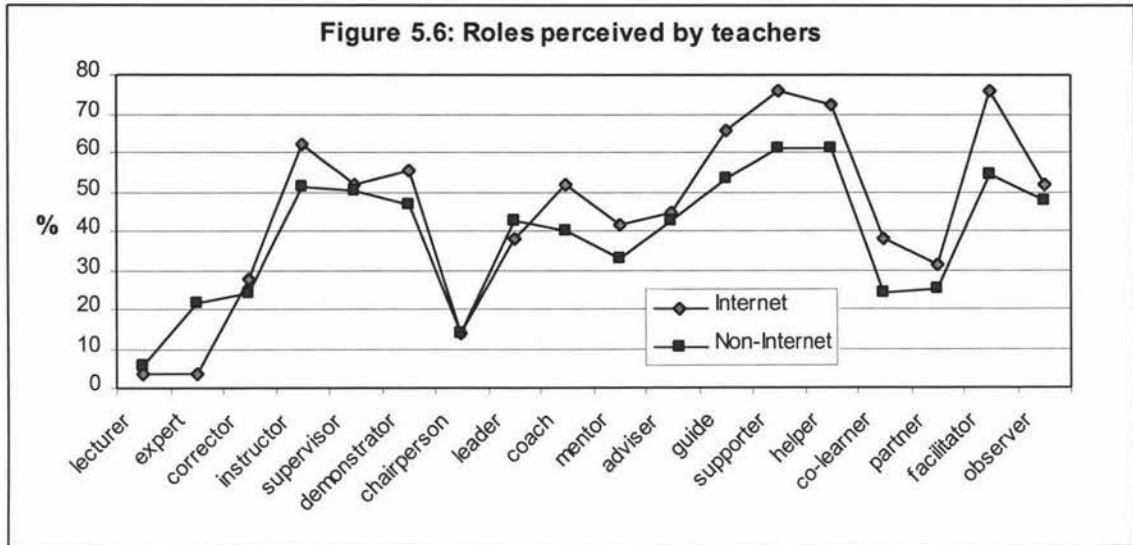
62% of the Internet-using teachers considered themselves “competent” computer users, compared with only 38% for the other group. The non-Internet-users were more likely to be “beginners” (Fig. 5.3)

	None	Acorn	Macintosh	PC	Other
Internet Users	3	3	38	55	7
Non Internet	9	21	27	36	4
Total	8	17	30	40	5

Table 5.4 shows that PCs were the most common computer type for both groups, being used by 55% of internet users and 36% of non-users. For both groups Macintoshes came second. The main difference was the presence of a significant number of Acorn users amongst the non-Internet-using teachers (22%).



As seen in figure 5.5, the Internet-using teachers used computers for lessons more frequently – “regular” use was their most common category (41%), followed by “occasional” (38%).



Teachers were asked to identify roles they perceived themselves to use either “often” or “sometimes”. Here the roles have been ranked (by the researcher) from most teacher-centred to most child-centred. The “often used” category was graphed because it gave clearer separation of the groups. The resulting graph (Figure 5.6) shows both groups consider themselves to be more likely to use child-centered roles such as facilitator or supporter, rather than teacher-centred roles such as lecturer or expert. However, the Internet-using teachers had a slightly greater tendency to be more child-centred in their roles.

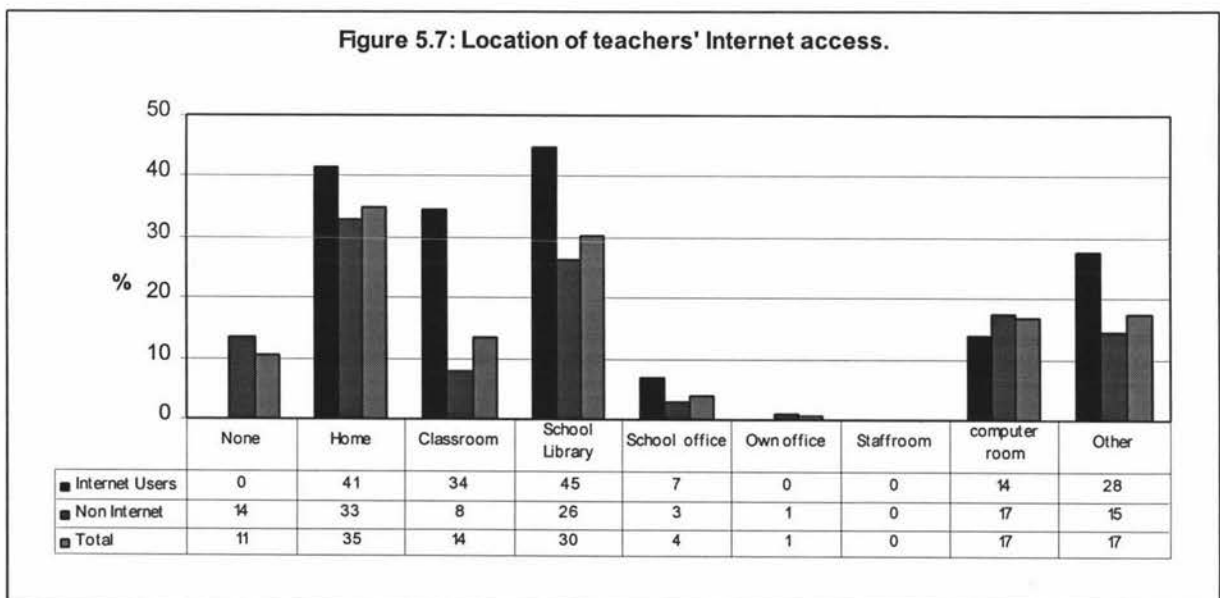
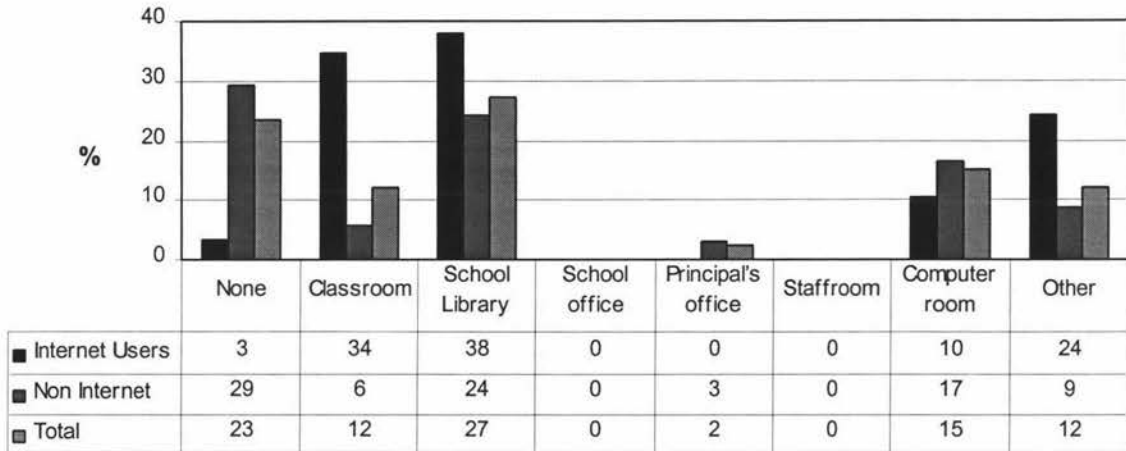


Figure 5.7 shows that for the Internet-using teachers the school library was the most common location for access to the Internet (45%), followed closely by home (41%) and

their classroom (34%). For teachers who did not use the Internet in lessons, the main access points for personal use were home (33%) and school library (26%), with only 8% having classroom access.

Figure 5.8: Location of childrens' Internet access.



For children in the classes of Internet-using teachers the library was the main location for Internet access (38%), closely followed by their classroom (34%). For the classes of non-Internet-using teachers the library was the main access location (24%), and 29% had no Internet access at all (Fig. 5.8).

Figure 5.9: Teachers' perceived Internet skill level

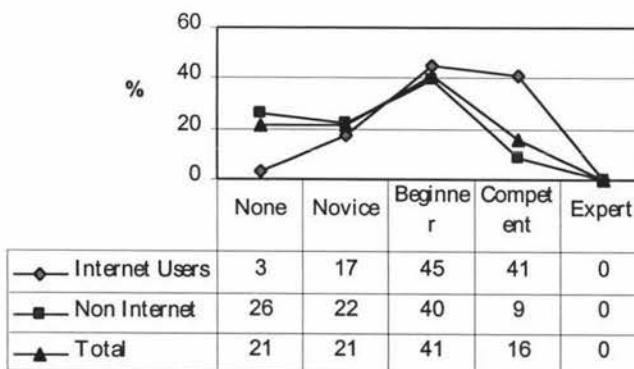
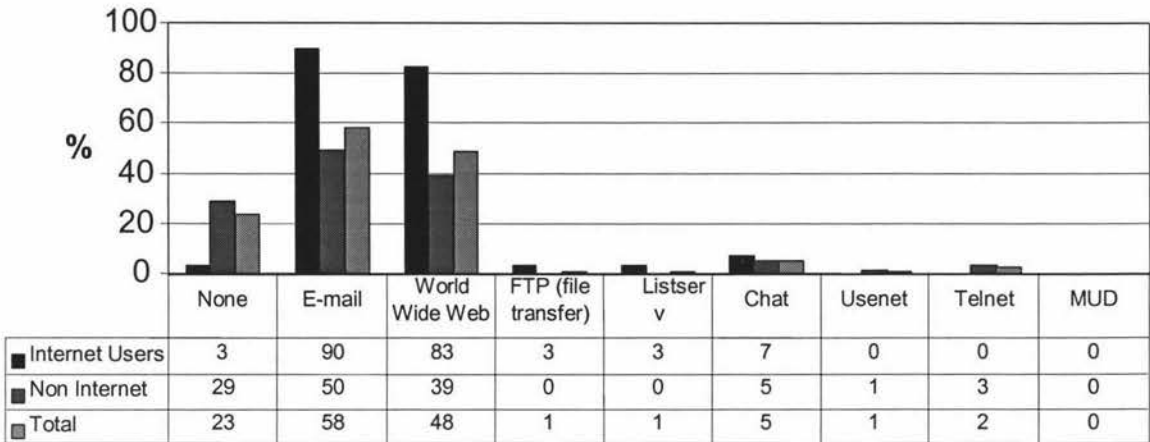


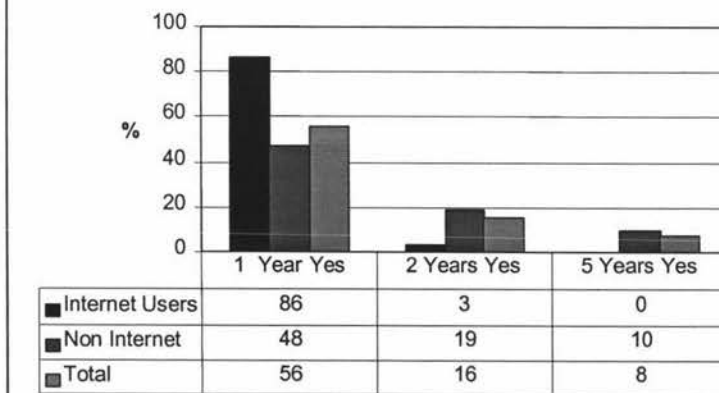
Figure 5.9 shows most of the Internet-users were in the beginner-competent range for Internet skill, while the non-users were most commonly "beginners" (40%). Neither group had any teachers who considered themselves Internet experts.

Figure 5.10: Internet services used by teachers



According to Figure 5.10 the Internet-using teachers mainly used only two services of the Internet for personal or professional purposes: e-mail (90%) and the World Wide Web (83%). The teachers who did not use the Internet for lessons, but used it for personal purposes, also used mainly these two services, but lower percentages are involved: 50% using e-mail and 39% using WWW. 29% of them did not use the Internet at all.

Figure 5.11: Intentions to use Internet with children



86% of the Internet-using teachers intended using the Internet with children within the next year, compared with only 48% of non-Internet-users. However 77% of non-users intended using it for lessons within 5 years (Fig. 5.11).

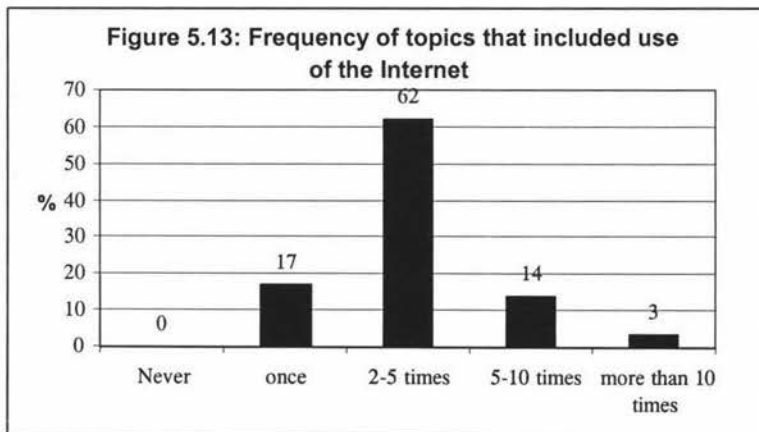
Yes (Internet used)	29	22%
No (Internet not used)	103	78%
Total	132	100%

Table 5.12 shows that 29 of the teachers who responded to the questionnaire (22%) said they had already used the Internet in lessons with children. These data were used to divide the respondents into the two groups used in reporting the results: i.e.

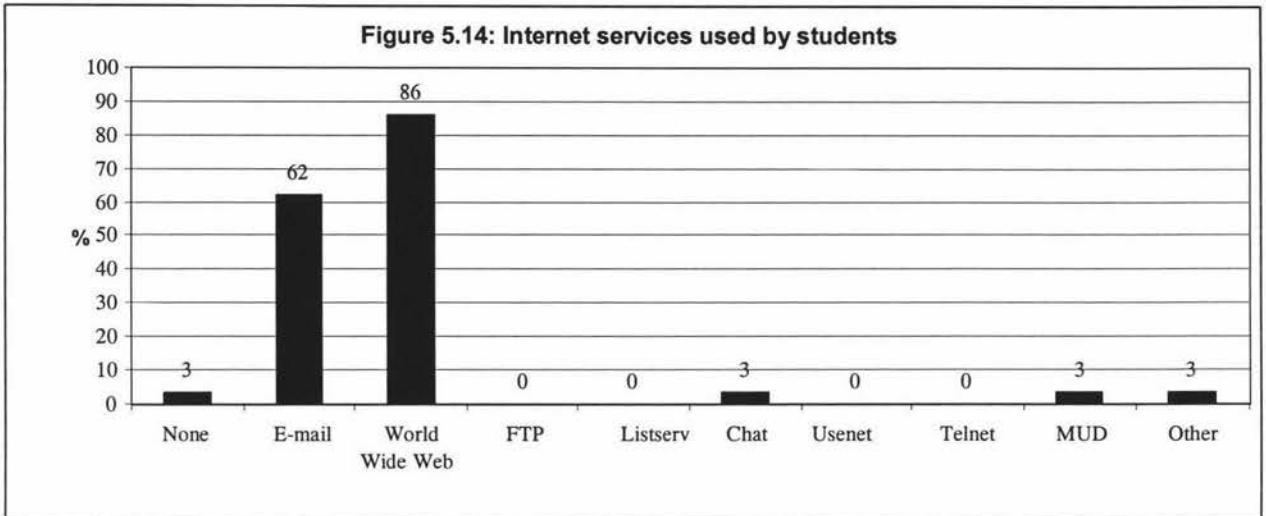
- *Internet Users*: teachers who have used the Internet in lessons with children and
- *Non-users*: teachers who have not.

### 4.3 Questionnaire Part B: Using the Internet for teaching and learning

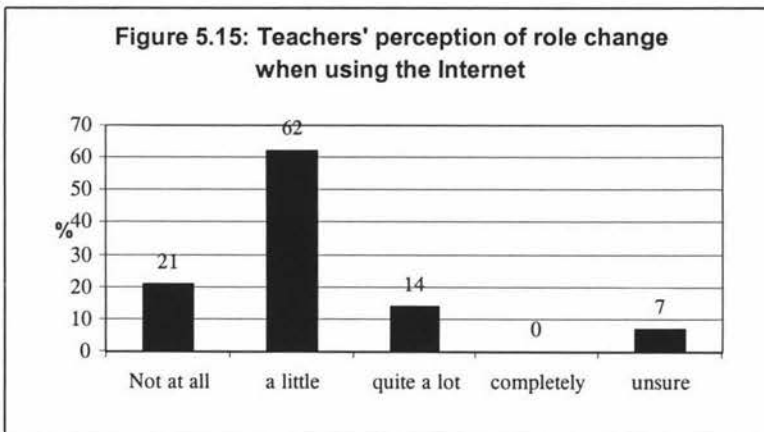
This section provides the results of questions directed to teachers who identified themselves in Part A as having used the Internet in lessons with children. The data presented here pertains to the research question: *How do Internet-using teachers utilise the Internet for teaching and learning?*



Most of the Internet-using teachers (62%) had used the Internet with children for 2 to 5 topics. Only 3% had used it for more than 10 topics (Fig. 5.13).



As shown in Figure 5.14, the main Internet services used by children were the World Wide Web (86%), and e-mail (62%). Other services were used very little or not at all.



Most of the Internet-using teachers (62%) thought that using the Internet had changed their role in the classroom a little, but none thought it had changed their role completely (Fig. 5.15).

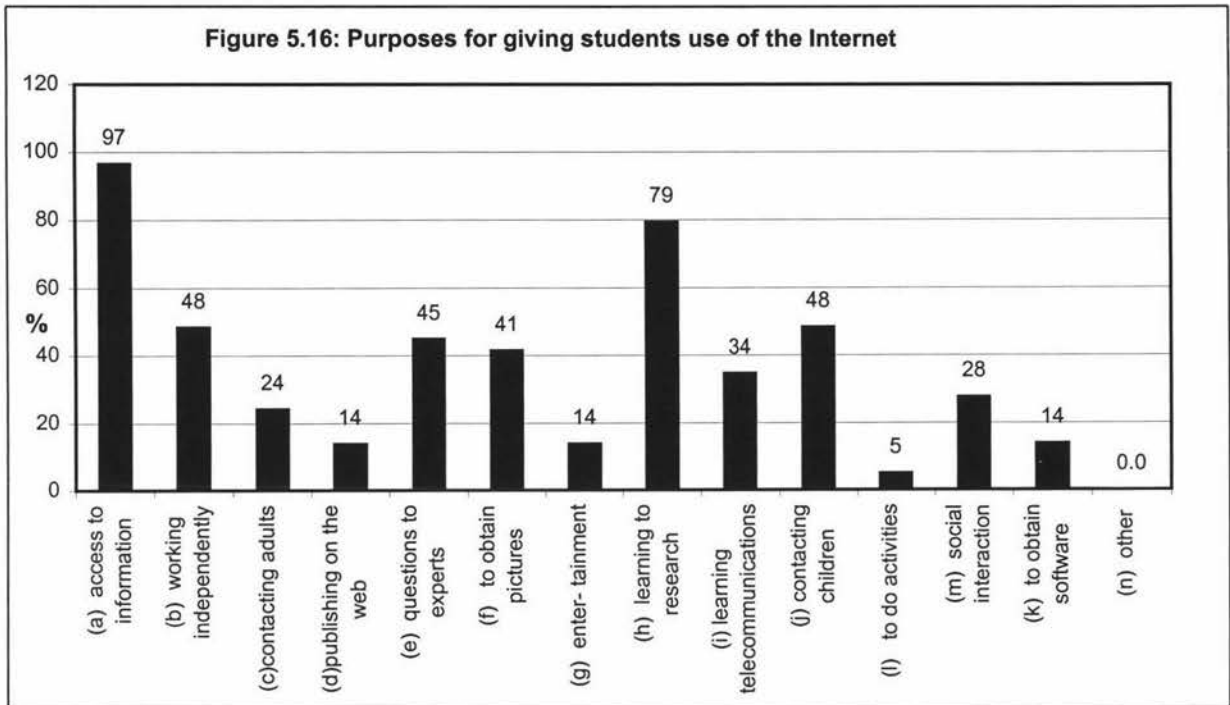


Figure 5.16 shows that teachers gave their students use of the Internet for a wide range of purposes. The most frequent were “access to information” (97%) and “learning to research” (79%). The least frequent purposes were “activities”, “entertainment”, “publishing” and “to obtain software”.

**Table 5.17: Teachers’ Descriptions of Internet Usage with children.**

Key-words	Occurrences
Research	<ul style="list-style-type: none"> <li>• “<u>Researching</u> space exploration.”</li> <li>• “To <u>research</u> information about little blue penguin.”</li> <li>• “<u>Researching</u> information on Nepal for a project.”</li> <li>• “<u>Research</u> about playground technology topic - children did a search and accessed and printed out pages.”</li> <li>• “<u>Research</u> on museums -visited museum sites around the World.”</li> <li>• “Mainly <u>research</u> skills.”</li> <li>• “Personal <u>research</u>.”</li> <li>• “In topic studies they <u>research</u> on the net. I access info and they present it in their language on charts.”</li> </ul>

	<ul style="list-style-type: none"> <li>• “<u>Research</u>.”</li> <li>• “<u>Research</u> on disasters...”</li> <li>• “Action learning - <u>research</u>.”</li> <li>• “E-mailing experts for Antarctic <u>research</u>.”</li> <li>• “Individual/class groups working with a teacher to e-mail other schools, experts, and <u>research</u> for info.”</li> </ul>
World Wide Web	<ul style="list-style-type: none"> <li>• “To access the World Vision ‘Sunflower Connection’ <u>web-site</u>. The children will follow Pauline McLeod’s trip to Malawi.”</li> <li>• “Unit on disasters - children accessed <u>CNN</u> [web site]for updates on Afghanistan earthquake and US cyclones.”</li> </ul>
E-mail	<ul style="list-style-type: none"> <li>• “<u>E-mailing</u> experts for Antarctic research.”</li> <li>• “<u>E-mailing</u> class whilst overseas.”</li> <li>• “Research on disasters - students <u>e-mailed</u> around the world various organisations for information. Also asked questions of experts.”</li> <li>• “<u>E-mailing</u> children at another school.”</li> <li>• “Individual/class groups working with a teacher to <u>e-mail</u> other schools, experts, and research for info.”</li> <li>• “Communicating with other schools - <u>e-mail</u>.”</li> </ul>
Information	<ul style="list-style-type: none"> <li>• “Mainly to access <u>information</u>.”</li> <li>• “I’ve used it to down-load <u>info</u>, children have used it to look at pictures.”</li> <li>• “Another teacher asked for <u>information</u> (internationally) on playground games and printed messages for us to share.”</li> <li>• “Finding <u>information</u> about yoghurt in other countries.”</li> <li>• “To research <u>information</u> about the little blue penguin.”</li> <li>• “Researching <u>information</u> on Nepal for a project.”</li> <li>• “...Internet was only access to valid and meaningful <u>information</u>...”</li> </ul>
Action learning	<ul style="list-style-type: none"> <li>• “<u>Action learning</u> - research.”</li> </ul>
Resource-based learning	<ul style="list-style-type: none"> <li>• “<u>Resource-based learning</u> - children in my class have needed to find out answers about famous artists we have looked up.”</li> </ul>

Project	<ul style="list-style-type: none"> <li>• “Teddy bear <u>project</u> - pen friends in Israel.”</li> <li>• “Classroom <u>project</u> in contact with children in the US.”</li> </ul>
Search	<ul style="list-style-type: none"> <li>• “<u>Searching</u> for info (weather).”</li> <li>• “...children did a <u>search</u> and accessed and printed out pages.”</li> </ul>
Activities	<ul style="list-style-type: none"> <li>• “Used the ‘Sunshine’ page <u>activities</u>.”</li> </ul>
Intranet	<ul style="list-style-type: none"> <li>• “In conjunction with C.O.E. where students set up an <u>intranet</u> for the children on a topic.”</li> </ul>
IEP	<ul style="list-style-type: none"> <li>• “As part of an <u>IEP</u> to key the student into learning by following his interest in a particular subject - for which the Internet was the only access to valid and meaningful information (ice hockey - current world expert players).”</li> </ul>
Problem solving	<ul style="list-style-type: none"> <li>• “As part of a Future <u>Problem Solving</u> topic on disasters boys used the net to find out about past disasters e.g. Kobe earthquake.</li> </ul>

Teachers were asked to describe one example of how they had used the Internet with children. The question was answered by 27 of the 29 teachers who had identified themselves as having done Internet work with children. Their answers have been collated in Table 5.17.

Most of their Internet activities involved getting the children to search for information about a topic. Some of these activities involved the whole class and some involved groups or individuals, but the proportions of these were not clear.

“Research” was a strong theme in their descriptions, -- mentioned directly by 45% of these teachers. Other descriptions also referred to research indirectly with phrases such as “access information”, “did a search”, “asked questions”, “down-load info”, “e-mailing experts” and “find out” – bringing the total of research-related examples to 76%. Most of the children’s Internet work was information-based.

Some teachers described the presentation of the information - using terms such as “a project”, “present it in their language on charts” which implied some processing of the

information. Some other teachers only mentioned “printed out pages” or “look at pictures”.

Most of the activities implied that the World Wide Web was used – since “searching” is most effective with the WWW search engines and indexes. However some classes used e-mail to directly contact experts, teachers, and other children to get or share information.

Most teachers seem to have allowed children to do their own searching, but in some cases teachers did the searching and provided print-outs or Intranet pages to speed up the search process.

Two teachers mentioned the “action learning” or “resource-based learning” approach, whereby students are guided in the process of researching and processing information.

One teacher described an IEP project in which a student was able to work on an individualised project.

One teacher mentioned the use of prepared activities that are available on the WWW – in this case the “Sunshine” web site.

## 5.4 Questionnaire Part C: Teachers' Opinions About the Internet

This section of the questionnaire asked teachers how much they agreed or disagreed with statements covering a range of opinions about the nature, effects and usefulness of the Internet. It pertains to the research question: *What are the factors that primary school teachers perceive inhibit or enhance the use of the Internet for teaching and learning?*

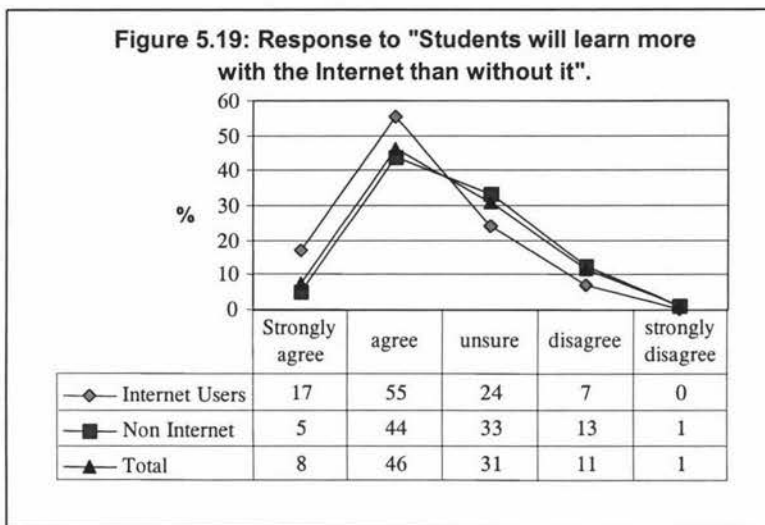
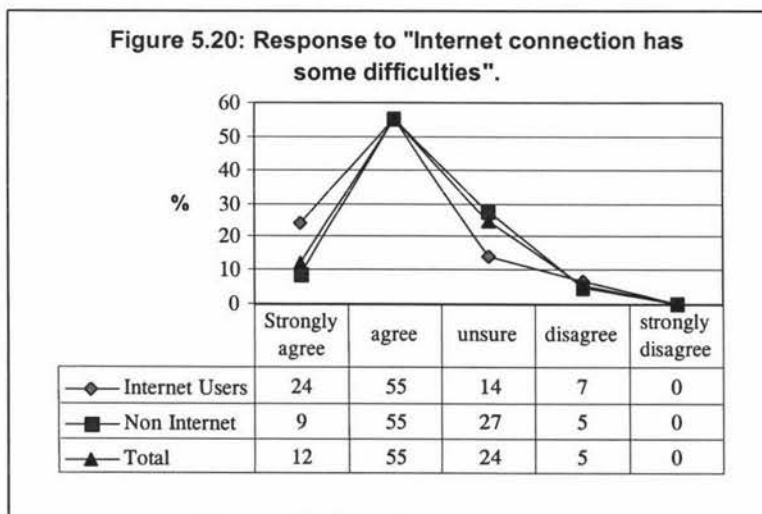
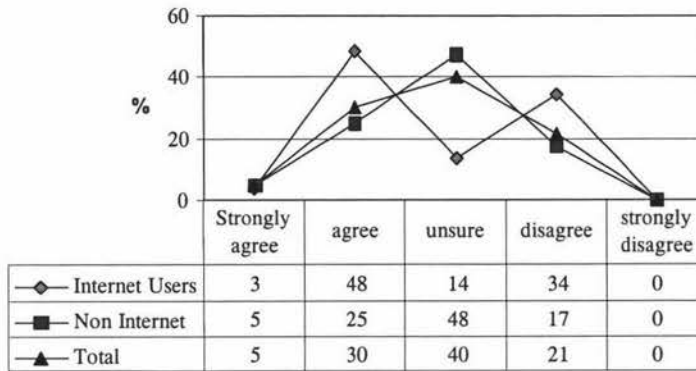


Figure 5.19 shows that most of the Internet users (72%) thought that students would learn more with the Internet than without it. Non-users agreed, but less firmly (49% agree/strongly agree).



In both groups the majority considered that Internet connection had some technical difficulties. More Internet users strongly agreed (Fig. 5.20).

**Figure 5.21: Response to "It is hard for children to find what they want on the Internet".**



The Internet users were divided about whether it was hard for children to find what they want on the internet. For the non-users "unsure" was the most common response (Fig. 5.21).

**Figure 5.22: Response to "The Internet will improve the way you teach".**

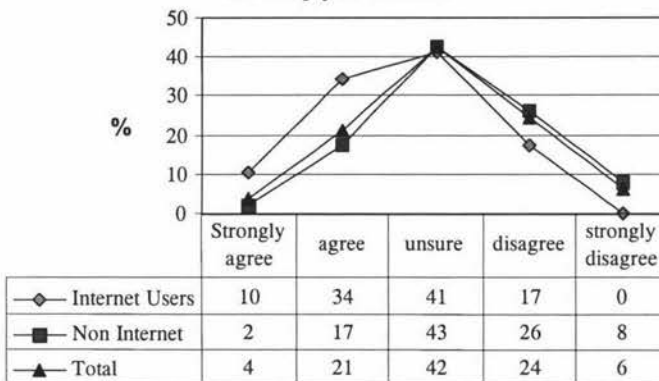


Figure 5.22 shows that 44% of Internet-users believed the Internet would improve their teaching, compared with 19% of non-users. However, both groups had large percentages of teachers who were unsure about this (41% and 43%).

**5.23: Response to "The Internet will enable your students to improve their research skills".**

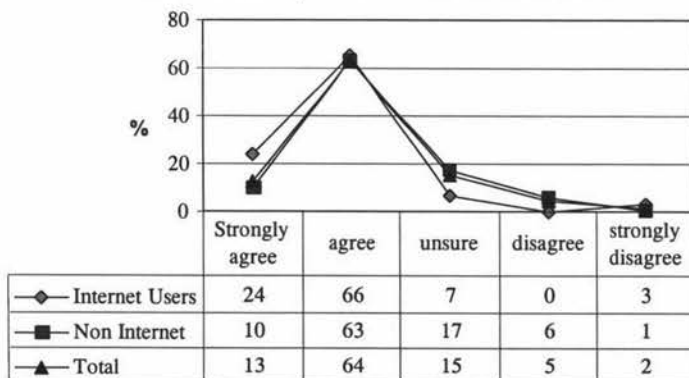
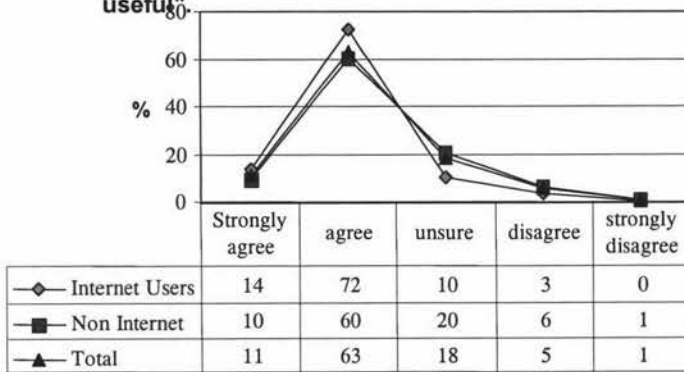


Figure 5.23 shows that 73% of non-Internet-users believed the Internet would enable students to improve their research skills. An even higher percentage (90%) of Internet-users agreed.

**Figure 5.24: Response to "The Internet will make the computer in your classroom more useful."**



The majority of both groups agreed that the Internet would make the computer in their classroom more useful (Internet-users 86%, non-users 70%), as shown in Figure 5.24.

**Figure 5.25: Response to "Students will enjoy using the Internet".**

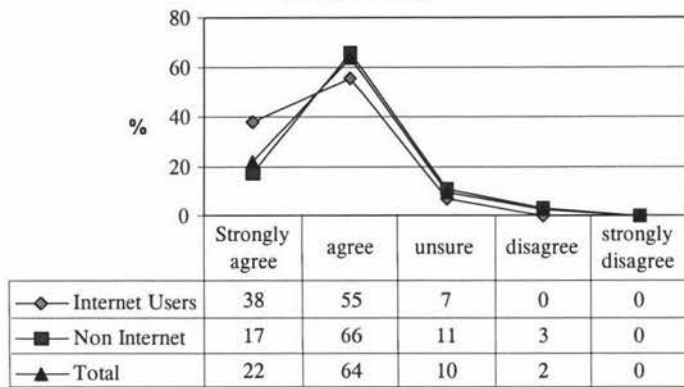
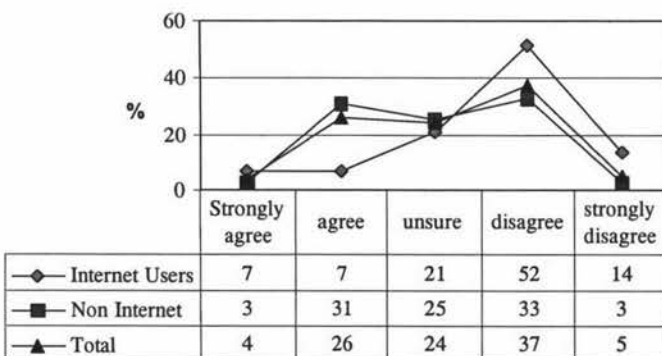


Figure 5.25 shows that both groups thought that students would enjoy using the Internet (Internet-users 93%, non-users 83%).

**Figure 5.26: Response to "The Internet is an unsafe place for children because of "adult" material".**



Most Internet users did not think adult material made the Internet an unsafe place for children. The non-users were divided though, with 34% agreeing and 36% disagreeing (Fig. 5.26).

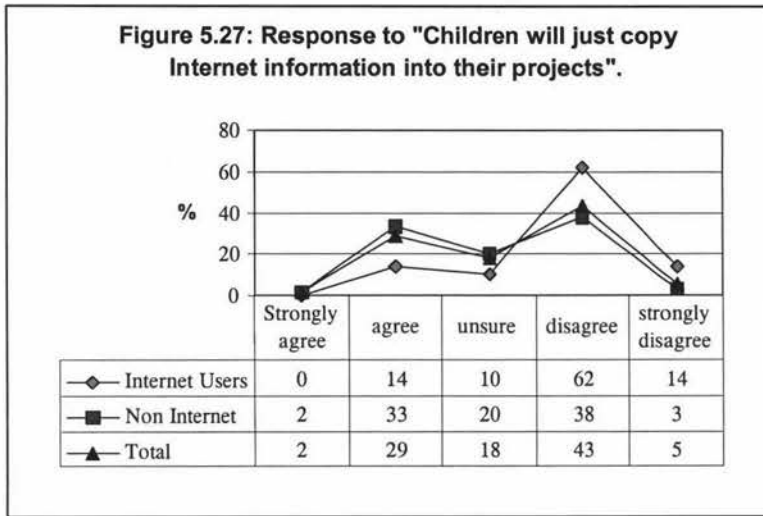
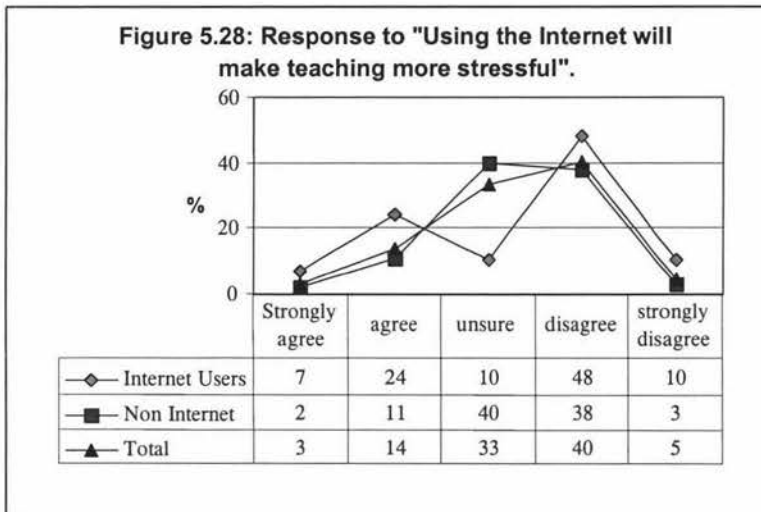
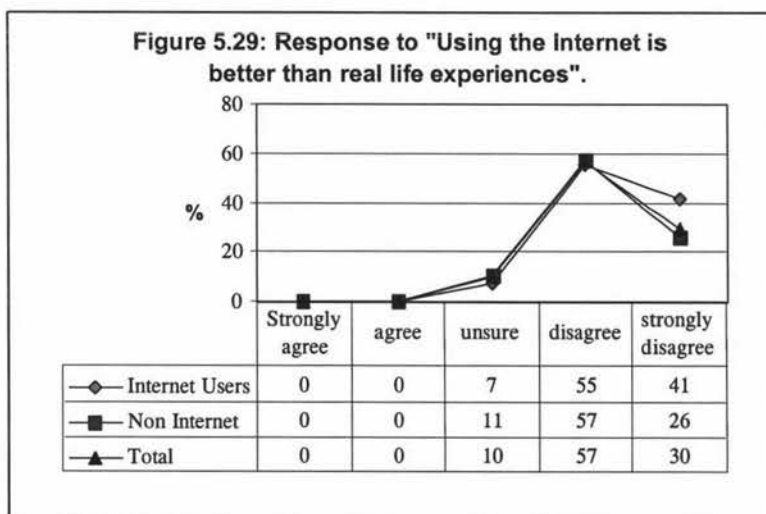


Figure 5.27 shows that most of the Internet users (76%) considered that children would not just copy Internet material into their projects. The non-users were divided.

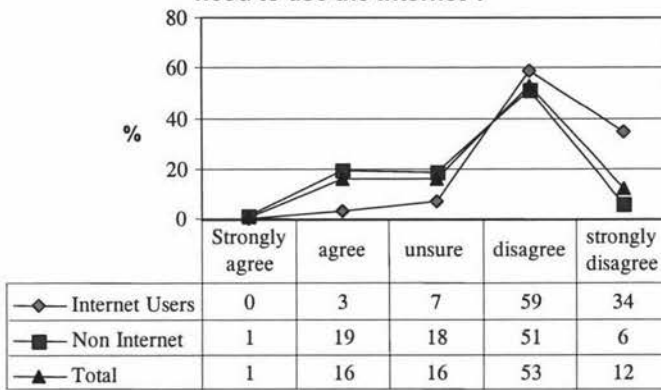


58% of the Internet users did not think using the Internet would make teaching more stressful. Many non-users (40%) were unsure. (Fig. 5.28).



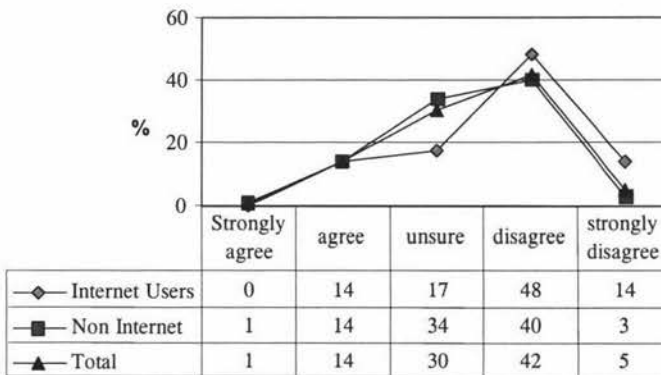
According to Figure 5.29, both groups believed that real life experiences were better than the Internet.

**Figure 5.30: Response to "A good teacher does not need to use the Internet".**



Almost all (93%) of the Internet users and the majority of non-users believed that a good teacher did need to use the Internet (Fig. 5.30).

**Figure 5.31: Response to "A library is more useful than the Internet for research".**



Neither group considered a library more useful than the Internet for research (Internet users 62%, non-users 43%). However the non-users were less sure about this (Fig. 5.31).

**Figure 5.32: Response to "Children will waste time with distractions on the Internet".**

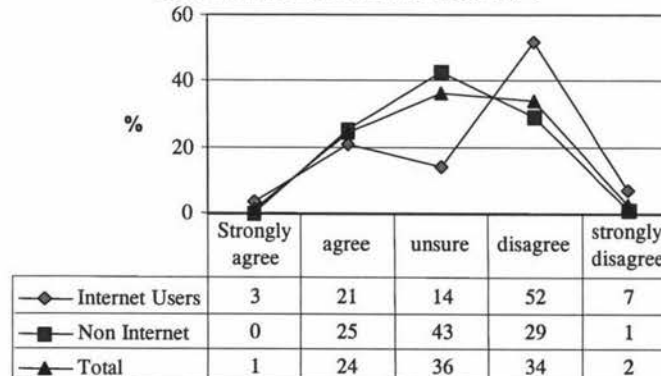
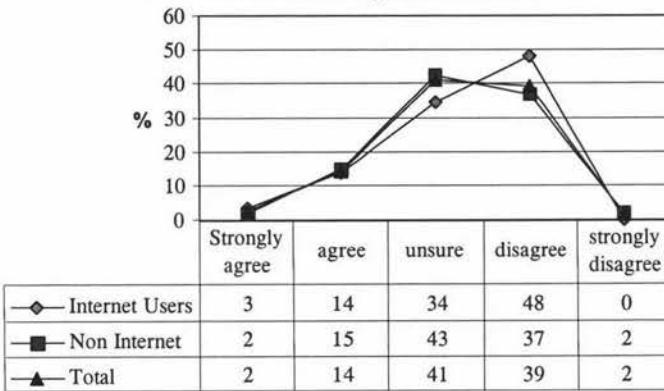


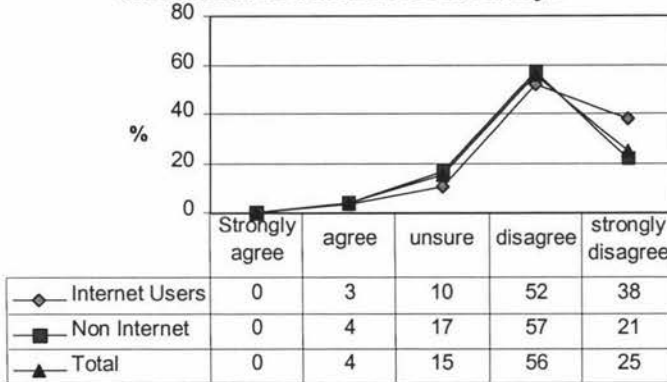
Figure 5.32 shows that most of the Internet-using teachers (59%) believed that children would not waste time with distractions on the Internet, but many of the non-users (43%) were unsure.

**Figure 5.33: Response to "Teachers should change their role when using the Internet".**



As seen in Figure 5.33, many teachers were unsure about changes to teacher's roles when using the Internet. But 48% of Internet users and 39% of non-users believed teachers should not change their role.

**Figure 5.34: Response to "All material on the Internet can be relied on for accuracy".**



Most of the teachers (90%) considered that not all material on the Internet could be relied on for accuracy. 38% of the Internet users emphasised this strongly (Fig. 5.34).

**Figure 5.35: "Teachers should have the right to decide whether the Internet is appropriate for their classroom".**

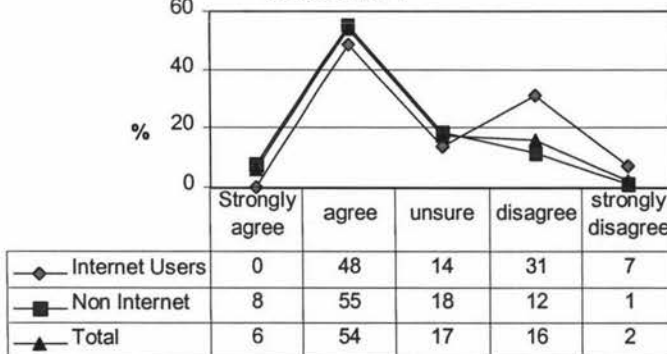


Figure 5.35 shows that both groups generally agreed that teachers should have the right to decide whether the Internet was appropriate for their classroom. But a substantial minority of Internet users (38%) disagreed.

## 5.6 Questionnaire Part D: Getting Connected

This section of the questionnaire was concerned with the effect of implementation matters on whether teachers use the Internet with their classes. This includes technical, training and support issues. The following data pertains to the research question: *What are the factors that primary school teachers perceive inhibit or enhance the use of the Internet for teaching and learning?*

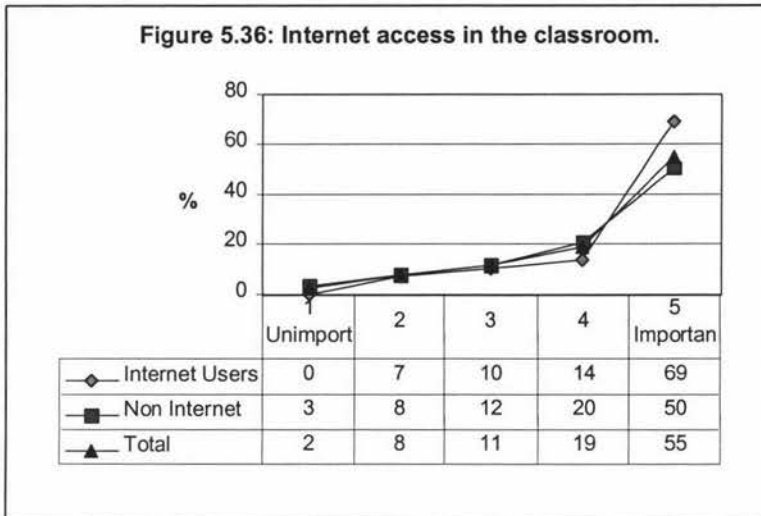
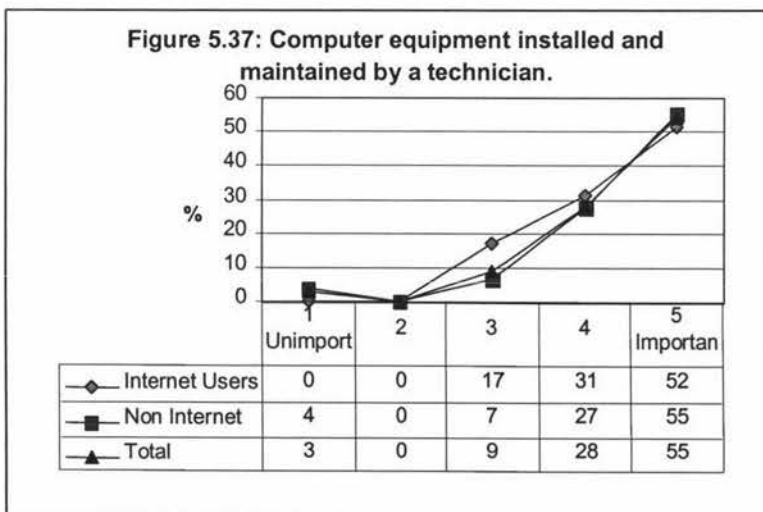
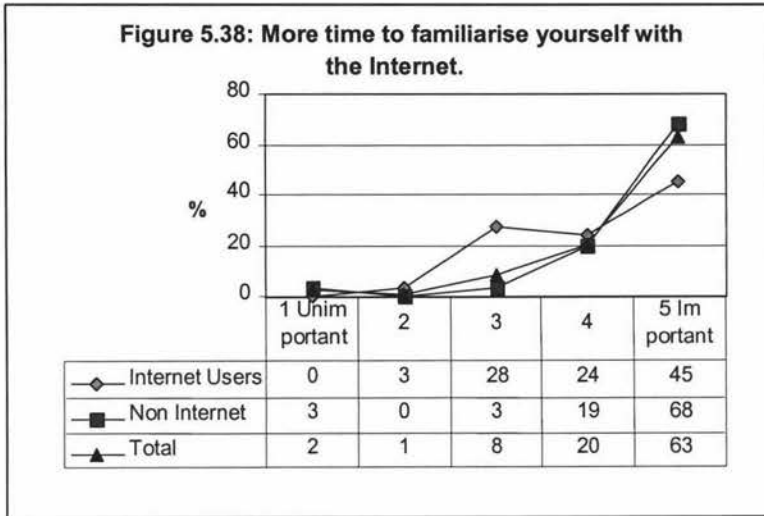


Figure 5.36 shows that most teachers, particularly the Internet-using group, considered that access in the classroom was an important factor.



The use of a technician to install and maintain equipment was considered important by both groups (83% in total) (Fig. 5.37).



Both groups saw a need to familiarise themselves with the Internet, particularly the non-user group (87%) (Fig. 5.38).

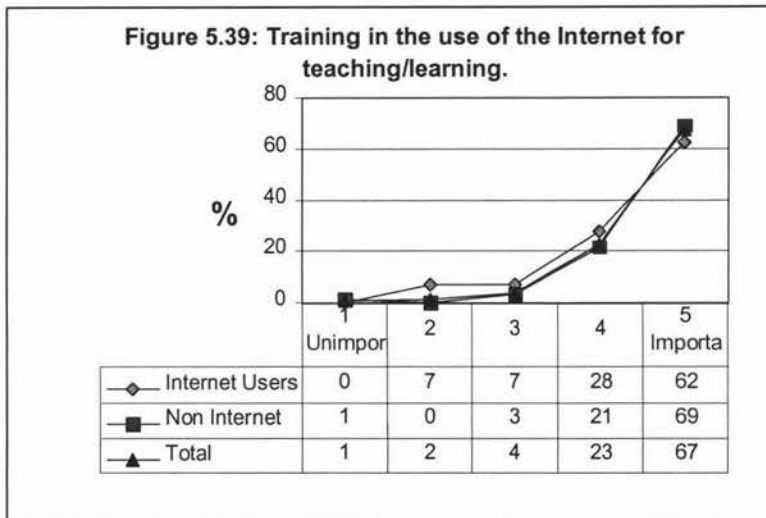


Figure 5.39 shows agreement on the importance of training in the use of the Internet for teaching and learning (90% in total).

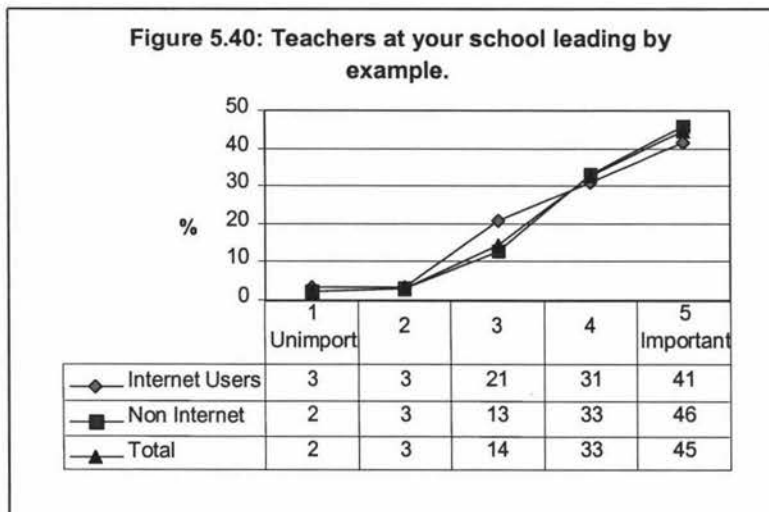
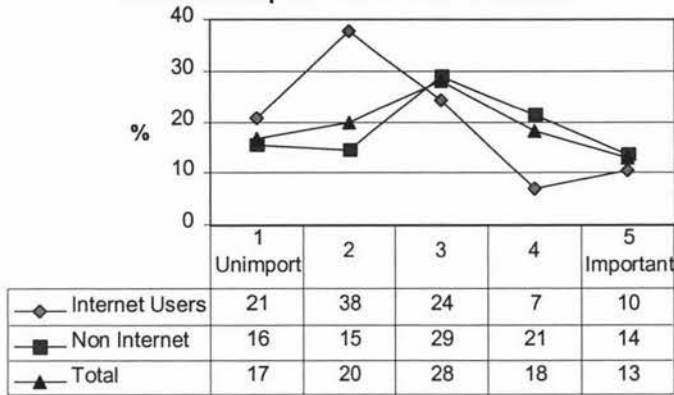


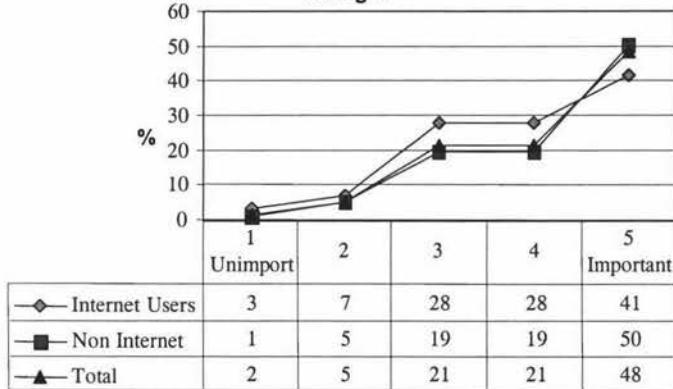
Figure 5.40 shows that having teachers leading by example was considered to be important (by 78% in total).

**Figure 5.41: Provision of a computer room with Internet computers for the whole class.**



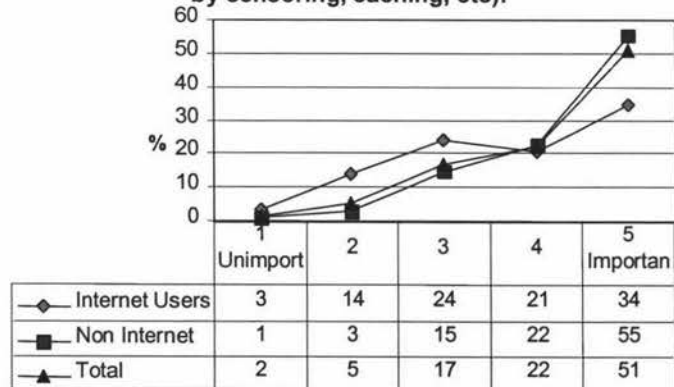
Having a computer room with Internet computers for the whole class was unimportant to Internet users, but the non-users were unsure (Fig. 5.41).

**Figure 5.42: Internet access provided free of charge.**



Having Internet access free of charge was considered to be an important factor, especially by the non-users (Fig. 5.42).

**Figure 5.43: Internet made "safe" for children (e.g. by censoring, caching, etc).**



Making the Internet safe for children was considered to be more important by the non-users (77%) than the Internet users (55%) (Fig. 5.43).

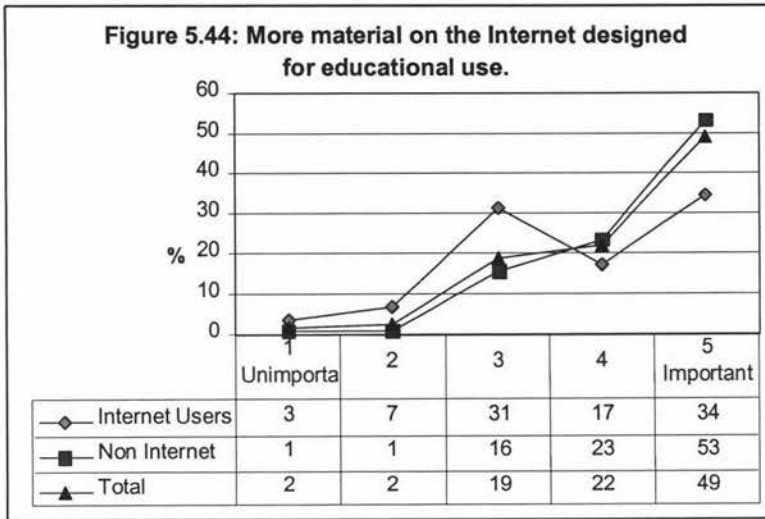
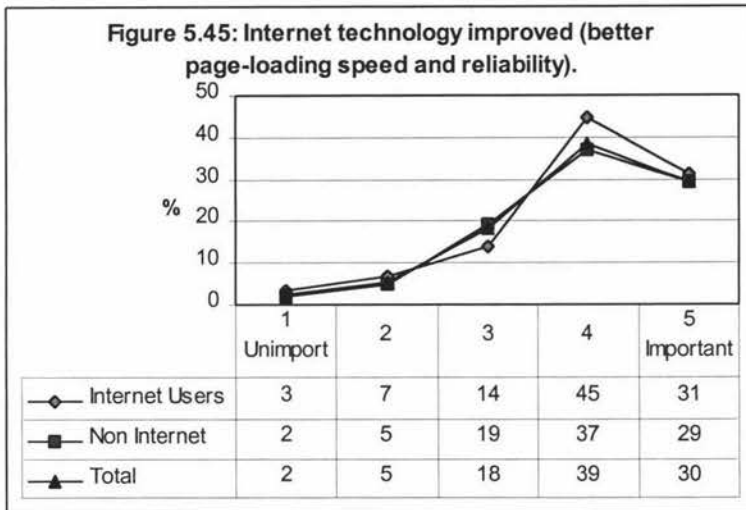
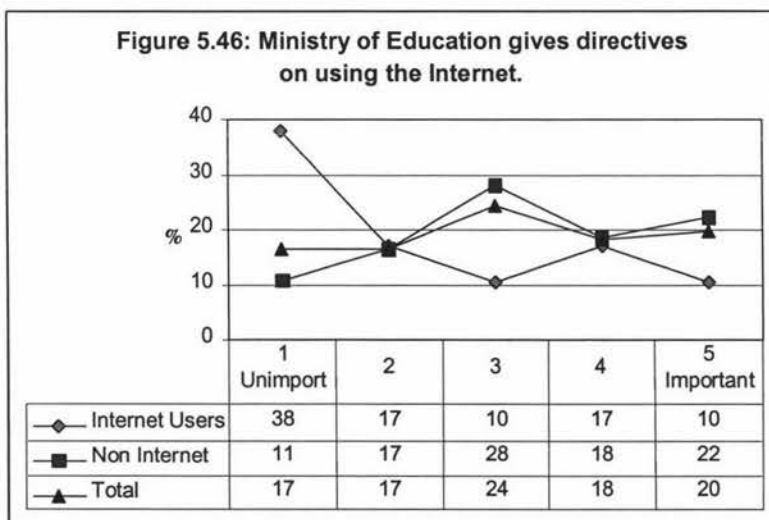


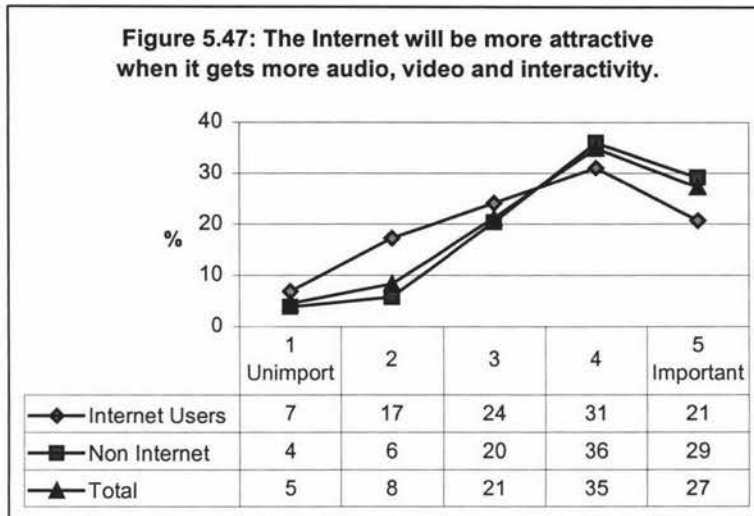
Figure 5.44 shows that the provision of more educational material on the Internet was considered more important by the non-users than by the Internet users (76% versus 51%).



As seen in Figure 5.45, both groups considered improvements in Internet technology (such as better page-loading speed and reliability) to be desirable (69% overall).



The majority of Internet users did not consider Ministry of Education directives to be an important factor in their using the Internet. However the non-user group was neutral, as shown in Figure 5.46.

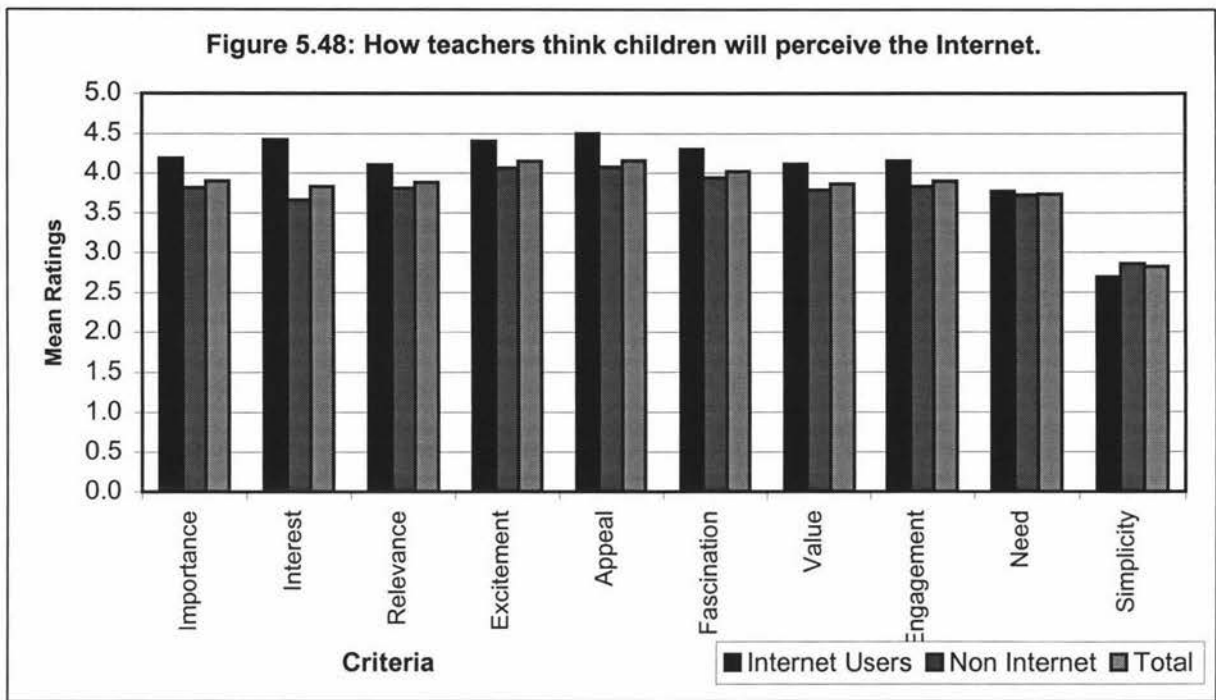


Both groups considered the enhancement of the Internet with audio, video and interactivity to be quite important (65% versus 52%) (Fig. 5.47).

## 5.6 Questionnaire Part E: Children and the Internet

This section of the questionnaire aimed to determine how teachers thought children would perceive the Internet. It pertains to the research question: *What are the factors that primary school teachers perceive inhibit or enhance the use of the Internet for teaching and learning?*

Teachers rated ten criteria on a score of 1 to 5 according to how they expected children would value the Internet. The mean of the ratings was then calculated for each of the criteria.



Both groups perceived that children would rate the Internet highly for most of the criteria in the rating survey, as seen in Figure 5.48, with the Internet-using teachers having higher expectations for all criteria except one. The exception was “simple” which received a medium rating by both groups.

## 5.8 Comments from teachers

Table 5.58 presents the data from the final question of the questionnaire: “Do you have any other comments about the use of the Internet for teaching or learning?”. The teachers’ comments have been grouped by key-words below (all of the teachers comments are included). The Internet-using teachers comments have been marked with an asterisk (\*).

<b>Table 5.58:</b>	
<b>Other comments about the use of the Internet for teaching and learning</b>	
<b>Key-word</b>	<b>Comment</b>
Exciting	<ul style="list-style-type: none"> <li>• * “I think it is the most <u>exciting</u> development in teaching for a decade.”</li> <li>• * “I think its an <u>exciting</u> and wonderful way to open up the world for children. The government should provide free access for all children. It will change the way children learn and the way teachers teach.”</li> </ul>
Love	<ul style="list-style-type: none"> <li>• * “I <u>love it</u> and my kids are beginning to <u>love it</u> too.”</li> <li>• * “I would <u>love</u> to have it in my room constantly. I would use it far more.</li> </ul>
Skills	<ul style="list-style-type: none"> <li>• * “My children do not have the <u>skills</u> to work independently, therefore they need me to be with them.”</li> <li>• “A full range of information processing and interpreting <u>skills</u> is important. Children need the higher level thinking skills to be able to make valid and valued judgements on material they find. Analysis is vital!”</li> <li>• “Using the Internet appears to be the way to go in the future, but children need to be able to read and interpret information.”</li> <li>• “Children will need very good critical thinking <u>skills</u> to sift through info.”</li> <li>• “A simple search engine would be valuable.”</li> <li>• “I feel that children need to have excellent reading , scanning and research <u>skills</u> before the Internet is of any use to them at all.”</li> <li>• “Children need to be taught critical discrimination in their use of what they find.”</li> </ul>
Training/learning	<ul style="list-style-type: none"> <li>• * “You need to have <u>trained</u> staff confident in its use and finding their way around it.”</li> <li>• * “Teachers must be <u>trained</u>.”</li> <li>• * “For me it is very much a learning curve. Talking with other teachers will be the most valuable <u>support</u> - especially those</li> </ul>

	<p>further down the track.”</p> <ul style="list-style-type: none"> <li>• “Before we get to this level a lot of teaching must be got through for teachers to be confident when using the computer.”</li> <li>• “I have been frustrated and exasperated by equipment which regularly malfunctions and <u>learning</u> skills which I lose because I don’t use.”</li> <li>• “Need full <u>training</u>.”</li> <li>• “Relevant <u>training</u> to all staff before connecting to this fascinating facility to all classrooms.”</li> <li>• * “There’s a lot I need to <u>learn</u> about it to be able to use it with kids to its full potential. I think it’s essential.”</li> </ul>
Access	<ul style="list-style-type: none"> <li>• * “<u>Access</u> at home has been really useful - i.e. accessible, easy to explore, play, find out.”</li> <li>• * “I don’t believe children at primary level need free <u>access</u>. Using caching, students can be restricted to topic material relevant to study. Cost is cheaper; direct line to classroom not required; safety ensured etc.”</li> <li>• “I have no <u>access</u> to the Internet except at school, and it is just one more area in an already overloaded timetable.”</li> <li>• “I would use it if it were on my machine.”</li> <li>• “I would love to have ready <u>access</u> to the Internet. Home subsidy for a modem purchase? It would make access easy if I could have the Internet on my classroom computer.”</li> <li>• “I would like to use it myself.”</li> <li>• “All children need to have equal <u>access</u> and usage - fairness.”</li> <li>• * “You need to have more than one computer in the classroom.”</li> </ul>
Technician	<ul style="list-style-type: none"> <li>• * “Free access to competent <u>technician</u> to make sure computers are running right or teacher at school released to do this regularly.”</li> </ul>
Time	<ul style="list-style-type: none"> <li>• * “The main drawback to using the Internet is the <u>time</u> it takes to browse and get children competent with it.”</li> <li>• * “Something would have to go to include something new in the classroom programme, or integration could be shown to us. We</li> </ul>

	<p>are just so busy already, and a computer is sometimes like having to teach piano lessons during class <u>time</u>.”</p> <ul style="list-style-type: none"> <li>• “I would love to use the Internet and encourage children to do so but when will I get the <u>time</u>.”</li> <li>• “I need <u>time</u> to develop my skills on using the Internet and then learn how to incorporate that into my teaching. I need time!”</li> <li>• “It is a huge learning curve for me as a teacher, and the biggest hassle is <u>time</u> to spend on learning.”</li> </ul>
Safe	<ul style="list-style-type: none"> <li>• * “I am keen to pursue open discussion of the sordid parts of the Internet to encourage honest use without relying on Net Nanny facilities to make it <u>safe</u>.”</li> </ul>
Policy/direction	<ul style="list-style-type: none"> <li>• * “The school must have a <u>policy</u> to ensure correct use of the Internet.”</li> <li>• “The Ministry must take the lead in providing funds and <u>direction</u> for IT development.”</li> </ul>
Learning	<ul style="list-style-type: none"> <li>• * “I believe it enhances <u>learning</u> but can’t replace a vibrant teaching-learning environment.”</li> </ul>
Management	<ul style="list-style-type: none"> <li>• * “Like with anything, <u>management</u> of children and the Internet is important.”</li> <li>• * “I feel the use of the Internet needs to be structured in the early stages of the students’ usage. It is easy to sit and flick instead of being focussed on gaining information.”</li> <li>• “Teachers need time <u>management</u> skills as well as technology skills. Only one computer will mean a small group of students engaged at any one time. Training and timetabling essential to get a fair and equitable use from classroom computers.”</li> <li>• “Taking children away from the classroom to work on this initially does create problems.”</li> </ul>
Tool	<ul style="list-style-type: none"> <li>• * “I don’t need the Internet to be a stimulating teacher – for me it is just another <u>tool</u>. My resources are: – my own creativity, lots of books, pictures, Encarta, etc. Internet is just <i>part</i> of this.”</li> <li>• * “The Internet is just another <u>tool</u> – like a telephone or photocopier. Children need to become familiar and confident (to</li> </ul>

	<p>the point of uninterest even).”</p> <ul style="list-style-type: none"> <li>• “When I am familiar with it I am sure it will be a useful <u>tool</u>.”</li> <li>• “It needs to be seen and used as <i>one more tool</i> for research and information.”</li> </ul>
Juniors	<ul style="list-style-type: none"> <li>• “I teach children in <u>year 1</u> who are unable to read a screen. The Internet is not applicable to us except in a very limited way – i.e. teacher directed.”</li> <li>• “I teach year 0 or year 1. All these issues are irrelevant to me.”</li> <li>• “Using the Internet with <u>young children</u> would only be appropriate if there was adult supervision and help.”</li> <li>• “Children in many <u>junior</u> classes would have problems with the Internet, however it could be an extension tool for gifted children.”</li> <li>• “For older children I think the Internet would be good, but for <u>junior</u> children that I teach it would be too confusing. People need to be competent readers before using the Internet.”</li> </ul>
Experience	<ul style="list-style-type: none"> <li>• “Hard to know – very little <u>experience</u>.”</li> </ul>
Information	<ul style="list-style-type: none"> <li>• “A lot of the material on it is not suitable for younger children (8-9 years). They bring <u>information</u> from home with no understanding of it. Probably better for teachers for reference, activities, etc.”</li> <li>• “There is still a lot to be said for finding <u>information</u> in a book.”</li> <li>• “I have concerns about the reliability of <u>information</u> available and the way it is packaged. Can be a lot of repetition. At least with books editing and choosing of appropriate material has taken place.”</li> </ul>
Reading	<ul style="list-style-type: none"> <li>• “There isn’t enough low <u>reading</u> age material on the net.”</li> <li>• “People need to be competent <u>readers</u> before using the Internet.”</li> <li>• “If you can’t <u>read</u>, can’t choose key words, have limited knowledge about the World – what’s the the point of the Internet? Putting a child in front of it is not any more useful than introducing them to the library of Alexandria.”</li> </ul>
Special needs	<ul style="list-style-type: none"> <li>• “Access through using Windows uses precision mouse pointing</li> </ul>

	<p>which limits those without manual dexterity, thus shutting out those with '<u>special needs</u>' from this form of research and experience."</p> <ul style="list-style-type: none"> <li>• "Question suitability for young <u>NESB</u> children."</li> </ul>
Funding	<ul style="list-style-type: none"> <li>• "Internet connection relies on <u>funding</u> – schools are struggling now."</li> <li>• "I hope the <u>funds</u> will one day be there for us to have computers in our classes."</li> <li>• "<u>Money</u> for hardware?"</li> </ul>

**Table 5.58:**

The opportunity to comment further on the use of the Internet for teaching or learning was taken by 16 Internet-using teachers (55% of their group) and 30 non-users (29%).

There were four highly enthusiastic comments ("exciting" and "love it") – all from Internet users. Most of the rest of the comments were words of advice or warning about schools', teachers' and students' lack of preparedness for the Internet.

Seven teachers, mostly non-users, mentioned that children need research and information processing skills before they can make use of the Internet. Skills identified were "reading", "scanning", "interpreting", "independence", "critical thinking" and "discrimination".

Training for teachers was mentioned eight times, including personal computer and Internet skills as well as how to include it in classroom programmes.

"Access" was also mentioned eight times. Teachers mostly commented on lack of access, but one recommended home access, and another alerted us to the need for fairness in access for children. One questioned the need for full access, recommending caching as an alternative which would save time and money.

Five teachers raised the issue of “time”. This included teachers’ lack of time to learn about the Internet, and also time constraints for children’s’ access and up-skilling within the school day.

Censorship was only mentioned once. This was advice to rely on children’s honesty rather than censorship software.

Policy issues were mentioned twice – one recommending that schools develop policies for Internet use, and another calling for Ministry of Education funds and direction.

Four teachers saw management as an issue. They mainly concentrated on the problems of management of a class with one computer and getting effective use of the Internet.

The Internet was described as a tool – with three teachers emphasising that it is just one of a range of tools available to the teacher or researcher.

Four teachers of junior classes considered the Internet inappropriate for use with juniors because of the difficulties of reading the screen and confusing technical concepts. A special needs and an NESB teacher also had reservations.

The value of Internet information was questioned by three teachers: considered too complex, unreliable, and repetitive. The advantages of books were contrasted: they are edited, and contain appropriate material. These comments link with the three teachers who commented on the need for children to be good readers in order to make good use of the Internet.

The problem of funding was mentioned three times: both the cost of computers and the ongoing connection fee.

## Chapter Six

# Results: Phase Two

### 6.1 Introduction

This chapter provides the results of interviews with the six teachers who indicated in the questionnaire their willingness to participate. The teachers were interviewed face to face in quiet locations in their schools, and the resulting conversations were tape recorded and transcribed.

Seven common questions (see section 4.7.1) were used to ensure some areas related to the research questions were covered with each interviewee. These questions were used as starting points, and the interviewees were encouraged to converse freely and allowed to digress if they wished into areas that seemed related to the issues involved.

These data pertain mainly to the following research questions:

- *How do Internet-using teachers utilise the Internet for teaching and learning?*
- *What roles do teachers adopt during Internet-related activities in the classroom?*

The other research questions are also relevant in some areas.

### 6.2 Teachers' Experiences of Internet Use

The interview transcripts were used to produce the following summaries of each teacher's experiences in using the Internet with children. Firstly they have been described separately to enable detail to be provided, and then they have been compared to determine what common factors were present in the teachers experiences.

#### 6.2.1 Teacher A:

Teacher A is a female full-time teacher in a suburban contributing primary school. She has been teaching for over 20 years, and considers herself a competent computer user. She has access to the Internet at home and in her classroom, and has used the Internet with children for at least 5 topics.

This teacher tries to cover at least 12 research topics with her class each year (usually 3 topics per term). Recent topics were about Vietnam and New Zealand endangered species. For some topics the Internet has been used by the class as one tool in a full

range of information sources - including library, vertical file, encyclopedias, TV, newspapers, etc.

The children printed out the material they found on the Internet and read it and used it in their own words. They used the computer to publish their work as written reports, and they also did oral presentations to the class.

Teacher A says the Internet enhanced the “action learning” method she tries to use for topics. It enabled children to work independently, and encouraged them to investigate current affairs: “It gives access to CNN before items are on TV or in the newspaper - and a lot of children don’t watch the news or read the paper at home.”

The main problem was that searches sometimes brought up too many sources. She bookmarked some useful sites for the children to use, such as CNN, and her school has installed Web Ferret in an effort to make searches more precise and efficient.

“Adult” material has not been a problem, but Teacher A says she tended to “hover near the computer and supervise”, and a parent volunteer came in to train the children (fifteen minute spells with groups of five).

Teacher A considers the Internet suitable for all teachers to use: “It is a useful research tool that everyone should use”. She does not know the costs involved, but has not had any complaints from the principal or Board about her class’s on-line costs.

### **6.2.2 Teacher B:**

Teacher B is a male full-time Scale A teacher with a Year 7 class in a large suburban full primary school. He has been teaching less than 2 years, and considers himself a competent computer user. He has computer access at home and in the school library, and has used the Internet for at least 2 topics with children.

Teacher B used the Internet as the basis of an IEP (individualised education programme) with a boy in his class. The boy was able to find information about a topic he was interested in – “It was about a current hockey player in the States, and there just isn’t the literature available unless you do something like on-line work”. This was a learning exercise for both teacher and child, with frustrations caused by problems such

as slow downloading, but the boy was patient with this, seeing the mastering of the technology as part of the project.

The boy used the World Wide Web as his sole information source, and produced a project on his research. Teacher B didn't consider the results to be "fully fleshed-in", but the deficiencies were balanced by the fact that the boy was able to explore his chosen topic and this helped maintain his interest.

There were some technical difficulties such as connections failing on some days. But the main problem of working on this IEP was the lack of classroom Internet access. Teacher B had to arrange supervision for the boy in the AV room – fortunately the school has an extra technology teacher who was sometimes available.

Teacher B recommends the Internet because of "the currency of the information and the fact that the students are caught up in the here and now of it." But he also gets children to use the library and CD-ROM encyclopedias for historical and less time-sensitive material. His school has a buddy system which is helping teachers to up-skill, but getting time to do it is a problem for all staff members. The school has helped him buy a personal lap-top computer which he brings to school, and this has helped him build up his own experience – "It wasn't until I got a connection at home that I really started getting familiar with being able to use it." The classrooms at his school are all wired up from NetDay-97, but Teacher B says the school is still working through the technical and policy matters that are needed to allow all rooms to have Internet access. A few staff members and some supportive parents have done "a phenomenal amount of work", and two classes were trialing it.

The issue of censorship is one matter Teacher B is interested in. He says the school needs to be able to assure parents that there is a system of safeguards in place, but the final solution is really one of building a responsible attitude in the children. "The fact they are able to explore allows a much more lateral type thinking and creativity in research." Another belief he has is that computer work should be contextually-based rather than simply rostered to keep the computer active. He supplements the classroom computer with his own lap-top and 2 school lap-tops to get four computers in action when needed.

### 6.2.3 Teacher C:

Teacher C is a young female full-time Scale A teacher with a class of year 3 and 4 children in a large suburban contributing primary school. She has been teaching less than 5 years, and describes her computer skill level as “expert” and Internet skill level as “competent”. She has used the Internet for at least two topics with children.

Teacher C used the Internet with her Year 3 and 4 class to enhance “action based learning”. In an “Art” topic the children thought of questions about art, and then explored web sites that were appropriate, especially art gallery sites. The school library was used first, but was found to be “really low on resources” in that area. The National Library supplied some useful books, but the Internet was still considered worth exploring.

Teacher C found she needed to scaffold the children’s exploration: “There was so much information that before and after school I’d go through and find the good sites because there were so many.” But children were also allowed to do key word searches for more information, with assistance to refine their searches. “They needed quite a bit of help to understand the information, so there was heaps of teacher input, but overall I think it was a ten out of ten unit, particularly because of that Internet use.”

The children presented their material in wall chart form, and Teacher C said she was “very happy with their work”. Because it was a question-based unit, children were assessed on their ability to discuss what they had learnt.

Teacher C found that children were quite independent once they had actually downloaded the information and printed it out, but “while they were on the Internet they were quite dependent on me”.

Teacher C found that having Internet access in another room caused a management problem: “I was back and forth and had the whole class working while I was off helping a few kids. I generally would take two groups over at a time, and one would be waiting and one working, but that was a big problem. But we are hoping to have it in our library soon. Then I could have other kids working and focus on helping the children.” She also

spent time with children before school and lunchtime in order to provide sufficient access time for them to down-load their information.

A technical problem was sometimes encountered: "...we'd be searching and then during the search it would disconnect, so there were often problems with being on-line and it would take heaps longer than we'd expect." The sheer volume of material found by the search engines was also a problem: "They'd offer so much information...and I found that I'd spend forty minutes looking and perhaps still not come up with the kind of answer to their question, so it took heaps of my time looking independently and making their choice a bit more limited".

The problem of "adult" material was glimpsed just once, when an inappropriate site began to down-load. But Teacher A was able to click the Back button before the children were aware of it. She then explained her actions to them, and the issue involved.

Teacher C described her role as mainly "reader", "because we didn't have time for them to sit there and try and digest all the information, ...and then once we printed it off they would be expected to try and make sense of it and understand it."

Despite the problems, Teacher C considers this work "the most successful unit I've ever done...the kids love it and I think it's quite creative the way I taught it. So it was really successful and they know heaps."

Teacher C recommends the Internet to other teachers and pupils: "...it can take the children further in the information that they can get. I particularly have got hooked on it because I enjoy it myself, but I think children need to know it's there as a resource". But she acknowledges the cost factor, and the shortage of New Zealand material: "...we were looking at New Zealand artists but that was really limited."

Another way she has used the Internet was to introduce the class to e-mail. The children were highly motivated to write to the Spice Girls and one girl started writing to a pen pal.

### 6.2.4 Teacher D:

Teacher D is a technology support specialist (female) at a large suburban full primary school, who has been teaching for more than 10 years. She describes her skill level for computer and Internet use as “competent”, and has Internet access only in the school AV room at present. She has taught at least five topics using the Internet with children.

Her last Internet topic was a technology unit on “yoghurt” with year 7 and 8 children at a school which receives technology services from hers. Teacher A’s job was to take children in groups of four from their classroom teacher to the Internet computer and guide them in their research on yoghurt. She found a lot of the children knew about games and “chat” on the Internet, but little else.

Each group had two or three Internet sessions. The first session was a chance for the children to explore areas of their choice, such as theYahooligans index. Each child had a ten minute “surf”, This also got them interested in trying key word searching, which was experimented with on topics of their own interest. Then searching was used in the second and third sessions to find information on yoghurt: “Some of them simply found recipes, some of them looked at different uses for yoghurts in different countries, which is really interesting - it was great for that. Some of them just the history of yoghurt and more about milk products really.”

The children went back to their class and produced wall displays using the material they had printed out and other resources such as books.

Teacher D found that using the Internet for the yoghurt topic “made them really aware of how international it is. It’s one thing for us to say...here’s some information about yoghurt, but for some reason off the Internet it was just more real. I think that it was just exciting, so that it made them want to find out more.”

Teacher D says her main role was “a little bit of guidance”. She was there to keep the children on task, encourage them, assist with searching: “...they would come up with a couple of key words, look them up and have no joy, so give up. So it was a lot of that - Okay let’s think of some more key words - what else could we do?”

Teacher D finds involvement with the Internet rewarding. “I love it!...And that’s neat for kids too, and I want kids to experience that, and I think its sad that so many of them think there’s only games or Chat lines...because so many kids have got it at home now.”

But she found a similar research project at her own school was frustrated by connection failures. “We just couldn’t get through because mid-afternoon was when we were doing it and that was a huge problem, and waiting and trying to get through...lost the kids interest often.” “We’ve actually since changed provider...because it was just hopeless.” She has not used the Internet much this year because her school has been re-organising their strategy for Internet usage which should be in place in 1999.

Teacher D considers that it is a necessity for teachers to become familiar with the Internet: “...every child should be exposed to it and should be okay about using it, and if it’s not their teacher someone else has to do it. I mean, it has to now be one of the resources of research for them every time, I think, when they’re researching.” But she still doesn’t consider it to be the only source of information – books and CD-ROMs have their place too.

### **6.2.5 Teacher E:**

Teacher E is a full-time Scale A teacher (female) with over 20 years experience, currently working in a small country school. She describes her computer and Internet skills as “competent”, and has Internet access at home and in the school library. She went to conference on educational use of ICT in Sydney in 1998.

Her class have used the Internet for e-mail and for research: “We had ongoing contact with a school in California earlier this year as part of a Technology topic on communications. All of the kids learnt to send and receive e-mail – the subject matter was basically the kids’ interests.” Teacher E assessed the children on their ability to send and access their messages.

The children have also used the World Wide Web for individual projects – for example one girl’s research was “hedgehogs” as part of an animals topic. “We used the computer in the library, and the librarian and I took turns to supervise the children on the computer. The rest of the class made use of the library as a resource while they were

off-computer.” The children collected print-outs of the sites they visited, and used these to produce project sheets and give oral presentations to the class.

Teacher E says the big advantage of the Internet was the up-to-date material. “The school library is small and the budget doesn’t allow everything to be the latest. Older books can still be used for many topics though – so the Internet is only one of a range of information sources. I have an old set of encyclopedias in my classroom that is still useful, but I remind the children to watch out for old statistics like countries’ populations.”

Teacher E experienced some technical problems at times: “There were times when we couldn’t connect - maybe because the ISP was too busy. Also, we found on-line costs of e-mail could be reduced by typing them off-line and sending all the e-mail in one batch.”

Teacher E says her main role was “...supervising their searching. The children always searched under adult supervision – not for censorship reasons, but to have instant help available.” Searching was a skill that children needed help with: “They would often get a million hits and need to refine their key words.”

Doing the Internet research in the library solved the management problem of looking after the class and the Internet searchers simultaneously. The librarian could help, and the library became part of the research.

Teacher E thinks all teachers should use the Internet. “It is not just for teachers with technological interests. They can use it as a teacher resource to get ideas, information for lessons, lesson plans, topic material and work-sheets. I use it mostly at home for this purpose – in fact I spend more time at home on the computer than TV.” She thinks that computer enthusiasts are still driving computer usage to some extent, but thinks it is more broad-based this time. “People keep asking me to help them, but they need to take time to explore and gain confidence.”

She predicts that in the future the Internet will become “even better and more popular.”

### 6.2.6 Teacher F:

Teacher F is a female deputy principal with a class of year 7 and 8 children in a large suburban full primary school. She has been teaching less than 10 years, and describes her computer skills as “competent” and her Internet skills as “beginner”. She has used the Internet for at least 2 topics with children.

This teacher incorporated Internet use as one of a range of information sources in a Year 7-8 syndicate-wide biotechnology unit on cheesemaking – “Whether it be a book or screen, it doesn’t really matter.” The World Wide Web was the sole Internet service used. “We used it to do research really, to look at what we needed, and the teachers went in and we bookmarked several sites that we thought were useful.” They found some useful Dairy Board material, and several American sites and others around the world. Different children looked at the Web sites for different purposes – for types of cheeses, what varieties in different countries, the history of cheese, and some of the recipes they could make themselves.

This school has joined the SINA programme, a trial programme offered through Victoria Link, in conjunction with EDCOM, which provides them with a home page with appropriate links for their topic of study. It provides safe links that have been tested for appropriateness for children. They are also intending to make e-mail contact with other schools in the programme.

The children did not make presentations or reports on their Internet research. The information they found was incorporated into their technology projects as part of the “Technological Knowledge” strand – helping them prepare for working with cheeses (choosing/designing, making, packaging, presenting, etc). Often the Internet information was not obvious, since it was just one of several research sources. But in their “History of Cheese” display it was clearly in evidence.

Teacher F believes that the skills that have priority are those of the curriculum area, not the computer. Computer skills are learned incidentally as needed, along with research skills. She has also used the Internet for other teaching purposes, such as children’s investigations of biographies of famous people, and to provide material for an ESOL

child working with a teacher's aide. The ESOL child found it a motivating way to get involved in reading every day.

The school has experienced difficulties getting reliable and fast connections, and has changed Internet Service Provider which seems to have helped. It has also purchased a router, which is expected to allow concurrent users to have good access.

Teacher F sees her roles as mainly "the normal teaching you would do in a curriculum area - so if we're doing biographies, modelling the questioning, modelling what information would be important, how to get it and what would make it boring and what would make it exciting".

Some management issues were mentioned, such as an "Internet Use Contract" for teachers and pupils to avoid misuse, and rules like quitting the connection promptly to reduce costs - "It's a lot of money...we've budgeted \$2500 I think, just for the on-line costs". The rooms are already wired, so it is now a matter of making outside connections work efficiently and making management decisions such as distributing on-line time fairly to classes.

Teacher F recommends the Internet for everybody's use - "children and teachers and community". "There will be some fear and hesitation...but in the last two or three years everyone in the school [has] moved incredibly in their confidence." She considers that Internet access will become a "part of the natural resources" of the classroom, and that "children will drive it", making it a requirement for teachers to use it where it supports the curriculum. But she also urges us to be realistic: "I think it's a good resource, but it needs to be questioned... - is this the best thing for this particular curriculum?...I'm not convinced it's the be all and end all of everything."

### **6.3 Summary**

A number of common themes and problems have been raised by these teachers.

The most consistent feature of the Internet use of the six teachers was the fact that their classes had all made use of the World Wide Web as an information resource for a "topic" being "researched". The topics varied though, ranging from topics set by the teacher for the whole class down to an IEP for a single pupil. In most cases the Internet

was just one of a range of information sources, acting as a supplement to the library, videos and CD-ROMs, but for the IEP mentioned it was the sole source. Key-word searching was used by most classes, but some teachers also started the children off on sites they had selected and book-marked for them. Free “surfing” was not common, but three teachers said their classes got the opportunity.

The most common outcome of the research was a written or published report or wall display, which was a synthesis of information obtained from the Internet and other sources and expressed in the children’s words. Pictures from the Internet were often used as illustrations. Some teachers also supplemented this with an opportunity to present the material or answer questions orally. One teacher deviated from the “presentation” requirement, allowing children to use the Internet as a source of research information to be integrated into the knowledge strand of a technology project.

All of the teachers considered that the Internet enhanced the lessons where it was employed. Four teachers perceived that it raised children’s interest or motivation. Three teachers mentioned that it enhanced the “action” or “enquiry” based learning techniques that they were implementing with children. Three teachers said that the Internet made teaching more interesting or satisfying for themselves.

All six teachers encountered difficulties of various types in using the Internet with children. Five teachers mentioned unreliable connections to the Internet, where they failed to connect on dial-up or lost connection during the session. Most of the other difficulties were related to children’s lack of skills (and hence needing constant assistance) and management issues within the school (such as classroom access).

The most commonly mentioned roles for the teachers were those of supervisor and guide – that is, an adult available to assist the children with searching and technical problems.

All of the teachers recommended the Internet for use by other teachers. The most common reasons for recommending it were that it gave access to information and that it was enjoyable and not hard to use.

In their extra comments about the Internet 3 teachers voiced expectations that the Internet would improve beyond its current capability. Combined comments describe it as a tool everyone should use that is more current than CD-ROMs, but which should be used critically in context where needed.

Data from the two results chapters will be discussed in the next chapter.

## Chapter Seven

### Discussion

#### 7.1 Introduction

This chapter discusses the research questions and issues that were raised during the study, in the light of the results reported from the two data-gathering phases. It also makes some comparisons with theories and observations in the literature reviewed in chapter three.

In chapter five it was described how the respondents were divided into two groups according to whether or not they had used the Internet in lessons with children. The groups were labelled the “Internet users” and “non-users” respectively. Comparing these two groups reveals some differences in background and opinions which help to explain their decisions to use or not use the Internet in lessons with children. The teachers who were using the Internet for teaching had more clearly formed perceptions of the Internet’s potential as a teaching and learning resource. The non-users were more likely to give “unsure” as a response. The non-users response was "unsure" for 7 of the 29 opinion and implementation scale questions (Parts C and D of the questionnaire), compared with 1 for the users.

Throughout this discussion three themes are apparent – firstly, the teachers in this study showed a positive attitude towards the Internet, and expect it to become a useful educational resource.

Secondly, the responding teachers showed the value of personal Internet experience for evaluating it. The Internet is complex and ever-changing, and needs regular use to gain familiarity.

Thirdly, the responding teachers showed a preference for making their own decisions about whether to use the Internet, and how to use it. They seem unlikely to simply follow theories, or directives from the Ministry of Education, unless they have confidence they are useful and manageable..

This chapter begins by discussing the research questions, posed in chapter 4, in the light of the results of this study, reported in chapters 5 and 6. These questions, involving teachers intentions, their perceptions of factors enhancing and inhibiting Internet use, their roles, and their use of the Internet, are discussed separately.

The first of the research questions in this study was “What are the intentions of primary school teachers in relation to Internet use?”

## **7.2 Teachers' Intentions**

The results show that most teachers intend using the Internet with children within the next year or two (Fig. 5.11). This appears to predict widespread use of the Internet in primary schools in the near future, supporting the predictions of Internet promoters (Butler & Zwimpfer, 1997; Tapscott, 1998). However, it is possible that some teachers have intentions that may not be supported by the technical infrastructure and their own professional development quite as quickly as they are expecting.

The majority of early adopters show an intention to continue using the Internet with classes, but 14% reported that they did not plan to use it again in the next year (Fig. 5.11). It seems they have decided that the Internet did not meet their expectations, and may be waiting for problems to be solved, such as class management, connection reliability and implementation models. Or they may be waiting until they feel confident about their own skills. These difficulties may be more inhibiting to the next group of innovators, who, according to Rogers' (1995) theory of Individual Innovativeness, are likely to be less predisposed.

The next section examines the factors that are attracting teachers to the Internet, and contributing to the high rate of intention to use it. It relates to the research question: “What are the factors that primary school teachers perceive inhibit or enhance the use of the Internet for teaching and learning?”

### 7.3 Factors Enhancing Internet Use

The Internet's value as an information source is one of the strongest factors enhancing Internet use in education. Both groups, users and non-users, thought that the Internet could be as good as or better than a library for research (Fig. 5.31). They expected that the Internet would help students learn more (Fig. 5.19) and improve research skills (Fig.5.23). Even teachers with no Internet access or experience were able to give an opinion on these factors, presumably because they had heard or read about the Internet or seen it demonstrated.

Experience and confidence in educational computer usage contributes strongly to Internet use. The Internet users in this study were already more frequent users of computers in the classroom than the Internet non-users (Fig. 5.5). This supports Rogers' (1995) theory of Individual Innovativeness. In Rogers' terms we are seeing a group of pre-disposed Innovators well ahead of the majority of potential adopters. The pioneering work of enthusiasts was observed in the original introduction of computers in schools, but it was not followed up by the majority of teachers (Bigum, 1995). The difference this time though is the potential for the Internet to provide its own support structure to facilitate innovation, – innovators are not as isolated as in the earlier phase, since they can find support on the Internet.

A crucial factor in the use of the Internet as a teaching and learning resource is the opportunity to investigate its potential personally. Rogers (1995) identified triallability as one of the attributes for judging an innovation, and some authors have recommended that teachers be given the opportunity to trial the Internet as a precursor to using it with children (Bigum, 1995; Alexander, 1997). The Internet users in this study had more access to the Internet for personal use than the non-users – often at multiple locations, such as home, classroom and school library (Fig. 5.7). This gave them the chance to explore the Internet in their own time, and they made more personal use of Internet services, particularly E-mail and the World Wide Web, and were more likely to consider themselves competent Internet users.

However a third of the non-users in this study had home access, and did not transfer their experience to the classroom. It is possible that the Internet experiences of some of these teachers left them unconvinced of the educational practicality of the Internet. Smits (1997), in her study of student teachers using the Internet, found that personal

investigation of the Internet may lead some users to conclude that it is inefficient and time-consuming, despite being entertaining. It is possible that supportive training during the investigative period may produce a more favourable response, but the final factor is the personal choice of the teacher. Some authors have viewed giving teachers freedom of choice as an obstacle in the introduction of a new technology (Cuban, 1986; Collis, 1996). But others maintain that consultation, support and the right to choose whether an innovation will become part of their classroom is a basic right of all teachers (Haughland & Wright, 1997). The latter view was supported by most teachers in this study.

Having classroom access to the Internet was identified as a strong factor towards using the Internet with a class. Classroom access allows a teacher to incorporate Internet use into an existing lesson, and manage the rest of the class on other tasks while one group of children use the Internet.

To many teachers the Internet provides an opportunity to make the classroom computer more useful (Fig. 5.24). Perhaps this shows an expectation that the classroom computer will be something like a window on the world or a “knowledge machine” (Papert, 1993) which will be more productive than stand-alone computers have proved to be. The computer will no longer be dependent on the limited and quickly outdated software generally available in schools, since the Internet is constantly being updated and added to.

A common expectation in the literature is that students will find using the Internet more attractive, motivating and rewarding than traditional learning resources such as books (Rakes, 1996). This study supports that view – with the strongest support coming from the teachers who had used the Internet in their lessons (Fig. 5.48). Some teachers noted the problem of children knowing about other attractions of the Internet which were an enticement to be distracted from their assigned task, but most teachers considered this would not be a problem, presumably intending to plan strategies to avoid this.

This study provides evidence that teachers need to be supported in the operation of the technology of the Internet. There was clear agreement amongst the responding teachers that it would be enhanced as a resource if installed and maintained by a technician, improved in speed, features and reliability, and made safe for children. It seems that

teachers would be more interested in using the Internet if they could be assured that it would be user-friendly and trouble-free.

Professional development is often identified as a factor in the uptake of the Internet (Brown & Ryba, 1996; Alexander, 1997; Roberts, 1997; Zwimpfer, 1997). Teachers in this study supported the provision of training, leadership within their school, and time to familiarise themselves with the Internet. However, Ministry of Education directives on using the Internet were not considered important in affecting Internet use. This seems to relate to the observations in the literature that teachers prefer to identify their own needs and take ownership of their own teaching programmes, rather than be dictated to by others (Morimoto, 1973; Casey, 1996).

Teachers in the study agreed that adding more useful educational sites would make the Internet more attractive. This supports the current process of the New Zealand Government and other institutions of providing web sites dedicated to education, and links to useful sites throughout the World. Teachers also agreed that the removal of cost as a factor for on-line time would enhance their usage. This may become a less important factor as on-line charges reduce due to competition and efficiency – charges decreased during the period of this study.

Some factors expected to encourage the use of the Internet for teaching were not supported by this study. Most teachers did not think it would improve the way they teach, which seemed to show a disinclination to accept the reforms that might accompany this new technology. The option of a computer room with Internet computers for the whole class was not seen as an attraction. This was most likely an indication of the preference to integrate computer usage into current curriculum programmes, and avoidance of giving the impression of a special 'computing' time or subject.

#### **7.4 Factors Inhibiting Internet Use**

The technical immaturity of the Internet was shown to be an inhibiting factor. Technical difficulties were perceived to be a potential problem by non-users, and most of the interviewed teachers reported problems with their connections to the Internet. Some had the impression that their problems were due to the lack of the ideal equipment or software, which was sometimes perceived to be a result of their school being

inexperienced in this area. However, it is possible that this is a common experience that is part of the environment of this new technology which has grown unexpectedly quickly – tests have shown that there is considerable variation in service quality between Internet service providers (Consumers Institute, 1997). The Internet service providers and telecommunications companies are investing heavily in upgrading the data transfer infrastructure, and perhaps this will solve these problems in the future.

Many authors have identified the disorganised nature of the Internet as a disincentive (Stoll, 1995; Dyson, 1997). The Internet has no central controlling body, editors or censors, although the search engines and directories provide various attempts at organising material. It is understandable that teachers showed that they considered the Internet to be complex for children (Fig. 5.48), and many showed awareness of the need for information literacy skills.

Class management issues need to be resolved to reduce the workload added to teachers incorporating the Internet into lessons. The interviewees reported difficulties with the management of their class when it was divided between Internet activities and other tasks. It was usually only possible for one group of children to use the Internet at a time. The problem was exacerbated when the Internet computer was in another room, resulting in the teacher being out of sight of either the group or the class. Some of the teachers found solutions to the problem – such as having a parent or specialist teacher supervise the Internet group. Two solutions were recommended by teachers: Internet access on the classroom computer while the rest of the class worked on regular activities, or the use of the Internet on a library computer while the rest of the class was researching in the library.

The expectation of higher workload and stress is understandable – there is more for the teacher to prepare and manage when incorporating the Internet into lessons (DeLahunta, 1996). Some Internet-using teachers showed that they felt confident that they could manage this without stress, but a group who considered stress a problem may have experienced the two main problems identified in the interviews, i.e. connection failures and class management.

The Internet can seem an expensive luxury to many teachers. The prospect of paying on-line charges of up to \$2:50 per hour can seem un-manageable when multiplied by 30

children and perhaps 6 topics during the year (not to mention the other classes in the school). So it is understandable that teachers in the study were keen to have free Internet access. However, this still would not overcome the problem of high equipment and maintenance costs.

There was some evidence in the study that older teachers were less likely to make use of the Internet for teaching (Fig. 5.2). This could be taken as support for the view of some authors that we will need to wait for a younger generation to come into teaching before true acceptance of modern ICT becomes established (Bigum, 1995). But we could consider this group to be a worthy target for professional development in ICT.

It seems that the choice of computer platform may have some influence on Internet use. The majority of the Internet users had PCs as their computer type, whereas many of the non-users were equipped with Acorns and Macintoshes, which may have given them some disadvantages, such as:

- higher cost for equipment (computers, network cards, etc).
- less assistance from parents, community and business (who are more likely to be familiar with PCs) in purchasing and maintaining hardware and software.
- less transference of skills and interest from home by teachers and pupils (who are more likely to have PCs at home).

The next section discusses the ways in which the Internet is used in lessons. It relates to the research question: *“How do Internet-using teachers utilise the Internet for teaching and learning?”*

## **7.5 Using the Internet for teaching and learning**

In this study, most of the teachers who had used the Internet in lessons with children had only used it for between two and five topics (Fig. 5.13). This low frequency is understandable, considering that the use of the Internet in schools is still in its introductory phase. However, it is apparent that most of these teachers still do not use it regularly on an everyday or even every-term basis with their classes.

Teachers in this study reported that the World Wide Web and e-mail provided almost all of their students’ needs (Fig. 5.14). This reflects the usefulness of these services for

information, research and communication, and relates to the personal usage of the teachers (Fig. 5.10). However, there may have been reasons for not using other services: e.g. avoidance of services such as Chat and MUDs which could be construed as ineffective or time-wasting (and adding to on-line costs).

The World Wide Web was used mainly as an information source, in the manner of a large on-line encyclopedia, rather than as a source of dedicated learning activities or software. E-mail was difficult to utilise fully, since it requires a commitment to maintaining regular long-term monitoring of mail, but at least one teacher showed it was possible for children to take responsibility for this.

The most highly-developed theories for the use of the Internet in classrooms are based on the constructivist view of learning, as outlined in chapter 3. Some teachers in the study showed an awareness of constructivist models such as resource-based learning and Action Learning (Gawith, 1992). However it seems that for most teachers the research involved was approached as an enhanced version of traditional project work, which has not usually provided enough support to meet the constructivist criteria of turning information into knowledge by applying analysis and reflection. Students usually simply paraphrase the facts they have found, or selectively copy. One of the interviewees, Teacher A, aimed to involve her class in three research topics each term, a far higher level of research project work than is typical in New Zealand classrooms (Crooks & Flockton, 1998). Several teachers emphasised that for research the Internet was just one of a range of information sources, which included the school library. But there was no evidence that there was a widescale paradigm shift involved – after all, these research topics occupied only a few hours of the classes' time.

Children tended to print out information they had found on the Internet, and use the print-outs for off-line reading and as a source of illustrations to use in their projects. This had the advantage of reducing the on-line time, allowing more children to have access. However, it may have deprived them of some interactive features such as hyperlinks, activities, animations, sound, Java applets and picture enlargements unless they had explored these while on-line.

One teacher emphasised the need for the skills and knowledge of the curriculum area being studied to be foremost. Computer skills and research skills should be learned as

needed. However, the use of computers to help analyse, re-organise, present or publish the Internet information was not a priority with most of the surveyed teachers, perhaps because of the difficulty of achieving this with one or two computers to a class.

The next section discusses the fourth research question: *“What roles do teachers adopt during Internet-related activities in the classroom?”*

## **7.6 Teachers’ Roles**

The literature predicts a shift in the role of teachers to a more child-centred position, such as guide or facilitator (Rakes, 1996; Duffy & Cunningham, 1996). However this study found the paradoxical situation in which teachers had the intention of allowing more independent and child-centred learning but acted in the opposite way. Most of the teachers were reluctant to allow children to work on the Internet without close supervision. It was common to allow children to do their own searching using a search engine or search index, but they were always searching in the presence of an adult, whether a teacher, librarian, teacher's aide or parent helper. The adult involvement was mostly attributed to the need for assistance with search terms, navigation, and the interpretation of information encountered. Often children needed to refine their search terms, and adult prompting helped to scaffold this in the manner of Vygotsy’s “zone of proximal development” (Perkins, 1991). However, the need for adult intervention in the eventuality of unsuitable adult material being encountered was also acknowledged by some of the interviewed teachers.

It is likely that this high reliance on adult involvement is a phase that will be overcome as children become more competent in the information literacy skills related to the Internet, and as adults gain confidence that the children can be made safe from “adult” material (either through censorship or training). Another possibility is that government legislation may force ISP’s and server hosts to remove objectionable material in transit or at its source, or code it for filtering.

## **7.7 Teachers’ Conceptualisation of the Internet**

The Internet exists on two levels – the “Information Superhighway” or physical system made of computers and cables, and “Cyberspace” – the virtual world of information and communication that makes up the content (PC World, 1995). Each needs the other to

exist, but the experience of teachers in this study showed that the virtual world of the Internet is expanding ahead of the physical Internet.

The majority of teachers in this study had positive views of the content of the Internet for teaching and learning, although the term “cyberspace” was not used at all. They thought the Internet was a resource that would help students research and learn, and that students would enjoy. They thought it could be more useful than a library, but not as good as real life experience.

This study found very few teachers or pupils going beyond the encyclopedia/library metaphor of the Internet. Many potentially valuable aspects of the Internet were rarely mentioned – such as contacting experts by E-mail, exploring special activities (e.g. SunSafe), following on-going projects (e.g. Learnz, Seakeepers), utilising Java applets, downloading software, publishing childrens’ work on Web pages, etc. These, especially the latter, may be of interest to teachers more experienced than those included in the survey. There is no doubt that some teachers are aware of the publishing function, as evidenced by the samples of children’s work available on the World Wide Web, but none of the teachers in the study mentioned any involvement. One of the problems of the Internet is the difficulty of finding the best sites to support a topic. There are many sites that specialise in linking teachers to good educational sites, but even these might not be found unless teachers are aware of their existence.

The term “information superhighway” was not used at all by the teachers in the study. The technical side of the Internet was difficult for teachers to understand, and they showed a preference for technical experts to look after it. They were not impressed with the ability of the technical infrastructure to deliver what it promised, and were quick to voice their dissatisfaction. This marks a change from the early stage of stand-alone computers, where the enthusiasts involved often understated the difficulties to avoid scaring off converts (Alexander, 1997). ICT equipment has now become a set of mysterious boxes which are expected to work, which may be a relief to teachers once everything is running smoothly.

## **7.8 A Teacher Resource**

The interviewees all recommended that other teachers should make use of the Internet. They considered that it is easy enough for any teacher to use, and a valuable resource

for the teacher as much as the children. Teacher E said that she used it at home to get ideas and information for lessons, and lesson plans, topic material and worksheets. This is a common expectation in the literature (Bigum, 1995; Lai, 1996; O'Hare, 1996), and it may facilitate the high standard of teaching that will be required to ensure the Internet is used to its potential. There is the likelihood it will provide well-organised on-going teacher support in the future (Ministry of Education, 1998), but at the time of this study only a minority of teachers are making use of the Internet for their teaching and for their students learning. There seems to be a gap between awareness of the potential of the Internet and the active step of putting it into practice.

## 7.9 Internet Skills

Teachers in this study showed an awareness of the need for students to have skills related to Internet use. They considered that not all material on the Internet could be relied on for accuracy (Fig. 5.34). This has been identified in the literature as a consequence of the uncontrolled nature of the Internet, which allows anybody to offer any text, pictures, video or audio for public viewing without having to satisfy editors as to the accuracy of the material (Stoll, 1995). Consequently, users of the Internet need to have the skills to evaluate the accuracy, bias and purpose of Internet material (Rakes, 1996; Gawith, 1992). That is, users need to gain information literacy skills (Roberts, 1997).

Teachers' Internet skills are as much an issue as childrens' skills. Teachers can be assumed to have well-developed literacy skills from their experience of books and libraries, as well as television, radio, film, CD-ROMs and newspapers. However, it seems that a distinction is necessary between searching for information and simply receiving broadcast information. Internet skills are a combination of these – involving the searching of material that has been placed on public-access servers (i.e. the material might be considered pre-broadcast, waiting for the audience to select and view it). There are additional needs for skills in navigating through the material (using hyperlinks and search engines), and evaluating the relevance and accuracy of unedited or biased information. Utilising the information involves skills of skimming and scanning, analysing and synthesising, and presenting the findings from the research (Gawith, 1992).

There is still some disagreement about whether it is hard for children to find things on the Internet. The Internet users in this study were divided between those who considered it hard and those who did not (Fig. 5.21). This may have been due to the nature of the search engines in the WWW – they can bring up results easily, but in a quantity that is overwhelming. This could be interpreted as both success and failure – success in locating information, but failure to isolate the most relevant and manageable portion.

Plagiarism has been raised as a potential problem (Gawith, 1995), but the Internet users in this study did not consider it difficult to avoid (Fig. 5.27). Some teachers suggested that teaching children research and information literacy skills would overcome this problem, which agrees with the recommendations of Gawith (1995) and Rakes (1996). They also seemed confident that they had strategies for avoiding plagiarism, such as setting investigations that required analysis of information and could not be satisfied by mere copying.

## 7.10 Unsure Teachers

The Internet non-users in this study differed from the users by being unsure or divided about a number of issues involving the Internet:

- whether the Internet will improve the way you teach (Fig. 5.21)
- whether it will be hard for children to find what they want (Fig. 5.22)
- whether the Internet is an unsafe place for children (Fig. 5.26)
- whether children will just copy information (Fig. 5.27)
- whether the Internet will make teaching more stressful (Fig. 5.28)
- whether children will waste time with distractions (Fig. 5.32)
- whether teachers should change their role (Fig. 5.33)
- whether a computer room would be helpful (Fig. 5.41)
- whether government directives would be helpful (Fig. 5.46)

This high degree of uncertainty helps to explain why these teachers have not begun using the Internet for teaching yet. There are still many issues to be resolved in their minds and in practice. Careful planning can reduce some of these problems, but others are reliant on students' responses and equipment user-friendliness, and leave the teacher with an element of risk. It is likely that most teachers are prepared to take risks in their lesson-planning in order to produce interesting activities, but they assess and manage

the risks on the basis of experience and judgement, which are missing in the case of Internet use.

There was one area of uncertainty shared by the Internet users and non-users groups. Both groups were unsure about whether the Internet would improve the way they teach (Fig. 5.22). This is understandable in the case of those who have not used the Internet with children. However, the uncertainty of the Internet users shows the need for more evaluation of the teaching and learning involved, and reflection on the experiences and outcomes. These teachers have only used the Internet with children a few times, and perhaps they are waiting to see whether their first experiences are typical of Internet-using lessons. Some reports in the literature of first-time experiences with innovations are rather tentative due to unforeseen disappointments and the extra load and stress of preparing and implementing something new (DeLahunta, 1996). With earlier innovations, such as television and computers, there was the tendency to err towards optimism and the assumption that educational benefits would appear. But now there seems to be a "wait and see" attitude amongst teachers. Many enjoy using the Internet personally, but don't yet feel that they have evidence that educational benefits will show in children's learning outcomes.

### **7.11 Implementation Models**

The most strongly-promoted model for use of the Internet at present is the constructivist model, which has been presented in variations such as "resource-based learning" (Rakes, 1995) and "Action Learning" (Gawith, 1992). Most of the Internet-using teachers described research project work as their main use of the Internet with students, but none claimed to be attempting a constructivist model. It seems that constructivist models require a greater degree of transformation of the classroom learning environment than many teachers are willing to commit themselves to. Alternatives are needed that can be utilised with a lower commitment to change.

In order to encourage more teachers to utilise the Internet in various ways, a series of models is hereby proposed to help teachers use the Internet at their own level of comfort and commitment. This makes use of Burkman's advice to develop a user-friendly product after measuring the perceptions of potential adopters (Surry & Farquar, 1997). It provides a structure compatible with the exploratory, discovery and promotional stages observed by Atmore (1995), and addresses the problems of earlier innovations

that seem to be caused by expecting later adopters to follow the same model as the enthusiasts (Cuban, 1986). It also follows Collis's (1996) advice to provide simple useful activities for the average teacher. The majority of teachers would benefit from a choice of more easily manageable models to follow, rather than a single model that has been shown to be effective in the hands of ICT experts.

From the literature and this study it can be seen that teachers are using the Internet in four basic ways - for personal/professional support, for classroom activities, as a source of information, and as a publishing/communication medium. These form the basis of a series of models which could be offered to teachers as options for integration of the Internet into teaching and learning. Here they have been arranged in order, from simplest to most complex.

### **1. The Support Model**

This model enables teachers to begin using the Internet to support their current teaching practices. It requires minimal commitment to Internet use or educational reform.

Teachers need to become Internet users first. They need time to become familiar with its strengths and weaknesses and make mistakes in private. They need a reason to use the Internet, and access to material that gives sufficient pay-off or pleasure (Collis, 1996). Using e-mail and the World Wide Web to support their own teaching needs would be a good way to start. Once teachers have used a few sites that they find rewarding, they are likely to return to them and share them.

Teachers could extend this implementation model by using photocopied sets of print-outs from the Internet. This would be a risk-free step towards Internet usage, avoiding the management problems caused by access to just one or two computers, and would be compatible with a range of traditional teaching methods. Teachers could stay with this model of use until they felt that conditions were right for the step to on-line use of the Internet for lessons.

### **2. The Activity Model**

This model involves limited on-line Internet usage. It would involve getting children to explore activities in a site chosen by the teacher, such as the Cancer Society's

SunSafe site. There are thousands of activity sites available. Finding the right one for a lesson or unit can be frustrating, but it would have advantages, such as the teacher having knowledge of the activity the children were about to experience, and knowing how it fits into the planning of the unit of work. The use of e-mail could be considered part of this model, since it is a constrained activity.

### 3. **The Research Model**

This has the potential to become a constructivist model as envisaged by Gawith (1995) and Rakes (1996). It involves teaching students to use the Internet as an information source for research, usually in conjunction with other resources such as a library. Teachers using this model need to ensure that they have an understanding of the process involved in researching a problem or question, finding information, and converting it into answers and knowledge – i.e. information literacy (Roberts, 1997). They also need to be able to model and teach this process to their students.

This model requires some complex and advanced teaching methods, and will need some strategies in place to enable the teacher to manage the Internet using students and the non-Internet section of the class. Using an Internet computer in the library is one solution, enabling multiple sources of information to be utilised.

### 4. **The Publishing Model**

This model involves using the Internet as an electronic publishing medium, enabling students to become contributors as well as consumers of information (Ryder, 1996). Students would publish their own work on the World Wide Web, either simply placed on Web pages by the teacher, or constructed as Web pages by the students. Publishing for a world-wide audience has been shown to increase students' motivation to complete their work and produce work of a high standard (Ryan, 1997). The work involved can be text, art work, photography, music and sound, and to a limited extent, video. This model would work best if the teacher had experience of the other models first, since it requires the teacher to have a good knowledge of the nature and features of the Internet. The amount of experience needed by the students would vary according to whether they were constructing the Web pages or simply supplying content.

These models provide a range of entry levels for teachers to begin using the Internet. It would be left to teachers to choose the model that matches their own skill level and suits the learning environment they have developed in their classroom. We cannot assume that teachers will change their role to accommodate the new technology. Experience in one of these models should provide sufficient confidence for a move to the next model in the sequence, but teachers should be allowed to make the decision about whether or not there is any benefit for them and their students.

According to Burkman, the next step in introducing these models is to inform teachers about them, particularly their degrees of user-friendliness (Surry & Farquhar, 1997). Possibilities for publicising the models include magazine and journal articles, pre-service and in-service ICT courses, teacher-support Web sites, and professional development contracts. Then, for teachers who choose to adopt one or more of the models, long-term support could be provided from Web sites.

## **7.12 Summary**

The use of the Internet in education is being explored at present by a small minority of teachers who, through their own personal experience with computers and the Internet, have gained the confidence to handle the complex teaching that is involved. These teachers could be considered Innovators under Rogers' (1995) theory, or enthusiasts in the same way as enthusiasts have always been the leaders of educational technology. They seem to have found the rewards that are necessary to make using the Internet a worthwhile activity – the problems are being offset by the pleasure and the payoffs they experience, as theorised by Collis (1996).

The results of this study show that most teachers, Internet users and non-users, are enthusiastic about the potential of the Internet. They view it mainly as an information source, rather like an encyclopedia or library. However, they find it to be a complex resource conceptually, with a disorganised structure that makes searching difficult despite the promise that information is available on any topic. The Internet is seen as imperfect in a technical sense too, and many teachers seem to be waiting for it to improve in reliability and features.

Teachers are finding that they need to spend many hours using the Internet personally in order to gain confidence with it. It has a great deal of unpredictability, firstly in its

technical operation, and secondly in the information obtained. So classroom use requires a special sort of confidence beyond simply knowing that a lesson is prepared – it requires the confidence to be able to solve problems in the midst of a multi-faceted lesson. These could be technical problems, but are more likely to be decision-making problems concerned with search terms, web page choices and the evaluation of information sources. This raises fears of management difficulties, which have been shown in this study to inhibit Internet use.

Teachers who have not yet used the Internet have many issues to clarify. They need time to explore the Internet personally in order to clarify these for themselves. It would be appropriate for them to be introduced to optional entry points for the use of the Internet, so that they can choose a level of commitment and complexity that suits their experience and needs. In this chapter a set of implementation models has been proposed that are expected to meet these needs:

1. The Support Model
2. The Activity Model
3. The Research Model
4. The Publishing Model

The next step is to introduce these models to teachers and support them in implementing the model of their choice.

## Chapter Eight

### Conclusion

#### 8.1 Introduction

This chapter begins by evaluating the original aim of describing primary school teachers' perceptions of the Internet as a resource for teaching and learning. It then considers the limitations of this study, research issues, and implications for teaching and learning.

#### 8.2 The Aim Evaluated

The original aim of this study was to describe and analyse the perceptions that teachers have of the Internet as a resource for teaching and learning. The study aimed to gather opinions about various aspects of the Internet from teachers who had used it in their teaching as well as from teachers who had not. It also asked teachers who had used the Internet in lessons to describe their experiences.

Data collected from the questionnaire and interviews has made it possible to describe teachers' perceptions of the Internet in moderate detail. Most teachers have favourable views of the Internet's potential as an educational resource – they expect that it will help students to learn more, research better, and enjoy learning. Most teachers in the study showed an intention to use the Internet with children within the next year or two. But most teachers want to make their own choices about how the Internet is used in the classroom. They do not want to be directed into a transformed teaching and learning environment with new roles for teachers and modified teaching methods. It seems then that most teachers would prefer to use the Internet as a resource to support their current teaching methods. This is opposed to the view of most theorists, who tend to support a constructivist approach. The opposing views of teachers and theorists would seem to indicate a danger of the Internet remaining a minority interest as an educational innovation unless a broader rationale can be agreed on. There seems to be a need to reconcile the two viewpoints by providing teachers with a range of options for taking up use of the Internet in either constructivist or non-constructivist ways. The proposed solution is a series of implementation models, as described in chapter seven.

### **8.3. Limitations of the Study**

The two-phase methodology of the study, involving a questionnaire followed by personal interviews, proved suitable for the gathering of data relevant to the research questions listed in chapter three. However some limitations have been noted.

The research questions were adequate for the study, but proved somewhat narrow when it came to ascertaining teachers' needs. The mismatch between the recommendations of theorists and the desires of the teachers was not anticipated and therefore not investigated in the depth that would have been ideal.

The use of NetDay schools as a sample had the advantage of providing an informed group of teachers with access to the Internet, but generalisation to the wider teaching profession is difficult to justify at present. Other schools have variations in their commitment to Internet connection. However it may become more relevant in future, since it is expected that eventually all schools will install Internet connections.

The return rate for the questionnaires was only 51%, therefore the views of approximately half of the potential respondents are unknown. It has been assumed for the purposes of this study that the respondents were representative of teachers in the NetDay schools. However, the possibility exists that the respondents differed from the non-respondents in some way – for example, the questionnaire may have appealed more to teachers with a favourable view of the Internet.

### **8.4 Implications for Research**

There is need for further investigation of several areas of teacher and student use of the Internet.

Detailed observational case studies are needed of how students and teachers use the Internet in the classroom. These should be studies of classes who have become experienced in using the Internet. Too many studies have involved classes who have been using the Internet for the first time, with the resulting emphasis on novelty effects and unexpected problems.

The process of teacher involvement in reform needs to be studied. This study suggests that the eagerness of theorists to predict and recommend educational reforms based on

new technology is not shared by teachers. Teachers needs, as perceived by the teachers themselves, should be considered in the prediction of what will be best and what is practical.

The theories of innovation diffusion have been used to identify failures in the introduction of educational technologies (Cuban, 1986, Collis, 1996), but have yet to identify the causes of failure. It has been suggested in this study that one weakness in diffusion theory is the expectation that the course of early innovators will be followed by later adopters, with nothing more than a time lag. This study proposes that later adopters be treated as a less pre-disposed group with requirements for not only more support but more options for implementation. More research is needed to confirm or reject this proposition.

Collis (1996) recommends that research be undertaken into how to support teachers in ICT. This suggests study into the appropriateness and usefulness of teacher resource Web sites in supporting teachers in their teaching. This could include support for the use of the Internet with students, as well as resources for planning non-Internet lessons.

The Internet is still in an immature phase of its development, and as it becomes more reliable and user-friendly, and as computer equipment becomes cheaper and more numerous, the scenario for using it in schools will change. Ongoing research is needed to re-assess the situation and teachers perceptions as these changes take place.

## **8.5 Implications for Teaching and Learning**

It is apparent from this study that most teachers agree that the Internet has potential for enhancing teaching and learning, but the use of the Internet in education is being delayed at present by two factors:

1. the immaturity of the Internet infrastructure. Within schools there are not yet enough Internet connected computers, and the Internet needs improvements to its speed, reliability, content quality, and features.
2. the perceptions of teachers that entering into Internet usage is a high stakes commitment. It commits teachers to the risks of new technology, information literacy issues, class management problems, and an unknown degree of educational reform.

Predictions of educational reform seem to be premature for the average teacher. Most teachers in this study would prefer to maintain the traditional classroom environment. This may seem to contradict their perception of the Internet as valuable and useful, but teachers do not necessarily see the Internet as inherently much different from a library, with the freedom to use it as you wish for your own needs.

This study supports the suggestions of Bigum (1995) and Alexander (1997) that teachers, rather than students, be given access to the Internet first. They need time to explore (Collis, 1996) and become users for their own personal and professional interests. This delay will also have the benefit of giving the Internet time to mature and become ready to deliver more advanced features, such as streamed audio and video, and published books and magazines.

Teacher training is necessary to introduce teachers to the possibilities the Internet offers for teaching and learning. It should be flexible enough to allow for different starting points, and allow teachers to make well-informed decisions on how (or whether) the Internet can meet their needs. This should include debate on the possibilities for transformation of the teaching and learning environment, so that teachers are involved in any initiatives for reform.

Providing a range of implementation models, such as those proposed in chapter seven, will enable teachers to become Internet users at a level that they feel comfortable with. The basic entry point, The Support Model, is a natural consequence of a teacher's personal exploration of the Internet. This is a more teacher-centered model than those recommended by educational theorists, but it allows teachers to extend their comfort zone in a way that will be more manageable.

This study has shown that student research is likely to become a major use of the Internet. This has been identified as providing a suitable environment for the transformation of learning to constructivist principles (Rakes, 1996), but the degree of adherence to constructivism depends on the teacher rather than the technology. There is no guarantee that the Internet will be any more a vehicle for reform than the school library is at present. Reform of the school environment is highly likely in the next century, but the Internet cannot be isolated as the cause of any particular direction,

because it can be used to support all viewpoints. It is not inherently constructivist or behaviourist - it can be used either way.

The use of the Internet is restricted at present by the number of computers available, which has the effect of restricting students' on-line time. The Internet-using teachers in this study only made use of the Internet with students for a few hours. Where a whole class was involved, each child would only have had about one hour on the Internet during a unit of work. It is possible for teachers to improve access through various strategies such as group work or after-hours access, but it is clear that more computers will be necessary for optimum access.

This study shows that teachers expect to have maintenance of hardware and software looked after by a technician. The introduction of networking raises the level of complexity to a professional level, and schools need to recognise that budgeting for the Internet and other networking should include the involvement of professionals in installation and maintenance.

## **8.6 Current Developments**

During the course of this study some developments occurred which may affect the use of the Internet in schools.

In late 1998 the New Zealand Government released *Interactive Education*, a booklet outlining its strategy for the use of ICT in schools: (Ministry of Education, 1998).

*Interactive Education* encourages teachers to make use of ICT in a wide range of ways to support teaching, learning and administration. It sets objectives to improve learning outcomes, improve teaching, and contribute to an information-literate workforce.

Intentions were announced to fund professional development for teachers and contribute to school ICT infrastructure. In 1999 schools were urged to apply for assistance, starting with training for principals.

In September 1999 a Government-funded On-Line Resource Centre for teachers (*Te Kete Ipurangi*) was established, as promised in the ICT strategy. This continues to develop as a first-call portal for New Zealand teachers wishing to learn more about the Internet and make use of it for teaching. It is also expected to become a useful index of worldwide sites relevant to the New Zealand curriculum, searchable by children as well

as teachers. Figure 8.1 shows the *Te Kete Ipurangi* home page. From this, access is available to a range of resources for teachers, such as curriculum advice and recommended sites.



**Figure 8.1:**  
Te Kete Ipurangi:  
The On-Line  
Learning Centre

<http://www.tki.org.nz/>

The models proposed in chapter seven of this study will complement these developments. *Interactive Education* provides encouragement and justification for seeking better ways to utilise the Internet in education, and *Te Kete Ipurangi* will provide resources and support.

## 8.7 Final Remarks

This study has provided evidence that teachers are central to technological innovation in schools. They are able to choose or reject an innovation, no matter how well designed or well-proven the innovation might be. The New Zealand Government is now actively encouraging the use of ICT by teachers and students through its ICT strategy and related initiatives, which provide added encouragement for teachers to use the Internet. But for the Internet to become a valuable resource, teachers must have the opportunity to explore it and decide how to make use of it for teaching and learning needs in their classroom.

## References

- Adams, J., Adams, P., Cheng, F., & Sutherland, J. (1992). Teachers' Attitudes and Perceptions of Computer Needs. *Computers in New Zealand Schools*, 4 (3), 10-17.
- Alexander, R. (1997). Finding the On-Ramp to the Information Super-Highway: The Challenges of Developing CMC in Schools. *Computers in New Zealand Schools*, 9 (2), 15-18.
- Atmore, D. (1995). *Schools Network Evaluation*. Wellington: NZCER.
- Banks, M. (1997). *Web Psychos, Stalkers and Pranksters*. New York: Coriolis Group Books.
- Beadle, M. E. (1996). Strategies for a Communication Course Using the Internet. *Techtrends*, March.
- Benson, A. C. & Fodemski, L. M. (1996). *Connecting Kids and the Internet*. New York: Neal-Schuman.
- Bigum C. (1995). The Internet and Schools: A Revolution of What Kind? *Computers in New Zealand Schools*, 7 (3), 13-14.
- Black, L., Klingenstein, K., & Songer, N. B. (1995). Part 2: Observations from the Boulder Valley Internet Project, in *T.H.E. Journal*, June, 54-57.
- Bromley, H. (1998). Data-Driven Democracy? Social Assessment of Educational Computing, in Bromley, H., & Apple, M. (1998) *Education/Technology/Power*, (pp. 1-25). Albany, NY: SUNY.
- Brown, M. (1995). *What is the Role of Information and Communications Technology in the New Zealand Curriculum?*  
<http://www.massey.ac.nz/~wwedpsy/t&sres/mark1.htm>
- Brown, M. & Ryba, K. (1996). The Information Superhighway: A Teachers Guide to the Internet, in Lai, K.W. (Ed.), *Words Have Wings*. Dunedin: Otago University Press.
- Butler, G. & Zwimpfer, L. (1997). *Impact 2001: Learning with IT - The Issues*. Wellington: ITAG/ITANZ. <http://www.moc.govt.nz/itag/publish.htm>
- Carey, D.M. (1993). Teacher Roles and Technology Integration: Moving from Teacher as Director to Teacher as Facilitator. *Computers in the Schools*, 9 (2/3), 105-118.

- Casey, P.J. (1996). Computing as Educational Innovation. *Journal of Information Technology for Teacher Education*, 5 (1/2).
- CAST (1996). *The Role of Online Communications in Schools: A National Study*.  
<http://www.cast.org/stsstudy.html>
- Chaptal, A. (1995). Why Media and IT will Become a Part of all Forms of Education, and the Problems we will Face – A Global Approach. *Educational Media International*, 32 (4), 11-15.
- Cohen, L., & Manion, L. (1994). *Research Methods in Education*. London: Routledge.
- Collis, B. (1996). The Internet as an Educational Innovation: Lessons from Experience with Computer Implementation. *Educational Technology*, Nov/Dec, 21-30.
- Consumers Institute (1997). Net Gains, Net Losses. *Consumer*, Jan/Feb. Wellington: Consumers' Institute.
- Cresswell, J. W. (1994). *Research Design: Qualitative and Quantitative Approaches*. Thousand Oaks: Sage.
- Crooks, T. & Flockton, L. (1998). *NEMP Report 7 - Information Skills: Assessment Results*. Dunedin: EARU-University of Otago.
- Cuban, L. (1986). *Teachers and Machines: The Classroom Use of Technology Since 1920*. New York: Teachers' College Press.
- DeLahunta, S. (1996). Arts and Internet: Reflections on an Introduction for Arts Students, *Educational Media International*, 33(2), 64-67.
- Duffy, T.M. & Cunningham D.J. (1996). Constructivism: Implications for the Design and Delivery of Instruction, in Jonassen, D.H. Ed., *Handbook of Research for Educational Communications and Technology*. New York: Macmillan.
- Dyson, E. (1997). *Release 2: A design for living in the digital age*. New York: Broadway Books.
- Evening Post* (1998). Behind the times. August 4, p3.
- Gall, M., Borg, W. & Gall, J. (1996). *Educational Research: An Introduction*. White Plains: Longman.
- Gawith, G. (1992). *Action Learning*. Auckland: Longman Paul.
- Gawith, G. (1995). *IT: Charms and Challenges*. TFL '98 Seminar, Massey University.

- Hannafin, R.D., & Savenye, W.C. (1993). Technology in the Classroom: The Teacher's New Role and Resistance to It. *Educational Technology*, June, 26-31.
- Harris, D. (1996). *Schools Network Evaluation: Phase Two*. Wellington: NZCER.
- Haugland, S., & Wright, J. (1997). *Young Children and Technology: A World of Discovery*. Massachusetts: Allyn and Bacon.
- Kerlinger, F.N. (1986). Sampling and Randomness, in *Foundations of Behavioural Research* (3<sup>rd</sup> edition), 109-122. New York: Holt, Rinehart and Winston.
- Knapp, L., & Glenn, A. (1996). *Restructuring Schools with Technology*. Boston: Allyn and Bacon.
- Kozma, R. & Schank, P. (1998). Connecting with the 21<sup>st</sup> Century: Technology in Support of Educational Reform, in Dede, C. (ed) (1998) *ASCD Yearbook 1998: Learning with Technology*, (pp. 3-27). Alexandria VA: ASCD.
- Lai, K. W. (1996). Computer-Mediated Communication: A New Learning Context, in Lai, K. W. (Ed.), *Words have Wings*. Dunedin: University of Otago Press.
- Leeuwenberg, B. (1996). Revolutionising research via the Net. *The Dominion*, May 27, p. 22.
- MacArthur, C. & Malouf, D. (1991). Teachers' Beliefs, Plans and Decisions about Computer-based Instruction. *The Journal of Special Education*, 25 (5), 44-72.
- Massey University (1997). *Code of Ethical Conduct for Research and Teaching involving Human Subjects*. Palmerston North.
- McGregor, J. (1994). *But I changed some of the words*. Paper, Seventh National AASL Conference, Indianapolis, November 1994.
- Miller, L. & Olson, J. (1995). How Computers Live in Schools. *Educational Leadership International*, October, 74-77.
- Ministry of Education (1994). *Education for the 21<sup>st</sup> Century*. Wellington: Learning Media.
- Ministry of Education (1998). *Interactive Education: An Information and Communication Technologies Strategy for Schools*. Wellington: Ministry of Education.
- Morimoto, K., Gregory, J., & Butler, P. (1973). Notes on the context for learning, *Harvard Educational Review*, 43, 245-257.

- Moore, N., Henninger, M., Huck Tee Lim, E., & Stueart, R. D. (1998). *A Curriculum for an Information Society*. Bangkok: UNESCO.
- Negroponete, N. (1995). *Being Digital*. New York: Knopf.
- Neill, M. (1995). Computers, Thinking and Schools in the "New World Economic Order", in Brook, J. & Boal, I. (1995) *Resisting the Virtual Life: The Culture and Politics of Information*, 181-194. San Francisco: City Lights.
- O'Hare, N. (1996). The Big Byte. *Listener* April 6, 18-21.
- Oppenheimer, T. (1997). The Computer Delusion. *The Atlantic Monthly*, July, 45-62, and <http://www.theatlantic.com/issues/97jul/computer.htm>.
- Owens, J. L. (1996). A Survey of Computer Use in New Zealand Schools. *The Research Bulletin*, No.7. Wellington: Ministry of Education.
- Papert, S. (1993). *The Children's Machine: Rethinking School in the Age of the Computer*. New York: Basic Books.
- PC World (1995) Highways to Cyberspace, in *The Absolute Beginner's Guide to buying a PC*. Auckland: PC World.
- Perkins, D.N. (1991). What Constructivism Demands of the Learner, *Educational Technology*, Sept.
- Pfaffenberger, B. (1996). *Web Search Strategies*. New York: MIS Press.
- Postman, N. (1993). *Technopoly*. New York: Vintage Books.
- Quinlan, L.A. (1996). Customising Web Documents for the Classroom, in *Techtrends* March.
- Rakes, G.C. (1996). Using the Internet as a Tool in a Resource-Based Learning Environment, *Educational Technology*, Sept/Oct, 52-56.
- Richards, C. (1996). *The Impact of the Internet on Teaching and Learning in Education as Perceived by Teachers, Library Media Specialists, and Students*. Masters Thesis, Salem-Teikyo University. ERIC No ED410943.
- Roberts, P. (1997). Literacies in Cyberspace. *Set Special 1997: Language and Literacy*, 1-4. Wellington: NZCER.
- Roblyer, M.D. (1996). Is Research Giving Us the Answers (and the Questions) We Need? *Learning and Leading With Technology*, September, 14-18.

- Rogers, E.M. (1995). *Diffusion of Innovations (4<sup>th</sup> Ed.)*. New York: The Free Press.
- Roszak, T. (1994). *The Cult of Information*. Berkley: University of California Press.
- Rowe, H. (1996). *I.T. is Failing to Revolutionise the Curriculum, because to Date we have Failed to Evaluate Its Benefits in Context*. Proceedings of the Australian Computers in Education Conference, Melbourne, 1996.
- Ryan, S. (1997). Internet Creations: Designing a Home Page. *Computers in New Zealand Schools*, 9 (3), 37-38.
- Ryder, M. (1996). *Affordances and Constraints of the Internet for Learning and Instruction*, paper presented to Association for Educational Communications Technology, [http://www.cudenver.edu/~mryder/aect\\_96.html](http://www.cudenver.edu/~mryder/aect_96.html).
- Sanchez, R. (1995). A Wired Education, *Internet World*, Oct., 71-74.
- Sculley, J. (1989). The Relationship Between Business and Higher Education: A Perspective on the 21<sup>st</sup> Century, in Hawisher, G. & Selfe, C. (eds.) (1997) *Literacy, Technology and Society: Confronting the Issues*. Upper Saddle River NJ: Prentice Hall.
- Sewell, D. (1990). *New Tools for New Minds: a cognitive perspective on the use of computers with young children*. New York: St Martin's Press.
- Skomars, N. (1998). *Educating with the Internet: Using Net resources at School and at Home*. Rockland: Charles River Media.
- Smith, J. K. (1992). Interpretive Enquiry: A practical and Moral Activity. *Theory into Practice* 31(2), 100-106.
- Smits, R. (1997). *Internet Realities: Amazing But Time Consuming?* unpublished MEd thesis, Massey University.
- Spender, D. (1995). *Nattering on the Net: Women, Power and Cyberspace*. Melbourne: Spinifex.
- Stoll. C. (1995). *Silicon Snake Oil*. New York: Doubleday.
- Surry, D., & Farquhar, J. (1997) Diffusion Theory and Instructional Technology. *Journal of Instructional Science and Technology* (Vol. 2: No.1).  
<http://usq.edu.au/electpub/e-jist/vol2no1/article2.html>
- Tapscott, D. (1998). *Growing Up Digital: The Rise of the Net Generation*. New York: McGraw-Hill.

- Tiffin, J., & Rajasingham, L. (1995). *In Search of the Virtual Class: Education in an Information Society*. London: Routledge.
- Teachers@Work, (1997). *Education and the Internet: Opportunities and Pitfalls*. <http://www.teachers-work.co.nz>
- Telecom Education Foundation (1996). *How Wired are Our Schools? Telecommunications in New Zealand Schools 1993-96*. Wellington: TEF.
- Trewern, A. (1996). The Internet: What's in it for Me and My Students? in Lai, K. W. (Ed.), *Words have Wings*, 35-81. Dunedin: University of Otago Press.
- Tuckman, B.W. (1978). *Conducting Educational Research*. New York: Harcourt Brace Jovanovich.
- Turkle, S. (1997). Seeing Through Computers: Education in the Age of Simulation. *The American Prospect*, March/April. <http://epn.org/prospect/31/31turk.html>
- Westberg, K. (1997). Open the Floodgates, Harness the Power of the Internet for Students' Independent Projects. *Computers in New Zealand Schools*, 9 (3), 23-27.
- White J. (1996). Ethical Issues for Teachers and Students, in *Words have Wings* (Ed. Lai, K. W.), pp 35-81, Dunedin: University of Otago Press.
- Woolfolk, A.E. (1990). *Educational Psychology*. Boston: Allyn and Unwin.
- Zaichkowsky, J. L. (1994). The Personal Involvement Inventory: Reduction, revision, and application to advertising. *Journal of Advertising*, 23 (4), 59-70.
- Zwimpfer, L. (1997). *NetDay '97 - Networking our Schools: Making a Start in Wellington*. Wellington: ITAG.

## Appendix A: Letter to Principals

(Massey letterhead)

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Dear

I am doing an MEd thesis on teachers' impressions of the Internet, including their intentions to use it for teaching and learning. Part of my research is a survey of the views of the teachers in schools that took part in NetDay 97. I hope that you will be willing to allow a questionnaire to be distributed to the teaching staff at your school. At a later date I may want to interview one or two teachers at your school if they indicate their willingness to do so on the questionnaire.

It is possible that I may need to interview a teacher using the Internet with children later in the year, but I will request additional permission from you and the teacher for this.

The purpose of this research is to record teachers' points of view about the Internet's usefulness and appropriateness as a teaching and learning resource. The development of the Internet has been accompanied by various recommendations from experts in both the telecommunications industry and the educational community. But teachers are the most vital component of technological innovation. Past experience has shown that innovations succeed or fail in the classroom depending on whether the teacher sees a need for them, but their opinions have rarely been sought.

The results from the questionnaires, interviews and observations in schools will be analysed and reported in my thesis. Also, a journal article will be written summarizing the results and findings. Copies of the article will be sent to the participating schools and teachers involved.

Completed questionnaires will be returned in sealed envelopes and all data will be treated with confidentiality. The identities of teachers and schools will be concealed by aggregation of data and anonymity of quotations. Teachers' wishes will be respected if they do not wish to participate or answer certain questions. It is hoped that teachers will answer freely, and not feel pressured to follow expectations or publicity related to the Internet.

Your cooperation in this research would be greatly appreciated. It is likely that it will prove useful for schools who are still trying to predict the future course of computing in schools. Evidence of teachers' needs and intentions may be a helpful contribution to government decision-making in this area too.

I will phone you next week to answer any questions you may have and ascertain your consent.

Thanks for your help.  
Yours sincerely

Mike Drain,  
Lecturer, Technology Education,  
Wellington College of Education.

## Appendix B: Distribution Letter

(Massey letterhead)

Researcher:

Michael Drain, BA, DipTchg

Masters student

Lecturer, Wellington College of Education

Ph 476 8699

Supervisors:

Mark Brown, MEd and Dr Tracy Riley

Massey University College of Education

Ph 06 356 9099

Dear Principal

Thank you for agreeing to distribute my questionnaire on teachers' views of the Internet to teachers at your school. I am hoping that this survey will provide insights into teachers' opinions about the Internet as resource for education, and their intentions to use it or not.

Copies of the questionnaire are enclosed. I hope you will be able to distribute these to your teaching staff, whether they have used the Internet or not.

Each questionnaire has a stamped/addressed envelope attached so that they can be returned individually. It would be helpful if teachers could return them to the school office for this.

Thank you for your assistance.

Yours sincerely

Mike Drain

Lecturer, Technology Education

## Appendix C: Letter to Teachers

(Massey letterhead)

Researcher:

Michael Drain, BA DipTchg  
Masters student, Massey University  
Lecturer, Wellington College of Education  
Ph 476 8699

Supervisors:

Mark Brown, MEd and Dr Tracy Riley  
Massey University College of Education  
Ph 06 356 9099

Dear Teacher,

I would like you to take part in a research project which will listen to teachers' impressions of the Internet, the world-wide network of computers that is gaining attention in schools.

You have been selected because your school took part in NetDay 97. Whether you were involved or not, you can make a contribution to the learning of teachers who are considering following this path.

The purpose of the research is to find out whether teachers intend to use the Internet, and whether they think it is useful for teaching. I would like to give a number of teachers the chance to give their views. It seems that teachers have not had enough opportunities to give their opinions about the development of computers in schools in the past. What you have to say is important as you have been one of the first to be offered this new educational innovation.

Attached is a questionnaire which gives you the chance to record your views. It is anonymous, but gives you the chance to discuss the issues further in an interview if you are willing. Your views will remain confidential, and will only be published in aggregated or anonymous form. So I hope you will feel confident to air your views freely. You can also leave out any answers that you feel unhappy about for any reason.

The results will become part of my Master of Education thesis, and a journal article in 1999. Copies of the article will be sent to the 6 schools that are participating. I hope that the results will contribute to a new atmosphere of listening to teachers' views on matters that affect them in their classrooms.

I would appreciate it if you would take 15 minutes to fill in the questionnaire and return it to your school office in the envelope attached. I will assume that filling in the questionnaire implies consent to use data in anonymous form.

Many thanks for your assistance,

Mike Drain,  
Lecturer, Technology Education,  
Wellington College of Education.

## Appendix D: Questionnaire

### Your Views about the Internet

#### PART A:

Please circle your indicated choices. Please feel free add comments to any question.

#### Staff Position

1. *What is your position on the school staff?*

Scale A teacher    Senior teacher    Principal    Deputy Principal    Other: .....

2. *How long have you been teaching?*

Less than 2 years    2-5 years    6-10 years    10-20 years    over 20 years

#### Computer Use

3. *How would you describe your current computer skill level?*

None    Novice    Beginner    Competent    Expert

4. *What type of computer(s) do you have in your classroom?*

None    Acorn    Macintosh    PC    Other.....

5. *How would you describe your use of the classroom computer for lessons?*

None    infrequent    occasional    regular    constant

6. *Which of these words describe your various teaching roles in the classroom. (You may tick more than one.)*

	Often	Some-times	Never
<i>lecturer</i>			
<i>co-learner</i>			
<i>corrector</i>			
<i>mentor</i>			
<i>helper</i>			
<i>instructor</i>			
<i>supervisor</i>			
<i>coach</i>			
<i>guide</i>			

	Often	Some-times	Never
<i>adviser</i>			
<i>leader</i>			
<i>expert</i>			
<i>demonstrator</i>			
<i>supporter</i>			
<i>facilitator</i>			
<i>chairperson</i>			
<i>observer</i>			
<i>partner</i>			

*other* .....

## Internet Use

### 7. *Where do you have access to an Internet-linked computer?*

None          Home          Classroom          School Library          School office  
Own office    Staffroom    computer room          Other .....

### 8. *Where can children at your school get access to the Internet?*

None          Classroom (.....points)          School Library (.....points)  
School office          Principal's office          Staffroom          Computer room (.....points)  
Other .....

### 9. *How would you describe your current Internet skill level?*

None          Novice          Beginner          Competent          Expert

### 10. *Which Internet services do you usually use? (You may circle more than one.)*

None          E-mail          World Wide Web          FTP (file transfer)          Listserv  
Chat          Usenet          Telnet          MUD (multi-user)          Other .....

### 11. *Do you intend using the Internet with children within the next:*

1 year? Yes No          2 years? Yes No          5 years? Yes No

### 12. *Have you already used the Internet in lessons with children?*

Yes No

If you answered "No" to this question go straight to Part C.

## **PART B: (For teachers who have used the Internet with children.)**

### **Using the Internet for teaching and learning.**

### 13. *How often have you taught topics that included use of the Internet by children?*

Never          once          2-5 times          5-10 times          more than 10 times

### 14. *Which Internet services do your students usually use? (You may circle more than one)*

None          E-mail          World Wide Web          FTP (file transfer)          Listserv  
Chat          Usenet          Telnet          MUD (multi-user)          Other .....

**15. How much do you think using the Internet has changed your teaching roles in the classroom?**

Not at all      a little      quite a lot      completely      unsure

**16. What are your main purposes for giving your students use of the Internet?**

*(You may circle more than one letter.)*

- |                           |                                       |
|---------------------------|---------------------------------------|
| (a) access to information | (h) learning how to research          |
| (b) working independently | (i) learning about telecommunications |
| (c) contacting adults     | (j) contacting children               |
| (d) publishing on the web | (k) to obtain software                |
| (e) questions to experts  | (l) to do activities                  |
| (f) to obtain pictures    | (m) social interaction                |
| (g) entertainment         | (n) other .....                       |

**17. Please give one example of how you've used the Internet with children.**

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**18. Are you willing to have a 20 minute interview about your Internet experiences with children?**      Yes      No

Name..... School .....

## **PART C: Your Opinions**

Please show how much you agree or disagree with these statements:

**Circle your indicated choices**

**19. Students will learn more with the Internet than without it.**

Strongly agree      agree      unsure      disagree      strongly disagree

**20. Internet connection has some technical difficulties.**

Strongly agree      agree      unsure      disagree      strongly disagree

**21. It is hard for children to find what they want on the Internet.**

Strongly agree      agree      unsure      disagree      strongly disagree

**22. *The Internet will improve the way you teach.***

Strongly agree      agree      unsure      disagree      strongly disagree

**23. *The Internet will enable your students to improve their research skills.***

Strongly agree      agree      unsure      disagree      strongly disagree

**24. *The Internet will make the computer in your classroom more useful.***

Strongly agree      agree      unsure      disagree      strongly disagree

**25. *Students will enjoy using the Internet.***

Strongly agree      agree      unsure      disagree      strongly disagree

**26. *The Internet is an unsafe place for children because of "adult" material.***

Strongly agree      agree      unsure      disagree      strongly disagree

**27. *Children will just copy Internet information into their projects.***

Strongly agree      agree      unsure      disagree      strongly disagree

**28. *Using the Internet with children will make teaching more stressful.***

Strongly agree      agree      unsure      disagree      strongly disagree

**29. *Using the Internet is better than real life experiences.***

Strongly agree      agree      unsure      disagree      strongly disagree

**30. *A good teacher does not need to use the Internet.***

Strongly agree      agree      unsure      disagree      strongly disagree

**31. *A library is more useful than the Internet for research.***

Strongly agree      agree      unsure      disagree      strongly disagree

**32. *Children will waste time with distractions on the Internet.***

Strongly agree      agree      unsure      disagree      strongly disagree



**44. More material on the Internet designed for educational use.**

Unimportant 1                      2                      3                      4                      5 Important

**45. Internet technology improved (better page-loading speed and reliability).**

Unimportant 1                      2                      3                      4                      5 Important

**46. Ministry of Education gives directives on using the Internet.**

Unimportant 1                      2                      3                      4                      5 Important

**47. Full audio, video and interactivity on the Internet.**

Unimportant 1                      2                      3                      4                      5 Important

**Part E: Children and the Internet**

*Please circle the number that best shows your view.*

*I think most children will find the Internet...*

- |                 |   |   |   |   |   |              |
|-----------------|---|---|---|---|---|--------------|
| 48. Unimportant | 1 | 2 | 3 | 4 | 5 | Important    |
| 49. Interesting | 1 | 2 | 3 | 4 | 5 | Boring       |
| 50. Irrelevant  | 1 | 2 | 3 | 4 | 5 | Relevant     |
| 51. Unexciting  | 1 | 2 | 3 | 4 | 5 | Exciting     |
| 52. Unappealing | 1 | 2 | 3 | 4 | 5 | Appealing    |
| 53. Mundane     | 1 | 2 | 3 | 4 | 5 | Fascinating  |
| 54. Valuable    | 1 | 2 | 3 | 4 | 5 | Worthless    |
| 55. Engaging    | 1 | 2 | 3 | 4 | 5 | Non-engaging |
| 56. Not needed  | 1 | 2 | 3 | 4 | 5 | Needed       |
| 57. Complex     | 1 | 2 | 3 | 4 | 5 | Simple       |

**58. Do you have any other comments about the use of the Internet for teaching or learning?**

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**Thank you for completing this questionnaire. Please put it in the attached envelope and return it to your school office.**

**Appendix E: Reminder to Principals**

(Massey letterhead)

Researcher:  
Michael Drain BA DipTchg  
Masters student  
Lecturer, Wellington College of Education  
Ph 476 8699

Supervisors:  
Mark Brown MEd and Dr Tracey Riley  
Massey University College of Education  
Ph 06 356 9099

Dear Principal,

Thank you for distributing my research questionnaire about teachers' impressions of the Internet. The response has been good, but there may be some teachers who would still like to respond, or have forgotten to.

I would appreciate it if you could remind your staff about it at your next staff meeting.

Some teachers may have lost the questionnaire or may have missed out on one, so I have included 3 more copies.

Also, I need information about the number of teachers at the ten schools involved in order to calculate an overall response rate. Could you please fill in the form below and return it to me in the enclosed stamped/addressed envelope.

Thank you for your assistance.

Yours sincerely

Mike Drain.

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School: .....

Number of full-time teachers (including principal): .....

Number of part-time teachers: .....

## Appendix F: Ethical Statement

Massey University College of Education

### Research Project:

## Teachers' Perceptions of the Internet as an Educational Resource

### ETHICAL STATEMENT

This research project is for a Master of Education thesis and is being conducted by Michael Drain, lecturer in the Technology Education Department, Wellington College of Education. It is being supervised by Mark Brown and Dr Tracy Riley, Massey University.

This project aims to investigate primary school teachers' perceptions of the value and nature of the Internet as a resource for teaching and learning. The project also aims to collect information about the ways teachers who already use the Internet are making use of it with children in their schools.

Interview participants will be given a copy of their interview transcript for comment. Any statements may be corrected or removed. The audio tapes will be available at any time and will be returned to the participants at the conclusion of the study. At the conclusion of the study participants will be invited to comment on the final report.

Confidentiality will be maintained at all times. Pseudonyms will be used to protect the identity of any participating school and care will be taken in removing any details which could lead to identification of schools or participants in the reporting of the research. All data will be stored securely for up to three years and then destroyed.

Mike Drain

#### **Informed Consent:**

I understand that the data that I provide through interview will be used for the purposes of this research project. I am agreeing to participation on the condition that confidentiality and anonymity will be maintained at all times. I am also aware that I may withdraw from this research at any time.

.....